

EFFICIENCY AND RENEWABLE  
ELECTRICITY POTENTIAL STUDIES  
APPROACHES, RESULTS, USES AND  
IMPLICATIONS

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## Recent Optimal Energy Potential Studies

- VT Statewide Update – Achievable of Technical Potential (with VEIC)
- NW Vermont – Achievable of Technical (with VEIC)
- Michigan – Achievable of Economic (with VEIC)
- Maine – Achievable of Technical (with VEIC)
- New York State –  
Technical/Economic/Achievable/Program  
Funding Constrained (with VEIC/ACEEE)
- Long Island – Achievable (with VEIC)

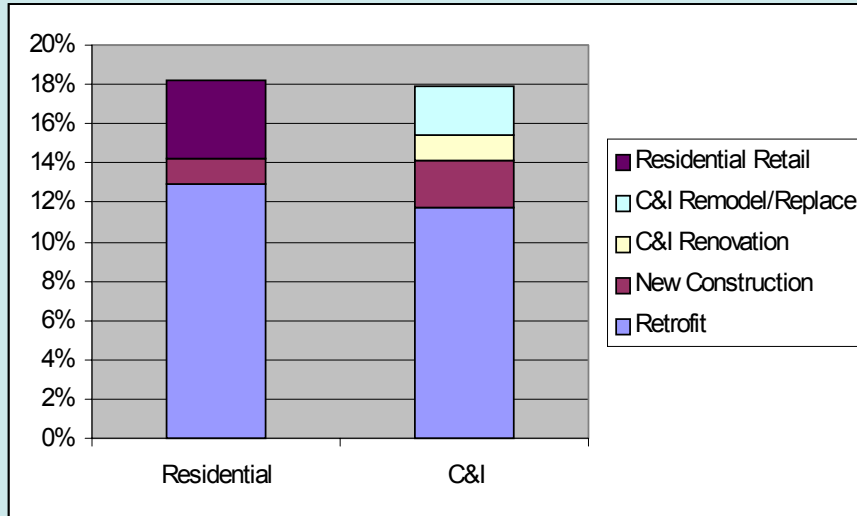
## Uses for Efficiency and Renewables Potential Studies...

- Establishing levels of efficiency/renewable resource allocation (public goods charges)
- Supporting policy decisions (e.g., climate action targets)
- Least Cost Planning – traditional IRP
- Distributed Utility Planning – T&D LCP
- Renewable Portfolio Standards

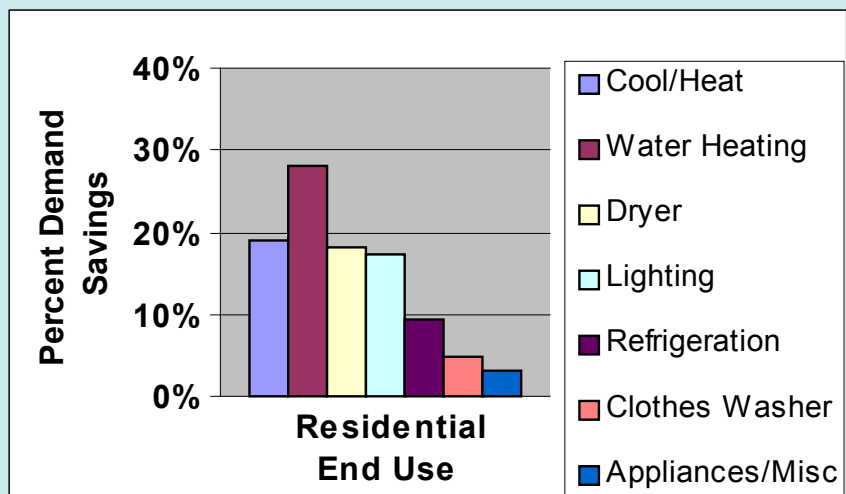
## Velco Northwest Vermont Reliability Project Achievable Potential Study Scope

- Targeted Transmission area – 4 load zones
- Potential to defer ≈\$100M investment in 345KV and 115KV lines
- Achievable potential from limited measures – excluded low peak coincidence measures, upstream regional strategy measures
- Conservative penetrations – increased confidence of success

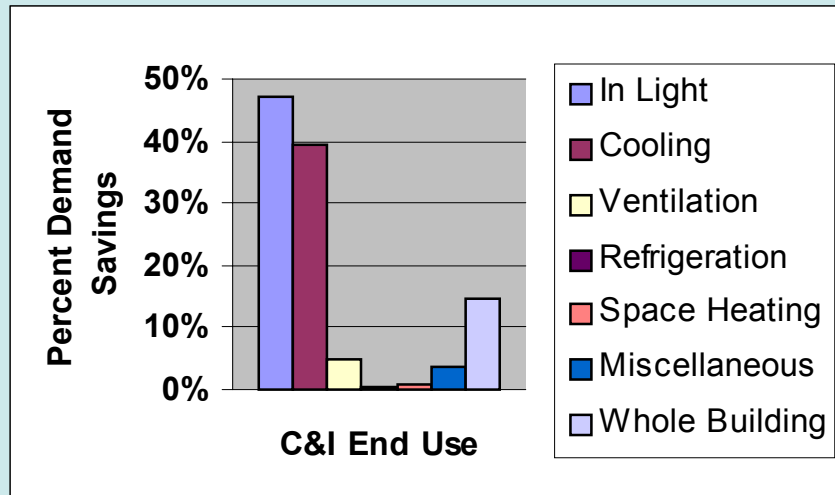
## VELCO Achievable 2012 Potential as % of Forecast Sector MWh Sales



## VELCO Achievable Potential Residential End-Use Summer Peak Demand Savings (kW) - 2012



## VELCO Achievable Potential C&I End-Use Summer Peak Demand Savings (kW) - 2012



## Velco Northwest Vermont Reliability Project Potential Study Uses

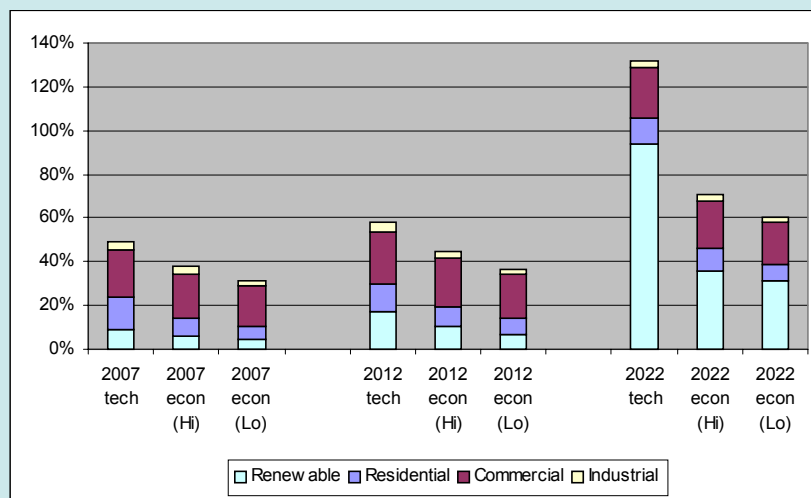
- Analysis of net transmission capacity cost of efficiency – “*the free lunch you’re paid to eat*”
  - nets out benefits of: generation energy and capacity, distribution capacity, externalities, risk adjustment
  - **(\$250)/kW-yr** net cost
- IRP – integration of transmission investment options, distributed generation, efficiency (5 scenarios analyzed)
- Max efficiency + CT is optimal (least cost) solution, but who pays?
- Section 248 hearings this summer

## NYSERDA Potential Study Objectives

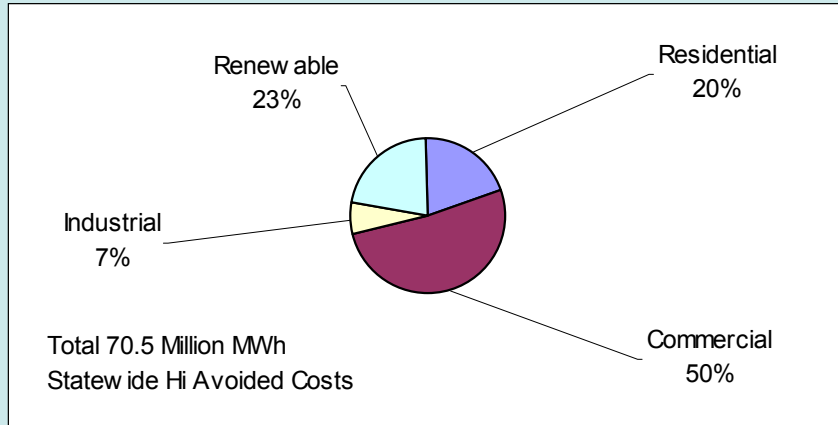
- Renewables & efficiency; tech, ec, greenhouse gas & currently planned initiatives potential
- 5, 10 and 20 year horizons (2007, 2012, 2022)
- Statewide and for 5 key load zones
  - Capital
  - Hudson Valley
  - Long Island
  - New York City
  - West



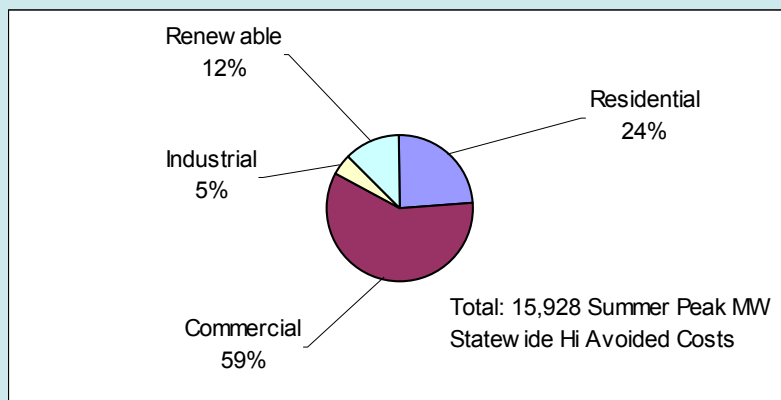
## NYSERDA Technical & Economic Energy Savings Potential by Sector as % of Forecast MWh Sales



## 2012 Statewide Economic Energy Savings Potential (% Savings by Sector)



## 2012 Statewide Economic Capacity Savings Potential (% Savings by Sector)



## NYSERDA Greenhouse Gas Scenario

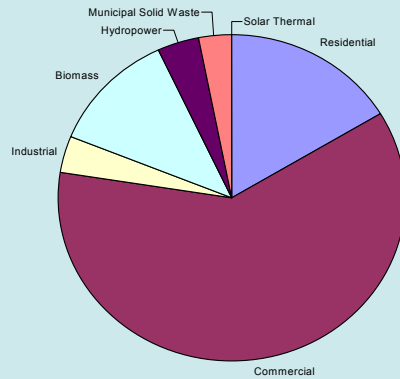
- For each efficiency and renewable technology, the study estimated
  - achievable electric energy contribution and
  - net costs of electric energy
- Net cost of electric energy =
  - Total resource cost, MINUS
  - Electric capacity value of kW saved or supplied

## NYSERDA Greenhouse Gas Scenario

- The analysis “stacked” each technology’s potential contribution in order of increasing cost (akin to power-plant dispatch order)
- Until the target for 2012 and for 2022 is met, or achievable resources exhausted, whichever came first

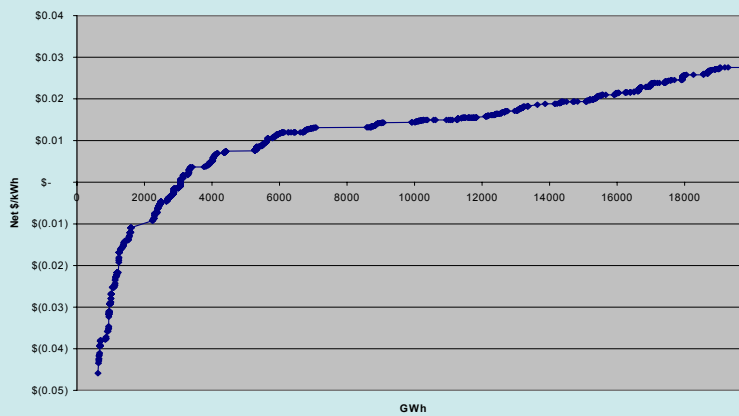
# NYSERDA Greenhouse Gas Scenario Results

Greenhouse Gas Scenario 2012 MWh Savings by Sector



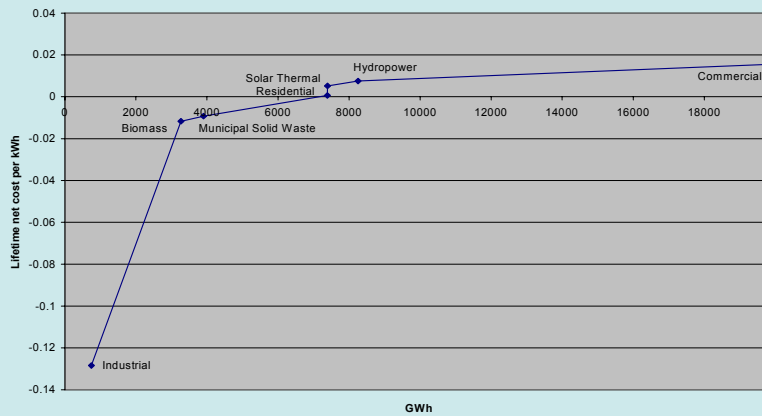
# NYSERDA Greenhouse Gas Scenario Results (2)

2012 Greenhouse Gas Target Supply Curve  
Low Avoided Costs



## NYSERDA Greenhouse Gas Scenario Results (3)

Supply Curve for Meeting 2012 Greenhouse Gas Target  
By Sector and Renewable Technology  
Low Avoided Costs



## Distributed Utility Planning (DUP) Scoping Tool

- Problem: 22 DUs required to perform DUP, many with little or no expertise
- Solution: Scoping tool for quick and easy look at efficiency potential
- Quickly estimates whether energy efficiency potential is large enough to cost-effectively defer transmission and / or distribution upgrades
- Designed for any size DU or geographic area
  - Usable by utility staff untrained in DSM
- Currently used in VT area service collaboratives (ACSs)

# DUP Scoping Tool Input Sheet

**VT DSM Scoping Tool**  
Enter Data for the Analysis Area Only

#	Building Type	Notes	Default Assumptions			Existing Customers in Area			New Buildings in Area				
			Elect. Space Heat	Central A/C	Elect. DMV	Existing % efficient	% of units	% summer only	% winter only	Yr. 1	Yr. 2	Yr. 3	Yr. 4 - Yr. 10
R1	Single Family		2.4%	3.4%	35.0%	0%							
R2	Multi-family	> 5 Units	16.4%	3.0%	32.8%	0%							

#	Building Type	Notes	req. ft. per building	kW per sq.ft.	Existing % efficient	# of buildings	Total kW/yr	% summer only	% winter only	Thousands of sq. ft. per year			
										Yr. 1	Yr. 2	Yr. 3	Yr. 4 - Yr. 10
1	Small Offices	<75,000 kWh/yr	1,500	14.2%	0%	5	407						
2	Large Offices	>75,000 kWh/yr	25,000	14.2%	0%	1	1,420						
3	Schools	Secondary and primary only	28,000	6.5%	0%	1	182						
4	Restaurant		5,250	2.9%	0%	2	189						
5	Small Retail	<75,000 kWh/yr	2,300	10%	0%	6	198						
6	Large Retail	>75,000 kWh/yr	20,000	10%	0%	3	600						
7	Mini-mart		1,500	2.9%	0%	2	84						
8	Grocery		25,000	2.9%	0%	1	725						
9	Lo-dging	B&B; see residential single family	17,500	17.6%	0%	1	308						
10	Warehouse		20,000	5.2%	0%	1	1,040						
11	Hospital	Large hospitals may use custom	18,000	20.5%	0%	1	369						
12	Small Industrial	Includes auto services. For large industrial see 13	3,150	10%	0%	1	16						
13	Farm		2,350	10%	0%	1	235						
14	Miscellaneous 1	Miscellaneous allows for custom combinations of other categories (e.g., a weighted average)			0%								
15	Miscellaneous 2				0%								
16	Custom 1	Custom allows for a completely user defined energy intensity and loadshape			0%								
17	Custom 2				0%								
18	Custom 3				0%								
19	Custom 4				0%								

# DUP Scoping Tool Measure (≈3,000) Library

**Residential - Achievable Savings, Costs and Economics**

Measure Toggle	End-Use Saturat'n	Return to Inputs Sheet	Measure ID1	Measure ID2	Measure ID3	Measure ID3	Cost	Cost/yr	BCF	2005	2006	2007	2008
1	100	Ceiling Fan	MF	lighting	rec	\$ (193.20)	\$ (0.01)	4.11	0.006	0.006	0.006	0.006	
2	1	Central A/C (proper sizing/install)	MF	cooling	rec	\$ (142.40)	\$ (0.23)	280.91	0.000	0.001	0.001	0.001	
3	1	CFL	MF	lighting	rec	\$ (913.06)	\$ (0.05)	3.52	0.024	0.023	0.023	0.023	
4	1	Clothes W/asher (E-Star)	MF	wash	rec	\$ (2,015.75)	\$ (0.20)	3.30	0.050	0.048	0.050	0.050	
5	1	Common area dimming/controls	MF	lighting	rec	\$ (1,145.05)	\$ (0.07)	5.31	0.064	0.067	0.081	0.169	
6	1	DMV fuel-switch	MF	dmv	rec	\$ (366.63)	\$ (0.07)	2.23	0.027	0.028	0.034	0.071	
7	1	Dishwasher (E-Star)	MF	dish	rec	\$ (850.56)	\$ (0.11)	5.67	0.080	0.080	0.082	0.082	
8	1	Dryer fuel-switch	MF	dryer	rec	\$ (367.26)	\$ (0.06)	2.02	0.022	0.027	0.034	0.071	
9	1	Exhaust fan (E-Star)	MF	misc	rec	\$ (382.77)	\$ (0.04)	1.96	0.214	0.221	0.265	0.548	
10	1	Furnace fan	MF	heating	rec	\$ (2,170.21)	\$ (0.12)	4.35	0.086	0.028	0.047	0.134	
11	1	GFU (electric DMV only)	MF	dmv	rec	\$ (129.22)	\$ (0.02)	0.80	0.002	0.002	0.002	0.004	
12	1	Hard-wired indoor apt fixture	MF	lighting	rec	\$ (1,375.54)	\$ (0.08)	7.05	0.410	0.438	0.542	1.191	
13	1	Hard-wired outdoor fixture	MF	lighting	rec	\$ (1,448.00)	\$ (0.08)	11.12	0.072	0.073	0.085	0.170	
14	1	HVAC/Shell - Central A/C	MF	coolthk	rec	\$ (165.66)	\$ (0.79)	4.42	0.063	0.063	0.063	0.067	
15	1	HVAC/Shell - no A/C	MF	heating	rec	#####	\$ (1.60)	3.71	0.007	0.008	0.009	0.020	
16	1	HVAC/Shell - Room A/C	MF	coolthk	rec	\$ (349.57)	\$ (0.70)	4.32	0.008	0.009	0.011	0.022	
17	1	Refrigerator (E-Star)	MF	refrig	rec	\$ (262.66)	\$ (0.03)	1.56	0.003	0.004	0.004	0.009	
18	1	Ceiling Fan	SF	lighting	rec	\$ (138.78)	\$ (0.07)	4.71	0.067	0.066	0.059	0.163	
19	1	Central A/C (proper sizing/install)	SF	cooling	rec	\$ (137.31)	\$ (0.30)	566.77	0.007	0.009	0.011	0.025	
20	1	CFL	SF	lighting	rec	\$ (324.85)	\$ (0.05)	3.50	0.257	0.270	0.330	0.694	
21	1	Clothes W/asher (E-Star)	SF	wash	rec	\$ (1,665.81)	\$ (0.24)	3.33	0.536	0.509	0.562	1.070	
22	1	DMV fuel-switch	SF	dmv	rec	\$ (544.66)	\$ (0.05)	1.91	0.726	0.754	0.912	1.904	
23	1	Dishwasher (E-Star)	SF	dish	rec	\$ (880.11)	\$ (0.11)	5.62	0.074	0.076	0.091	0.186	
24	1	Dryer fuel-switch	SF	dryer	rec	\$ (375.27)	\$ (0.06)	2.02	0.333	0.370	1.173	2.448	
25	1	Exhaust fan (E-Star)	SF	misc	rec	\$ (383.52)	\$ (0.04)	1.95	0.561	0.602	0.702	1.462	
26	1	Furnace fan	SF	heating	rec	\$ (1,593.50)	\$ (0.50)	3.85	0.079	0.132	0.233	0.672	
27	1	GFU (electric DMV only)	SF	dmv	rec	\$ (435.06)	\$ (0.05)	0.68	0.055	0.054	0.060	0.114	
28	1	Hard-wired indoor fixture	SF	lighting	rec	\$ (1,448.00)	\$ (0.08)	7.06	2.074	2.216	2.741	5.623	
29	1	Hard-wired outdoor fixture	SF	lighting	rec	\$ (1,448.00)	\$ (0.08)	11.13	0.363	0.367	0.430	0.861	
30	1	HVAC/Shell - Central A/C	SF	coolthk	rec	\$ (648.23)	\$ (0.78)	4.12	0.048	0.050	0.060	0.126	
31	1	HVAC/Shell - no A/C	SF	heating	rec	#####	\$ (1.62)	3.70	0.063	0.066	0.080	0.167	

## DUP Scoping Tool Sample Output

Microsoft Excel - Scoping Tool V3.1.xls

VERMONT DISTRIBUTED UTILITY PLANNING COLLABORATIVE  
DSM SCOPING TOOL  
COSTS OF ELECTRICITY SAVINGS FOR ANALYSIS AREA - TOTAL POTENTIAL  
(Present Worth in 2002 Dollars)

Delivery Costs*	Total Gross Societal Costs	Direct Energy Savings	Avoided Externalities	Less: Other Savings			Total Savings	Net Societal Costs			Disc Rate 5.80%	Cumulative Savings Through 2012	
				Generation Capacity Savings	Statewide T&D Capacity Savings	DEFAULT		Net Costs (Costs - Savings)	Net Cost/ kW	Net Cost/ kW-yr		Total Sum MV	Total MWh
\$26,589	\$90,477	\$93,485	\$10,215	\$18,455	\$20,821	\$142,975	(\$52,498)	(\$10,585)	(\$188.98)	0.01	113		
\$18,277	\$102,681	\$140,954	\$18,204	\$30,540	\$39,013	\$228,311	(\$125,630)	(\$5,760)	(\$58.09)	0.04	263		
\$54,473	\$696,916	\$811,335	\$83,792	\$195,014	\$214,468	\$1,304,930	(\$598,144)	(\$8,081)	(\$743.52)	0.11	391		
\$139,339	\$793,973	\$1,045,673	\$112,230	\$244,009	\$274,323	\$1,676,216	(\$876,243)	(\$8,436)	(\$725.92)	0.16	1,293		
\$18,786	\$37,532	\$58,235	\$5,179	\$16,662	\$17,160	\$98,237	(\$59,706)	(\$10,401)	(\$986.63)	0.02	86		
\$42,282	\$29,760	\$37,811	\$46,505	\$131,974	\$149,976	\$725,466	(\$433,706)	(\$4,524)	(\$444.44)	0.35	789		
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0.00	0.00	-		
\$61,958	\$329,292	\$456,047	\$52,684	\$148,237	\$166,736	\$823,704	(\$494,412)	(\$5,901)	(\$565.01)	0.21	874		
\$200,497	\$1,129,285	\$1,501,720	\$164,894	\$392,246	\$441,089	\$2,498,919	(\$1,370,655)	(\$4,312)	(\$441.68)	0.37	2,166		

\* Delivery Costs are an approximation for delivering a complete program.

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## Summary and Conclusions

- Usefulness of more studies depends on goals and data
  - Focus should be on refining first cut information for targeted areas with more detailed, accurate and timely data
- Potential analysis has clear and important role in policy decisions and resource investment portfolios, *but...* don't put the cart before the horse — let the need drive the analysis.