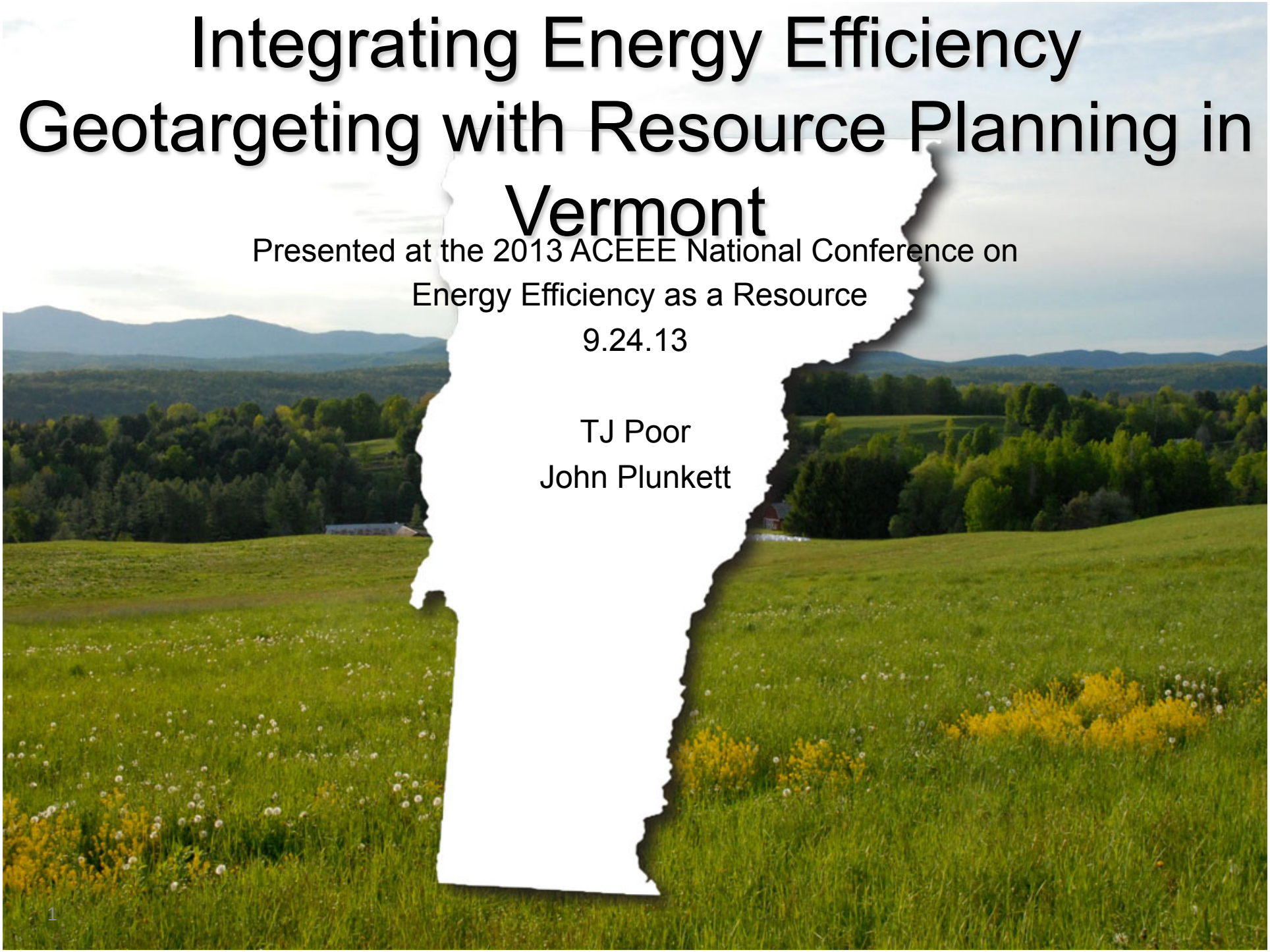
Integrating Energy Efficiency Geotargeting with Resource Planning in Vermont



Presented at the 2013 ACEEE National Conference on Energy Efficiency as a Resource

9.24.13

TJ Poor

John Plunkett

Overview

- Criteria used to evaluate potential benefits of GT in context of specific reliability constraint
  - Uncertainty associated with the analysis of whether or not it "worked"
- Methodology for determining potential/ cost for EE to be part or all of a solution

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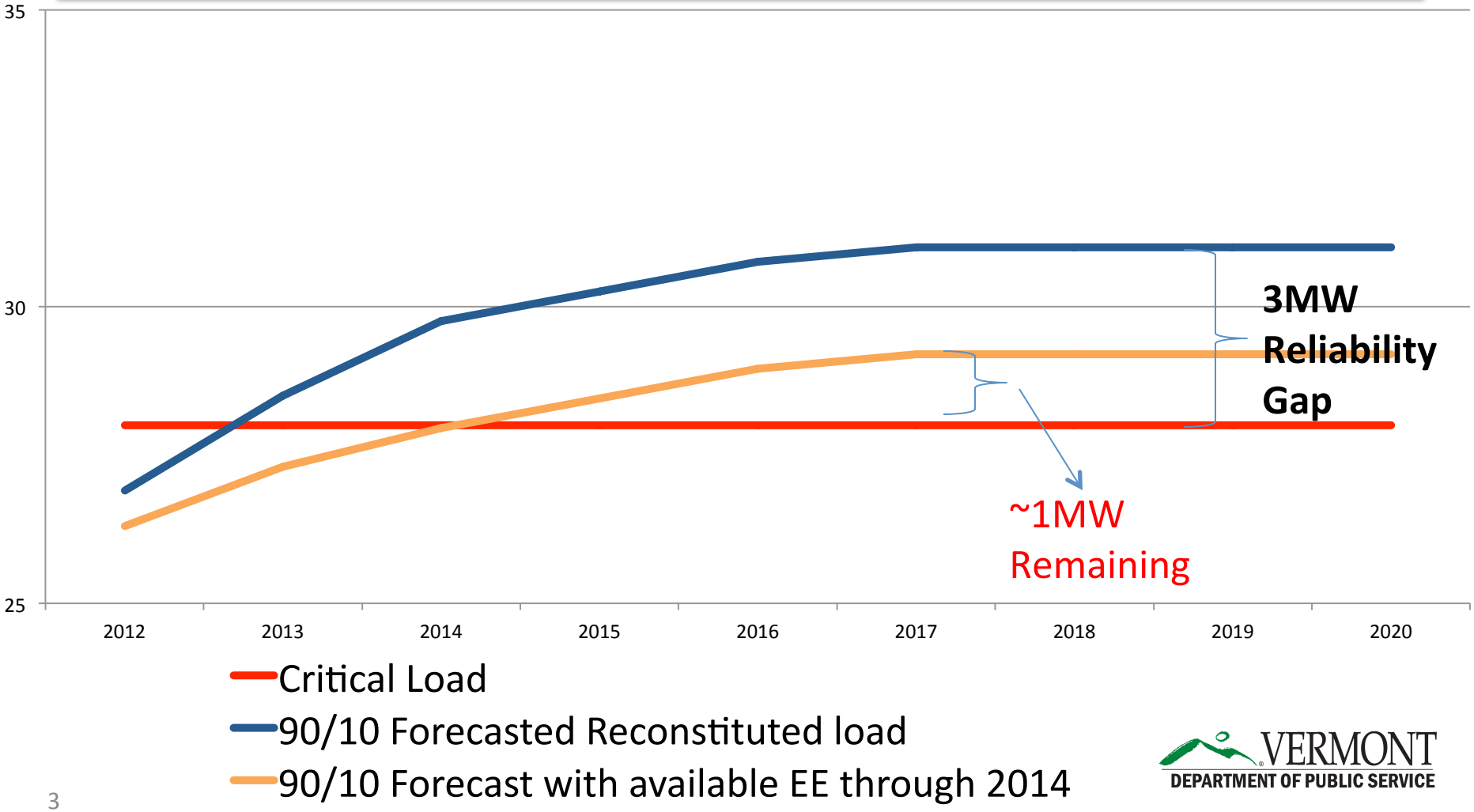
The St. Albans Constraint (2011)



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Best use of Limited Funds?

Societal Test

- Deferral Value
- Avoided Energy/ Capacity Costs
- Externalities
- Other in-state T&D Benefits
- 3% Discount Rate

Ratepayer Test

- Deferral Value
- RNS
- Avoided Energy/Capacity Costs
- DRIPE
- Other in-state T&D benefits
- 5.6% Discount Rate

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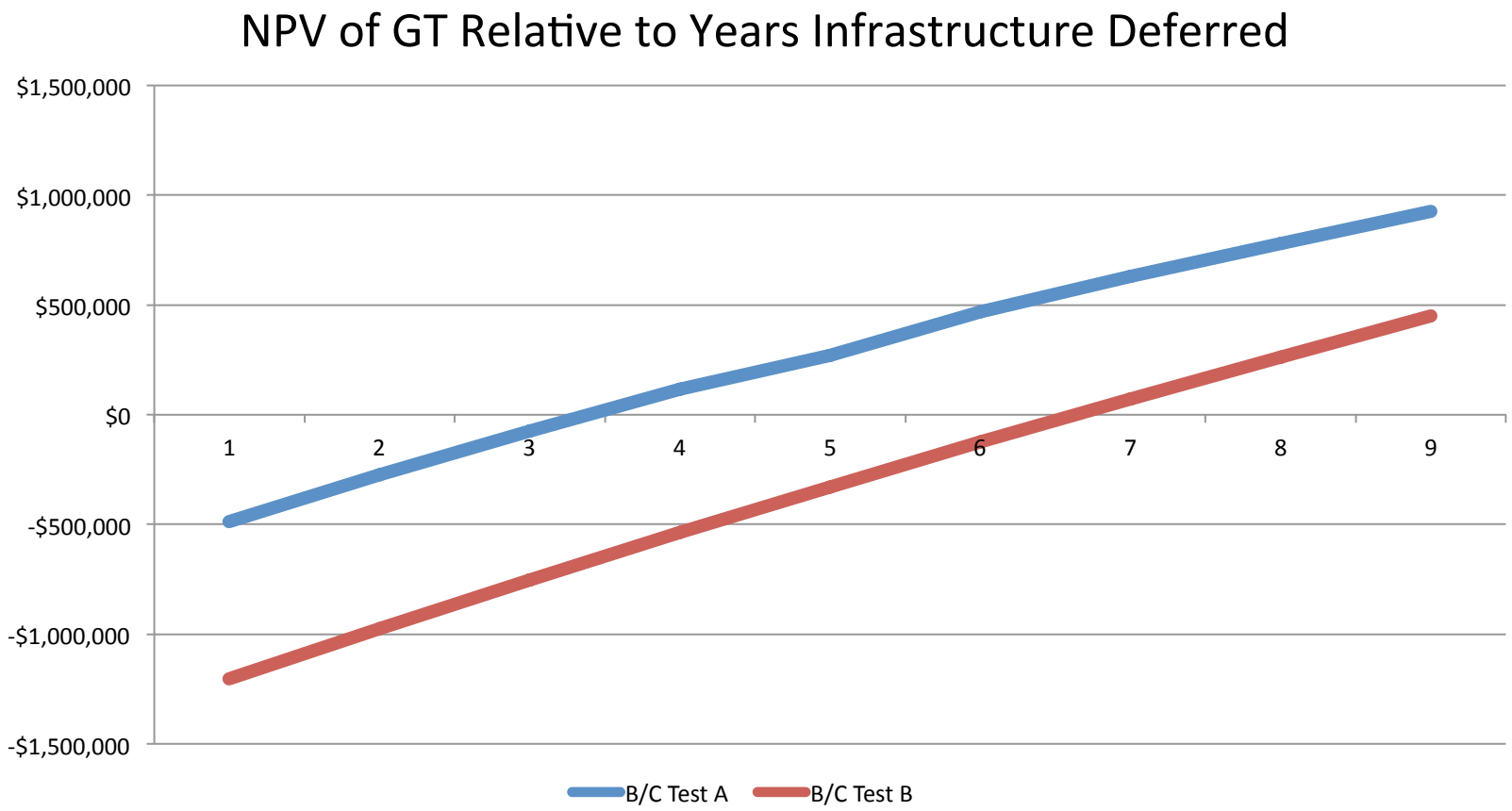
Benefits of Targeting Under Two Tests



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So… Did it work?

- Large Manufacturer located in the area – 4MW load with no DR opportunity
- ~1 – 1.5MW other new load
- 2013 95/5 load – peak load significantly LOWER than forecasted
- 2.2MW PV expected to be commissioned 2013
- Peak moved from 3pm to 6pm

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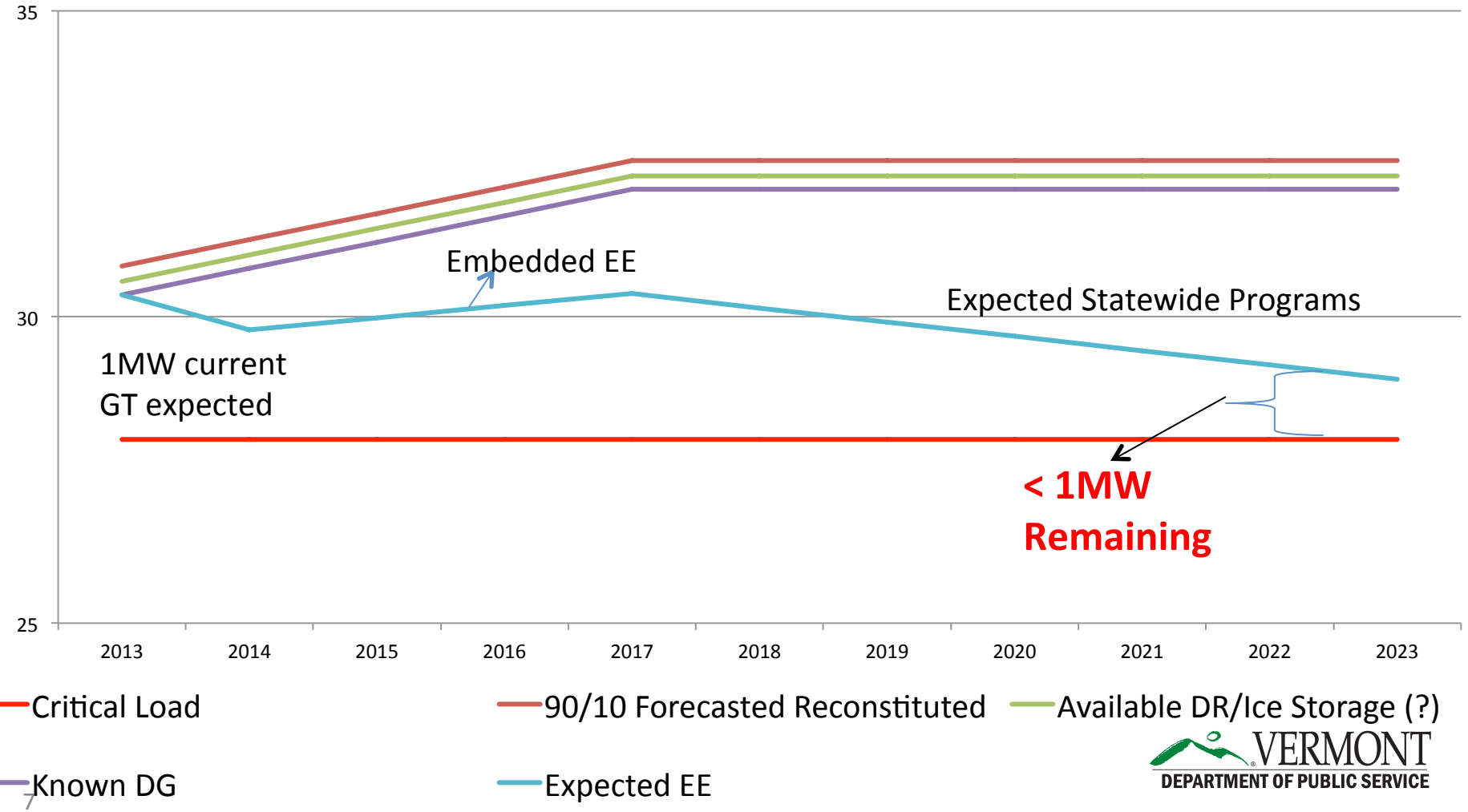
The St. Albans Constraint (2013)



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Evolving Process

- Instead of statewide programs vs. geotargeting, simply whether to GT or not
- Looking more holistically at constraint and the range of potential solutions
  - Demand Response, Load Shifting Technologies
  - PV, other DG
- Re-evaluating energy efficiency potential in the area given two years more of GT

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How much will it cost to expand EE in GT area beyond statewide programs?

GEEG developed an NTA EE Calculator to

- Specify quantities of additional peak savings
- Account for base-case program savings
- Develop and apply more granular estimates than results from maximum potential analysis
- Characterize GT program costs

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Specifying Quantities of Additional EE Resources

- Select annual incremental EE savings to reach total contribution toward resource gap
  - Nonresidential retrofit
- Recognize expected results from current statewide plans
- Estimate per-project savings
    - Customer size mix
    - Per-participant savings as % of customer load
    - Total number of projects

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Specifying Quantities of Additional EE Resources (continued)

1 Select characteristics of EE retrofit resource investment									
					2014	2015	2016	2017	2018	Total
a Targeted custom retrofit projects substituting for EEU base case										
i Total incremental annual peak kW savings from BEF custom retrofit in targeted area					300	500	500	500	500	2,300
Cumulative					300	800	1,300	1,800	2,300	
ii Calculate total annual targeted savings required										
(a) Peak kW/yr					508	708	708	708	708	3,340
(b) Annual energy, MWh/yr					3,115	4,341	4,341	4,341	4,341	20,481
iii Project sizing	L	M	S							
(a) Project size category peak savings as share of total	33%	33%	33%							
(b) Average peak kW load per participant	500	100	20							
(c) Average % savings	8%	13%	15%							
(d) Average peak kW savings per project	**37.5**	**12.5**	**3.0**							
(e) Targeted kW by project size category				L	169	236	236	236	236	1,113
				M	169	236	236	236	236	1,113
				S	169	236	236	236	236	1,113
				Total	508	708	708	708	708	3,340
(f) Target project counts by project size category				L	5	6	6	6	6	30
				M	14	19	19	19	19	89
				S	56	79	79	79	79	371
Calculate number of projects by size category by year				Total	75	104	104	104	104	490

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Accounting For Base-Case Program Savings

- Annual savings expected from statewide business retrofit
- Annual retrofit program expenditures
  - Financial incentive budget
  - Average share of total project capital costs
  - Other program implementation costs
- Pro-rated for GT area according to area energy usage percentage of state

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Accounting For Base-Case Program Savings (continued)

	2014	2015	2016	2017	2018	Total
b EEU base case savings and spending						
i EEU base case statewide BEF custom retrofit savings						
(a) Peak kW/yr	8,000	8,000	8,000	8,000	8,000	72,000
(b) Annual energy, MWh/yr	49,056	49,056	49,056	49,056	49,056	441,504
ii EEU base case % of statewide totals in targeted area by year						
(a) Peak kW/yr	2.6%	2.6%	2.6%	2.6%	2.6%	
(b) Annual energy, MWh/yr	2.6%	2.6%	2.6%	2.6%	2.6%	
iii EEU base case statewide BEF custom retrofit program spending by year						
(a) Financial incentives	$ 8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$72,000,000
(b) Average share of total project capital costs	40%	40%	40%	40%	40%	
(c) Program implementation costs	$ 4,000,000	$4,000,000	$4,000,000	$4,000,000	$4,000,000	$36,000,000
iv EEU base case custom retrofit spending in targeted area, % of statewide	2.6%	2.6%	2.6%	2.6%	2.6%	

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Developing More Granular Estimates than Results from Maximum Potential Analysis

- Prior maximum potential study indicated unacceptably high costs
- Resource planners sought intermediate levels of savings and their costs
- "Boots on the ground" project assessment rejected as too expensive for NTA scoping analysis
- Approach: Use empirical analysis of actual EEU retrofits to estimate project capital costs

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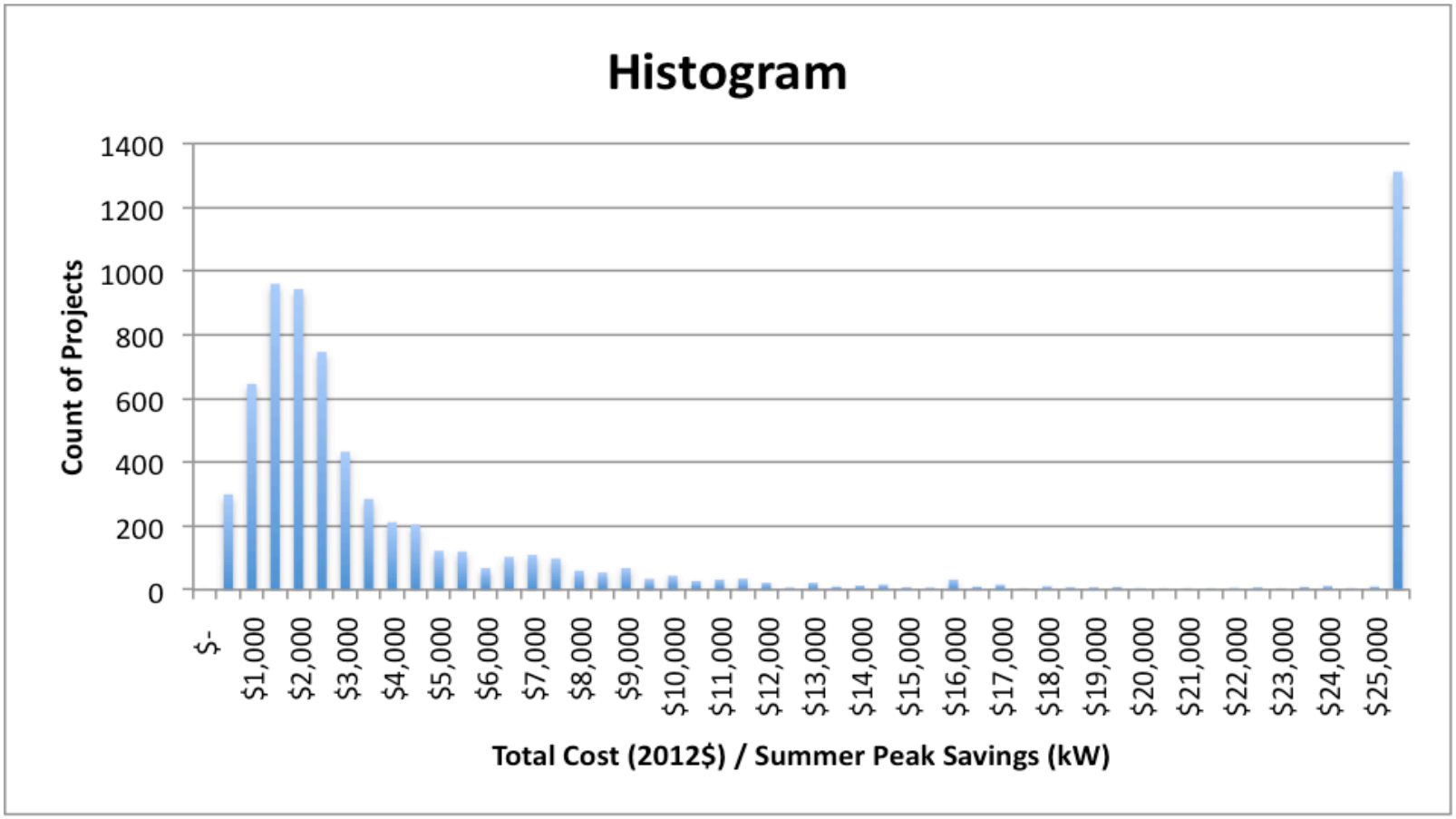
Developing More Granular Estimates than Results from Maximum Potential Analysis (continued)

Project Data



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Developing More Granular Rstimates than Results from Maximum Potential Analysis (continued)

Regression Model

Multiple. R-square	0.988
Adjusted. R-square	0.988
Degrees of Freedom	5961
Residual standard Error	0.8492

Category	Variable	Coefficient	Standard. Error	T value	Pr(>|t|)
Average Savings Period (ASP)	ASP	(0.215)	0.006	-38.684	<2.00E-16
	1/ASP	8.031	0.181	44.276	<2.00E-16
	ln(ASP)	3.926	0.036	108.883	<2.00E-16
Gross Peak Savings (kW)	1/kW	0.0024	0.0005	4.59	0.000452
	ln(kW)	(0.185)	0.008	-22.313	<2.00E-16
Flags (1 is true 0 false)	EFF_LIGHTING	(0.207)	0.032	-6.378	1.93E-10
	EFF_AC	(0.256)	0.070	-3.664	0.000251
	JOB_FLAG	0.278	0.026	10.552	<2.00E-16
	CUSTOM_FLAG	(0.099)	0.025	-3.941	1.04E-05
	GTPREMISE	(0.101)	0.029	-3.431	0.00605

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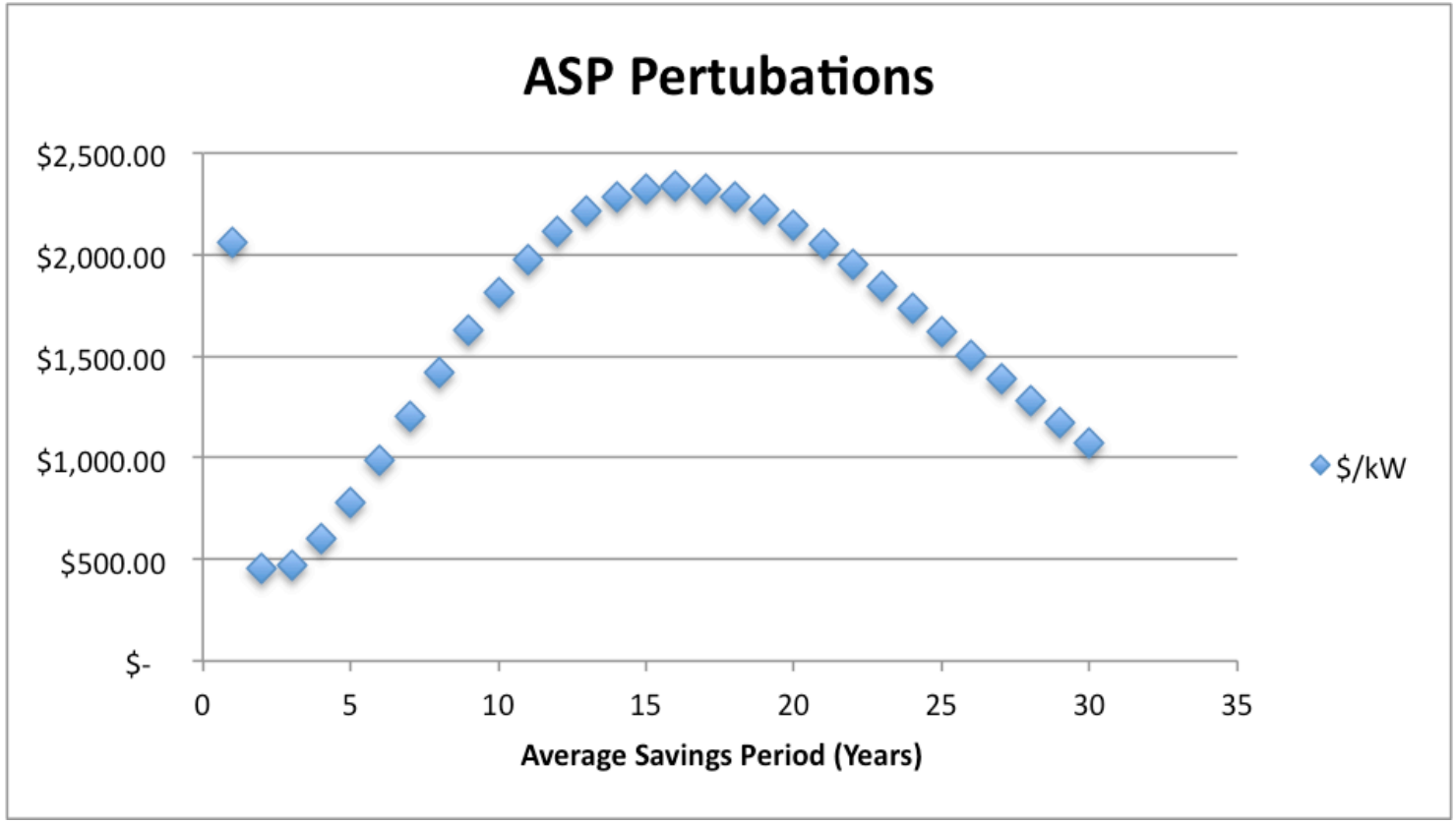
Effects of Project Savings Period on $/kW



Assumes mean values for other inputs

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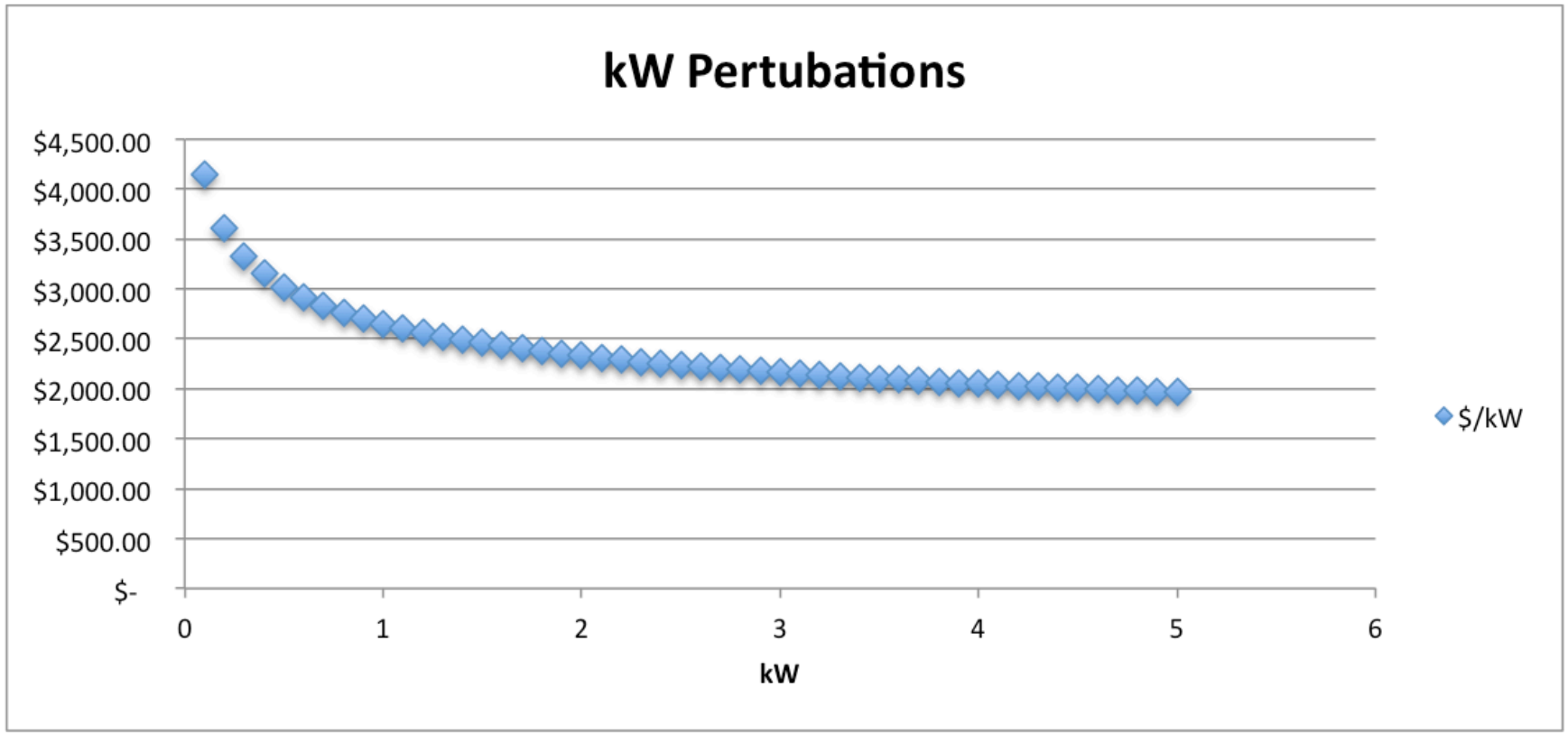
Effects of Project kW on $/kW



Assumes mean values for other inputs

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Effects of Other Variables on $/kW

Input	Effect
EFF_LIGHTING	Adding lighting to a project decreases the $/kW by approximately 19%
EFF_AC	Adding air-conditioning measures to a project decreases the $/kW by approximately 23%
JOB_FLAG	A retrofit job (code 6012) costs approximately 32% more per kW than an end-of-life "natural" replacement of existing equipment (job code 6013).
CUSTOM_FLAG	A custom project costs approximately 9% less per kW than a prescriptive project.
GTPREMISE	A geo-targeted premise costs approximately 10% less per kW than a non-geo-targeted one.

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Developing more granular estimates than results from maximum potential analysis (continued)
Total Area Retrofit Costs (Base Case + GT)

			L	M	S		2014	2015	2016	2017	2018	Total
c	**Regression prediction for total project capital cost**		**L**	**M**	**S**							
	i Independent variable values	**Input in regression capital costs sheet**										
	(a) Average kW/project by size category	Step a iii (d)										
	(b) Average savings period											
	(c) End use (lighting, AC)	**Input in regression capital costs sheet**										
	(d) Job flags (retrofit, custom, GT)											
	ii Calculate $/kW capital cost by project size category		**$ 1,258**	**$ 1,196**	**$ 1,629**	**/kW**						
	iii Calculate total annual retrofit project capital costs					**L**	**$ 212,997**	**$ 296,854**	**$ 296,854**	**$ 296,854**	**$ 296,854**	**1,400,415**
						M	$ 202,525	$ 282,259	$ 282,259	$ 282,259	$ 282,259	1,331,562
						S	$ 275,854	$ 384,457	$ 384,457	$ 384,457	$ 384,457	1,813,683
						Total	691,376	963,571	963,571	963,571	963,571	4,545,660

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Characterizing GT EE Program

- Assumption: GT program REPLACES existing program design
- Reasoning: Impossible to maintain separate programs side by side for same target population in same territory

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Characterizing GT EE Program (continued)
Elements by Project Size Category

- Financial incentives
  - Payback period “buydown”
  - Implies % of capital costs covered
- Customer acceptance rates
- Implementation costs
  - Fixed
    - Administration
    - Marketing
    - Evaluation
  - Variable
    - Project development
    - Inspection

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Characterizing GT EE Program (continued)
Elements by Project Size Category

						2014	2015	2016	2017	2018	Total
a	**Customer financial incentives**										
	Avg project payback		Payback buydown		% capital cost						
i	L	10	1.5		85%	$ 181,048	$ 252,326	$ 252,326	$ 252,326	$ 252,326	$ 1,190,353
ii	M	8	1		88%	177,209	246,977	246,977	246,977	246,977	1,165,117
iii	**S**	**6**	**0**		100%	275,854	384,457	384,457	384,457	384,457	1,813,683
iv	Calculate targeted EE retrofit financial incentive budget				Total	$ 634,111	$ 883,760	$ 883,760	$ 883,760	$ 883,760	$ 4,169,153
v	Calculate incremental EE retrofit ressource annual financial incentive budget					$ 426,111	$ 675,760	$ 675,760	$ 675,760	$ 675,760	$ 3,129,153
b	**Implementation costs**										
i	Fixed costs by year										
	(a)	Administration				$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 750,000
	(b)	Marketing				$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 500,000
	(c)	Evaluation				$ -	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 200,000
	Total fixed implementation costs					$ 250,000	$ 300,000	$ 300,000	$ 300,000	$ 300,000	$ 1,450,000
ii	Variable costs per project by size category										
	(a) Project acceptance rate		(b) Project development/audit cost			(c) Project Inspection cost					
	L	**67%**	$ 6,000			$ 1,000					
	M	**75%**	$ 3,000			$ 500					
	S	**90%**	$ 1,000			$ 300					
	(d)	Project development/audit costs				$ 157,543	$ 219,567	$ 219,567	$ 219,567	$ 219,567	$ 1,035,812
	(e)	Project inspection costs				$ 28,222	$ 39,333	$ 39,333	$ 39,333	$ 39,333	$ 185,556
	(f)	Total variable implementation costs				$ 185,765	$ 258,901	$ 258,901	$ 258,901	$ 258,901	$ 1,221,368

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Calculating Net Incremental Costs of Additional GT EE Resources

2 Targeted program budget						
	2014	2015	2016	2017	2018	Total
iii Calculate total annual implementation costs	$ 435,765	$ 558,901	$ 558,901	$ 558,901	$ 558,901	$ 2,671,368
iv Calculate incremental annual EE retrofit program implementation costs	$ 331,765	$ 454,901	$ 454,901	$ 454,901	$ 454,901	$ 2,671,368
c Calculate incremental annual retrofit EE program expenditures	$ 757,876	$ 1,130,661	$ 1,130,661	$ 1,130,661	$ 1,130,661	$ 5,280,520
d Calculate annual incremental EE total resource costs	$ 503,141	$ 898,472	$ 898,472	$ 898,472	$ 898,472	$ 4,097,028
3 Combine EE incremental retrofit resource acquisition costs and savings with other NTARC components						

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Questions?

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