Integrating Energy Efficiency Geotargeting with Resource Planning in Vermont

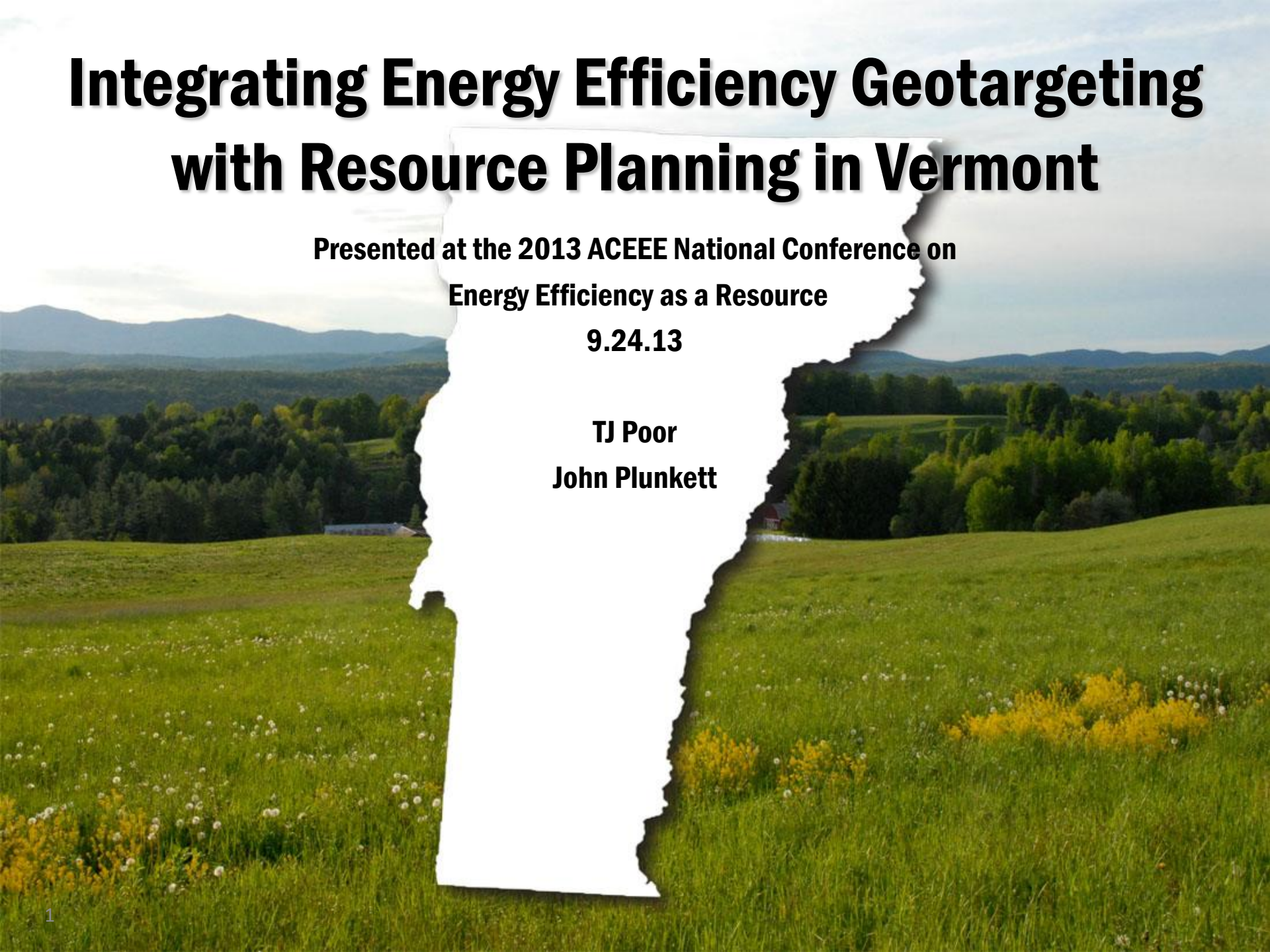
Presented at the 2013 ACEEE National Conference on

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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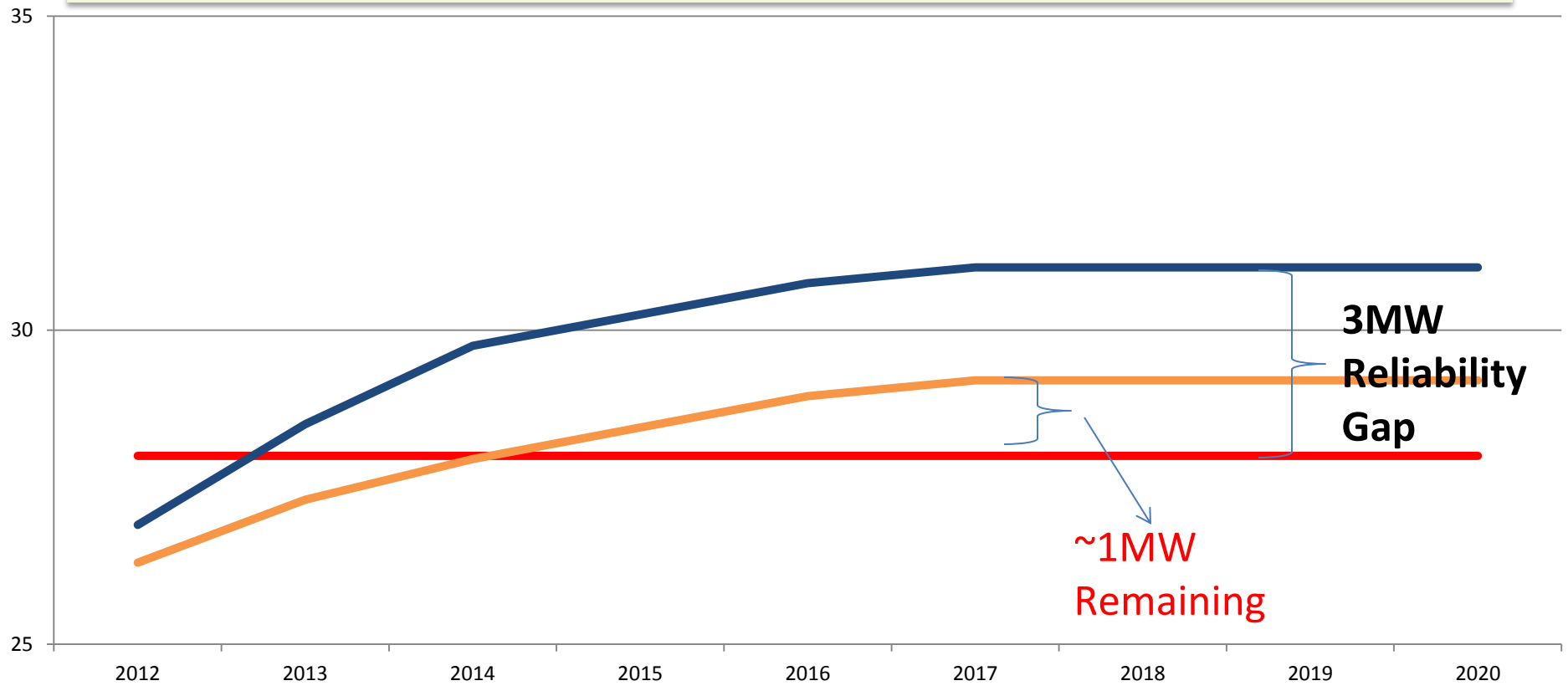
The St. Albans Constraint (2011)



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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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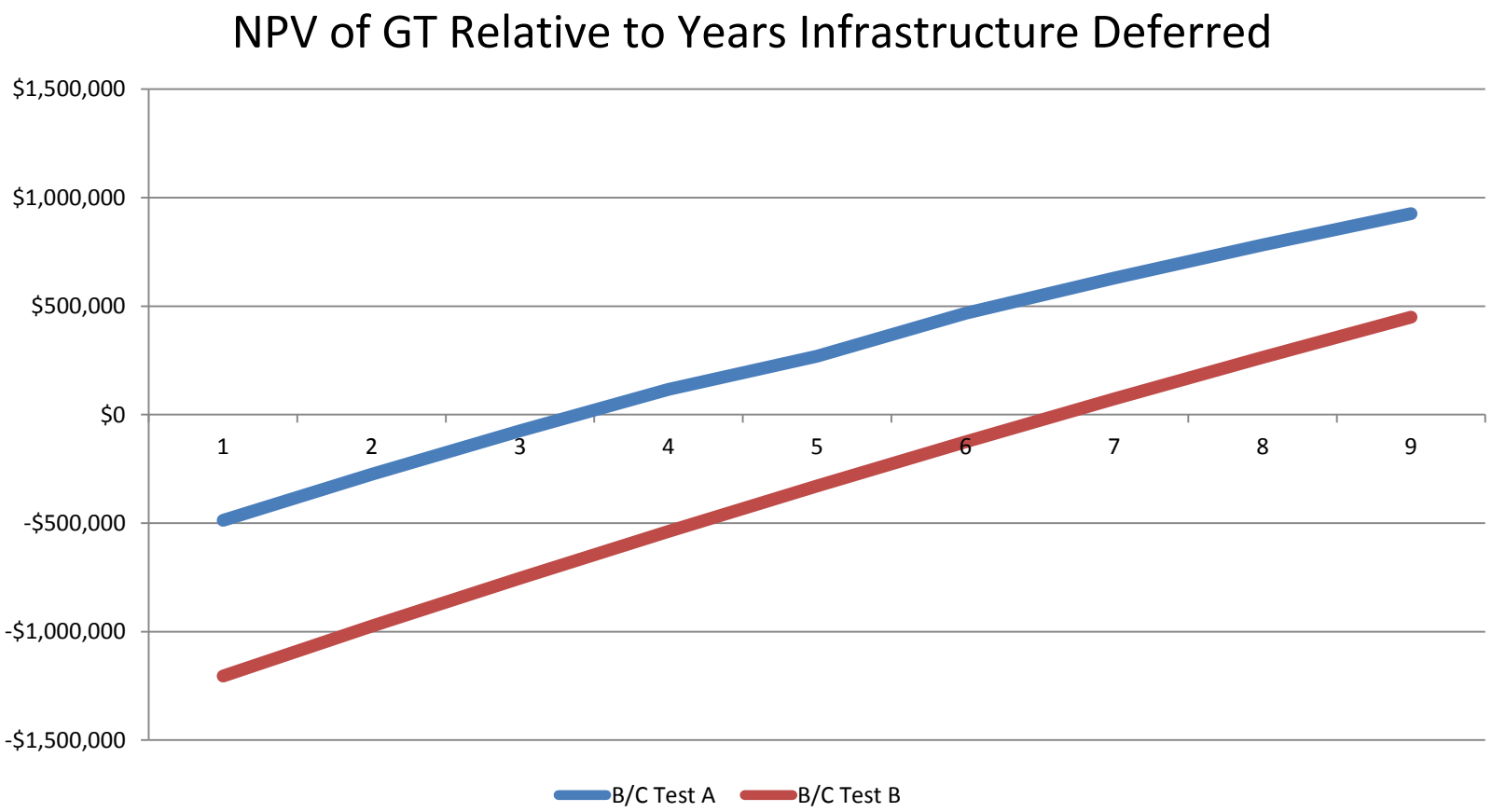
Benefits of Targeting Under Two Tests



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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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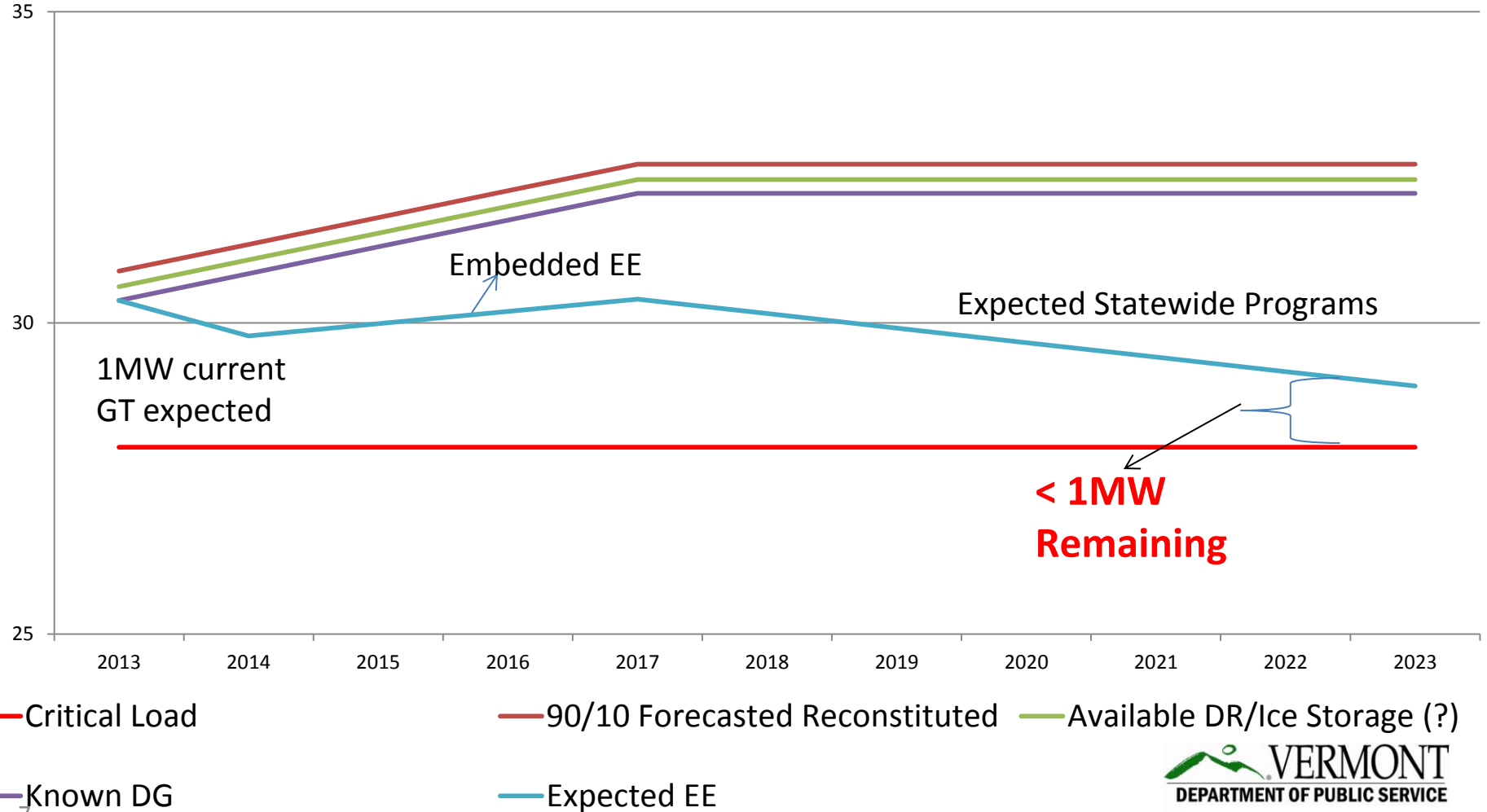
The St. Albans Constraint (2013)



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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					[illegible]300	[illegible]500	[illegible]500	[illegible]500	[illegible]500	[illegible]2,300
Cumulative					[illegible]300	[illegible]800	[illegible]1,300	[illegible]1,800	[illegible]2,300	
ii Calculate total annual targeted savings required										
(a) Peak kW/yr					[illegible]508	[illegible]708	[illegible]708	[illegible]708	[illegible]708	[illegible]3,340
(b) Annual energy, MWh/yr					[illegible]3,115	[illegible]4,341	[illegible]4,341	[illegible]4,341	[illegible]4,341	[illegible]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	[illegible]169	[illegible]236	[illegible]236	[illegible]236	[illegible]236	[illegible]1,113
				M	[illegible]169	[illegible]236	[illegible]236	[illegible]236	[illegible]236	[illegible]1,113
				S	[illegible]169	[illegible]236	[illegible]236	[illegible]236	[illegible]236	[illegible]1,113
				Total	[illegible]508	[illegible]708	[illegible]708	[illegible]708	[illegible]708	[illegible]3,340
(f) Target project counts by project size category				L	[illegible]5	[illegible]6	[illegible]6	[illegible]6	[illegible]6	[illegible]30
				M	[illegible]14	[illegible]19	[illegible]19	[illegible]19	[illegible]19	[illegible]89
				S	[illegible]56	[illegible]79	[illegible]79	[illegible]79	[illegible]79	[illegible]371
Calculate number of projects by size category by year				Total	[illegible]75	[illegible]104	[illegible]104	[illegible]104	[illegible]104	[illegible]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	[illegible]8,000	[illegible]8,000	[illegible]8,000	[illegible]8,000	[illegible]8,000	[illegible]72,000
(b) Annual energy, MWh/yr	[illegible]49,056	[illegible]49,056	[illegible]49,056	[illegible]49,056	[illegible]49,056	[illegible]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	$[illegible]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	$[illegible]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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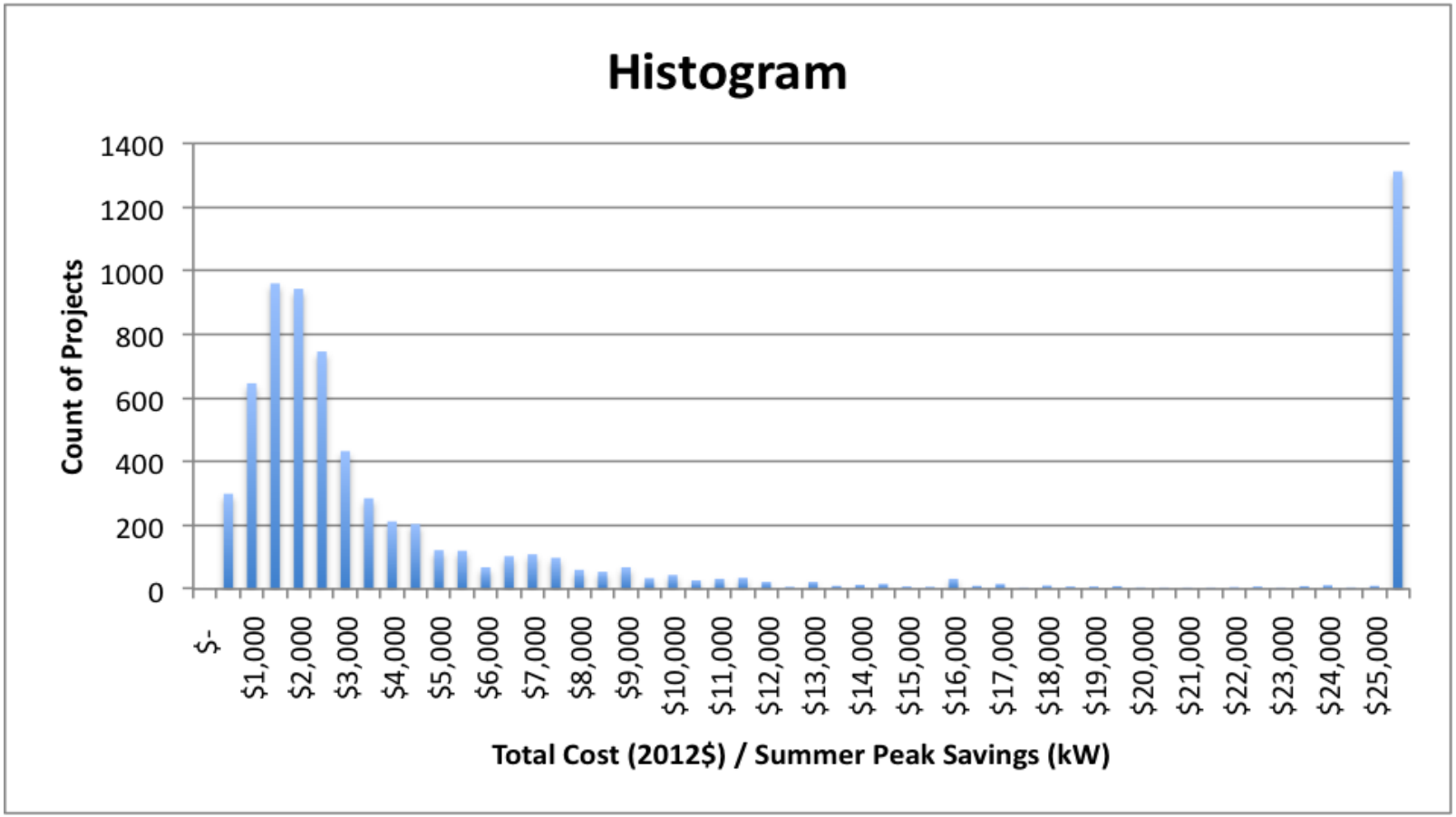
Developing More Granular Estimates than Results from Maximum Potential Analysis (continued)

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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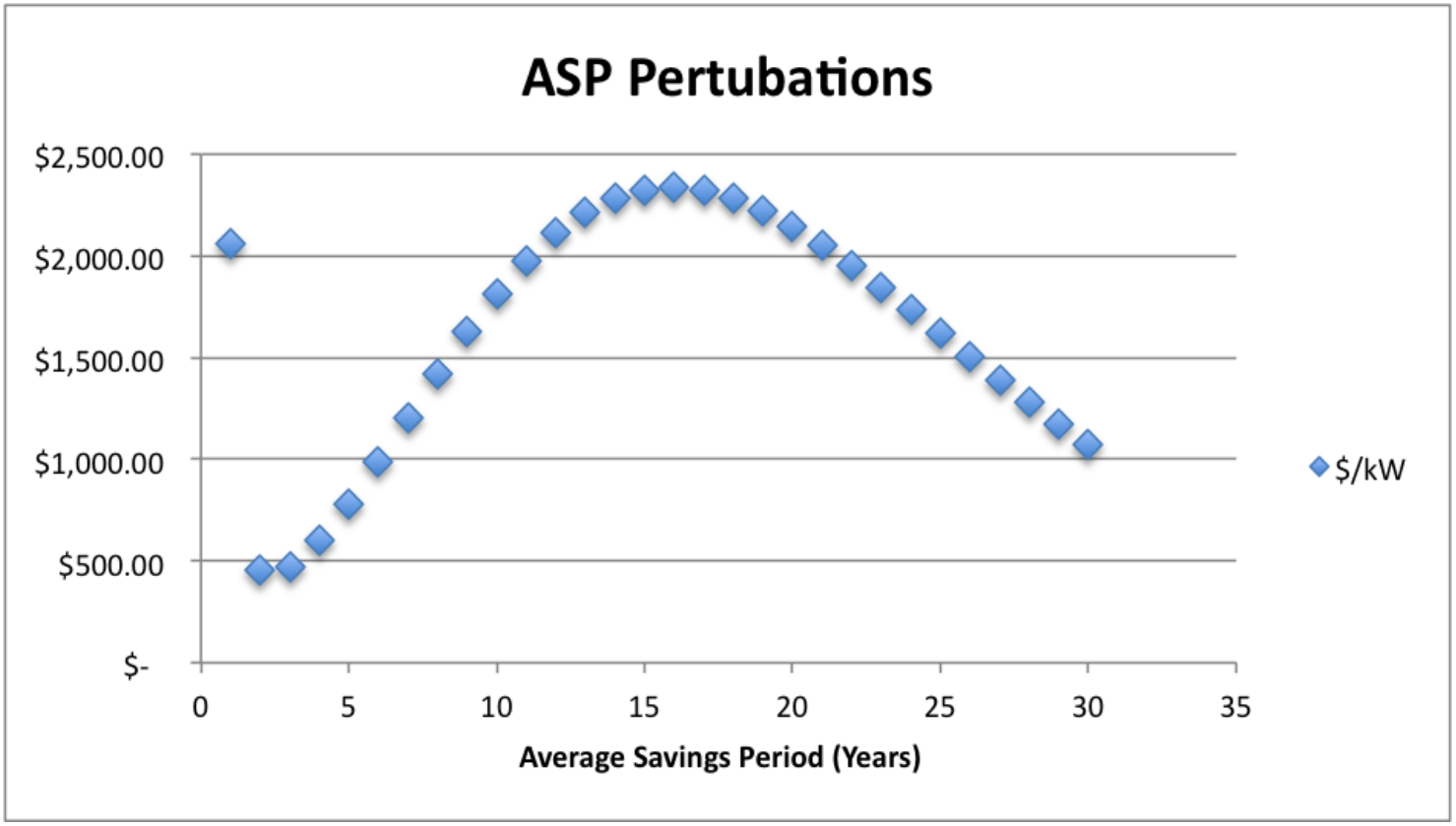
Effects of Project Savings Period on $/kW



Assumes mean values for other inputs

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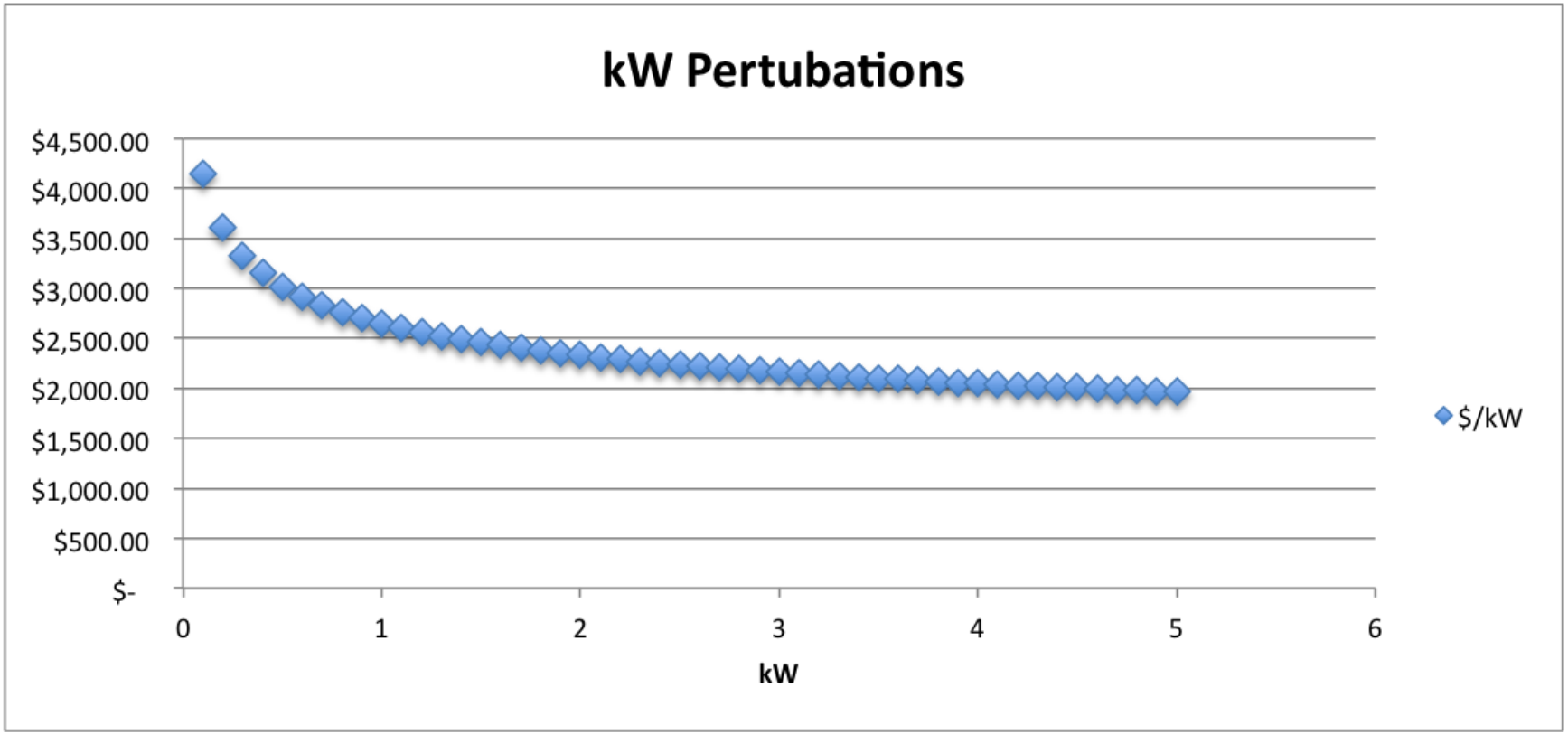
Effects of Project kW on $/kW



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)

								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 2 iii (d)											
	(b) Average savings period	**Input in regression capital costs sheet**											
	(c) End use (lighting, AC)												
	(d) Job flags (retrofit, custom, GT)												
	ii Calculate $/kW capital costs by project size category			$[illegible],258	$[illegible],196	$[illegible],629	/kW						
	iii Calculate total annual retrofit project capital costs						**L**	**$[illegible]212,997**	**$[illegible]296,854**	**$[illegible]296,854**	**$[illegible]296,854**	**$[illegible]296,854**	**[illegible],400,415**
							M	$[illegible]202,525	$[illegible]282,259	$[illegible]282,259	$[illegible]282,259	$[illegible]282,259	[illegible],331,562
							S	$[illegible]275,854	$[illegible]384,457	$[illegible]384,457	$[illegible]384,457	$[illegible]384,457	[illegible],813,683
							Total	[illegible]691,376	[illegible]963,571	[illegible]963,571	[illegible]963,571	[illegible]963,571	[illegible],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%		77,209	246,977	246,977	246,977	246,977	1,165,117
iii	**S**	**6**	**0**	100%		75,854	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		$600						
	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	$[illegible]58,901	$[illegible]58,901	$[illegible]58,901	$[illegible]58,901	$[illegible]2,671,368
iv Calculate incremental annual EE retrofit program implementation costs	$331,765	$[illegible]54,901	$[illegible]54,901	$[illegible]54,901	$[illegible]54,901	$[illegible]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	$[illegible]6,280,520
d Calculate annual incremental EE total resource costs	$503,141	$[illegible]98,472	$[illegible]98,472	$[illegible]98,472	$[illegible]98,472	$[illegible]4,097,028
3 Combine EE incremental retrofit resource acquisition costs and savings with other ENTARC components						

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Questions?

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