Pasadena Water & Power
2009 Integrated Resource Plan

Public Meeting #2

October 15, 2008

PACE

Agenda

- AB 32 Update
- Executive Summary
- Detailed Study
  - Phase I Approach
    - Resource Screening
    - Policy Scenarios
  - Screening Analysis
  - Policy Analysis
  - Recommended Portfolios for Phase II
  - Next Steps
    - Phase I
    - Phase II

Objective for Today

- Provide update and perspective on AB32
- Provide overview of Phase I process, approach, results
- Get stakeholder comments and advice on next steps
- Begin to determine what constitutes “acceptable” risks in a portfolio from different customer groups
- Describe remainder of Phase I and Phase II process

AB 32 Update
(15 Minutes)

GHG Constraints and their impacts on PWP's IRP

- AB 32 caps statewide GHG emissions in 2020 at 1990 levels (11% below current levels & 29% below projected 2020 levels)
- AB 32 implementation plans call for needed reductions through a combination of "direct reductions" (displacing high polluting sources) and a "cap and trade" system for buying and/selling emission reductions among market participants
- PWP can rely on both approaches to meet and exceed the AB 32 GHG emission reduction requirements, but faces several key risks in doing so:
  - The costs of implementing direct reductions through changes in its resource portfolio, such as increasing energy efficiency and renewable energy
  - The system of allocating or auctioning "free allowances" among market participants
  - The price ($/tonne) of buying and selling allowances in the market

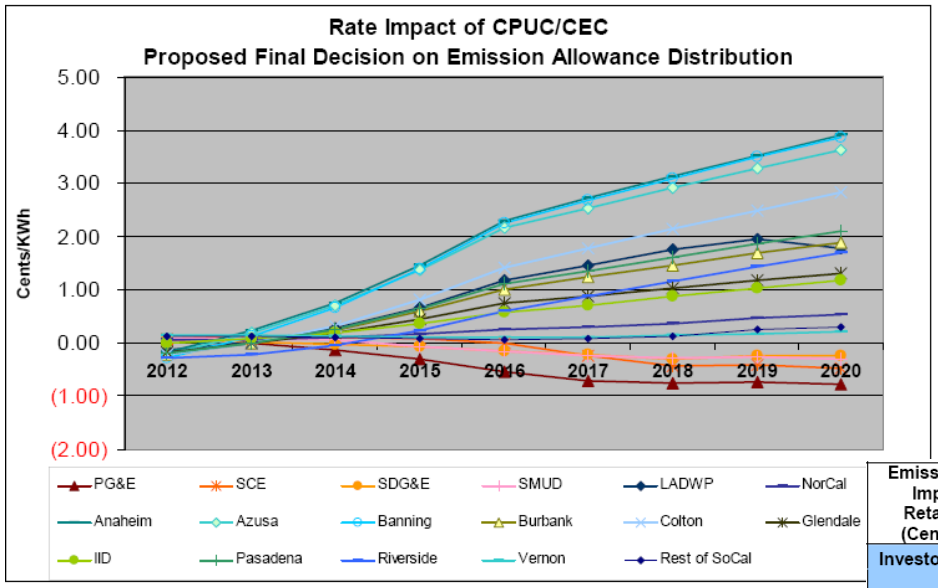
AB 32 Update and Key Implications

- CPUC/CEC Proposed Decision on recommended regulatory strategies to implement AB 32 issued September 12, 2008
- Electricity sector expected to provide 40% of required emissions reductions even though it produces only 25% of statewide GHG emissions
- Proposed approach to achieving direct reductions and a multi-sector cap and trade program:
  - Aggressive expansion of cost-effective energy efficiency programs
  - Statewide adoption of a 33% RPS requirement
  - Phased auction of allowances (20% in 2012 rising to 100% in 2016)
  - Allocation of remaining allowances (80% in 2012 falling to 0 in 2016) based on an “output-based” allocation scheme

SCPPA/LADWP Responses to AB 32 Proposed Decision

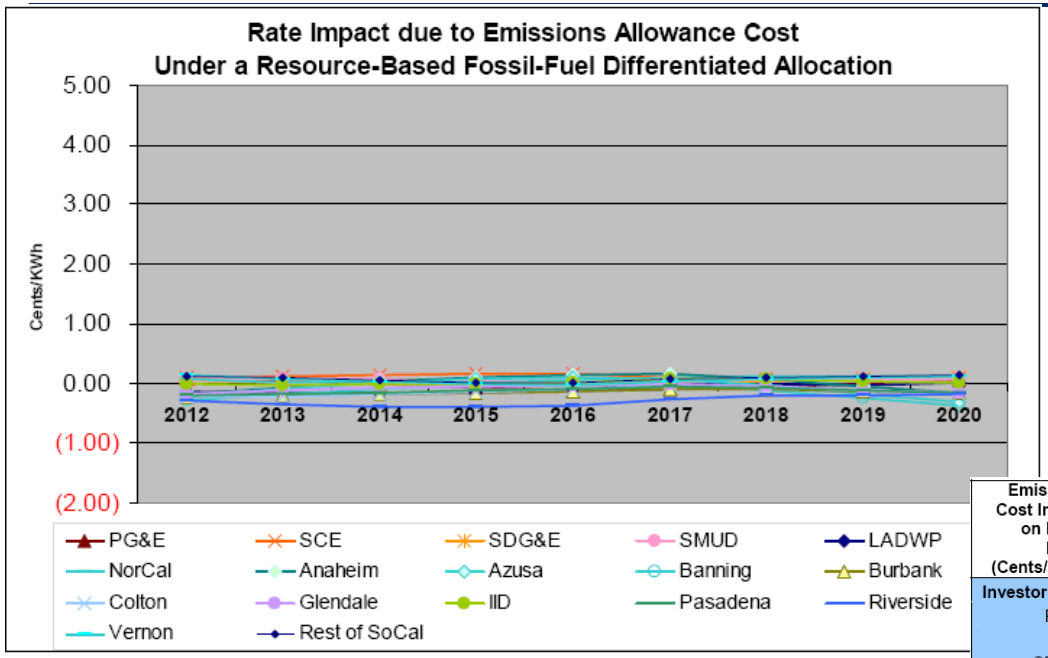
- Major Objections
  - Needlessly complex allocation allocation/auction methodology that penalizes utilities reliant on high emitting resources (notably, Southern California municipal utilities)
  - Inappropriate wealth transfer from Southern California munis to IOUs ($4.7 billion through 2020)
  - AB 32 should not be a “tool to true-up rates” between IOUs and munis
- Proposed Alternatives and Impacts
  - Shift away from an allocation based on retail sales made by “legacy” and large hydroelectric supply sources
  - Shift toward an allocation based on historical emissions that is “resource-based and fuel-differentiated”
  - Extend the transition toward allocation auctions through 2020
  - Reduce rate impacts and potential wealth transfers between IOUs and munis

LADWP Estimate of AB 32 Proposal's Rate Impact



Emissions Cost Impact on Retail Rates (Cents/KWh)	2012	2013	2014	2015	2016	2017	2018	2019	2020
Investor Owned Utilities									
PG&E	0.07	(0.02)	(0.15)	(0.34)	(0.59)	(0.69)	(0.71)	(0.75)	(0.77)
SCE	0.09	0.09	0.07	0.02	(0.05)	(0.22)	(0.38)	(0.43)	(0.46)
SDG&E	0.05	(0.01)	(0.06)	(0.13)	(0.20)	(0.19)	(0.27)	(0.26)	(0.24)
SMUD	0.09	0.05	0.02	(0.12)	(0.21)	(0.22)	(0.24)	(0.28)	(0.30)
NorCal	0.07	0.03	0.05	0.11	0.19	0.32	0.40	0.45	0.53
Southern California Publicly Owned Utilities									
LADWP	(0.13)	(0.04)	0.20	0.58	1.09	1.48	1.80	1.93	1.77
Anaheim	(0.18)	0.15	0.67	1.36	2.21	2.74	3.19	3.51	3.90
Azusa	(0.21)	0.11	0.62	1.27	2.07	2.56	2.97	3.26	3.62
Banning	(0.29)	0.04	0.58	1.29	2.16	2.70	3.15	3.47	3.87
Burbank	(0.22)	(0.07)	0.18	0.52	0.93	1.26	1.52	1.67	1.90
Colton	(0.22)	(0.07)	0.26	0.72	1.33	1.80	2.19	2.48	2.82
Glendale	(0.17)	(0.04)	0.14	0.38	0.67	0.89	1.07	1.16	1.32
IID	(0.00)	0.03	0.13	0.29	0.50	0.73	0.92	1.01	1.18
Pasadena	(0.21)	(0.05)	0.20	0.56	1.02	1.37	1.66	1.85	2.10
Riverside	(0.28)	(0.26)	(0.11)	0.15	0.51	0.89	1.20	1.41	1.69
Vernon	0.14	0.10	0.08	0.05	0.03	0.12	0.19	0.16	0.21
Rest of SoCal	0.13	0.09	0.06	0.03	0.00	0.10	0.16	0.24	0.30
Water Ag	0.14	0.22	0.08	0.12	0.19	0.36	0.50	0.56	0.71
Legacy CHP	(1.43)	(0.91)	(0.33)	0.30	0.98	1.22	1.42	1.54	1.73
Total	0.00	(0.00)	(0.00)	0.00	0.00	0.00	(0.00)	0.00	(0.00)

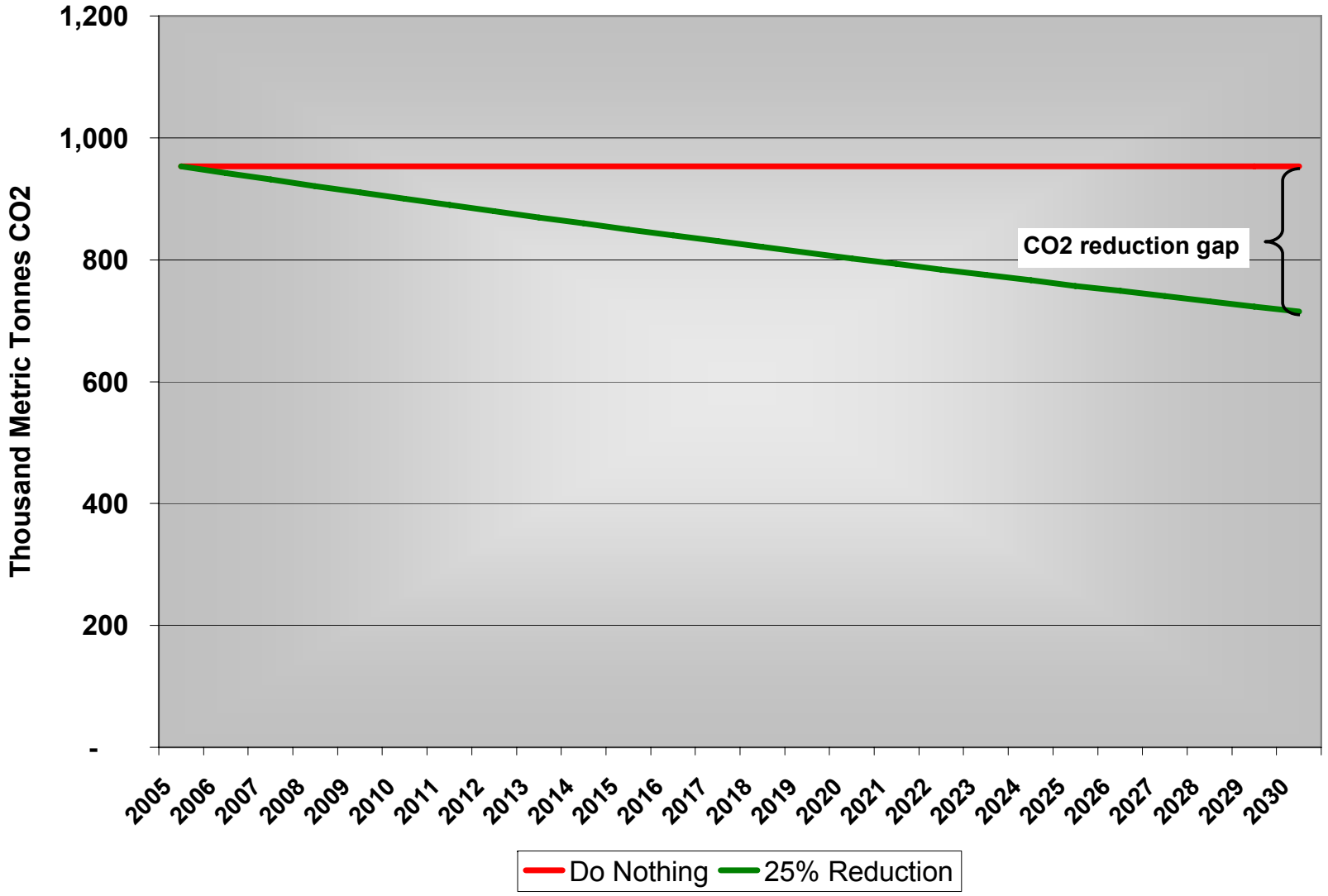
LADWP Alternative Proposal's Estimated Rate Impact



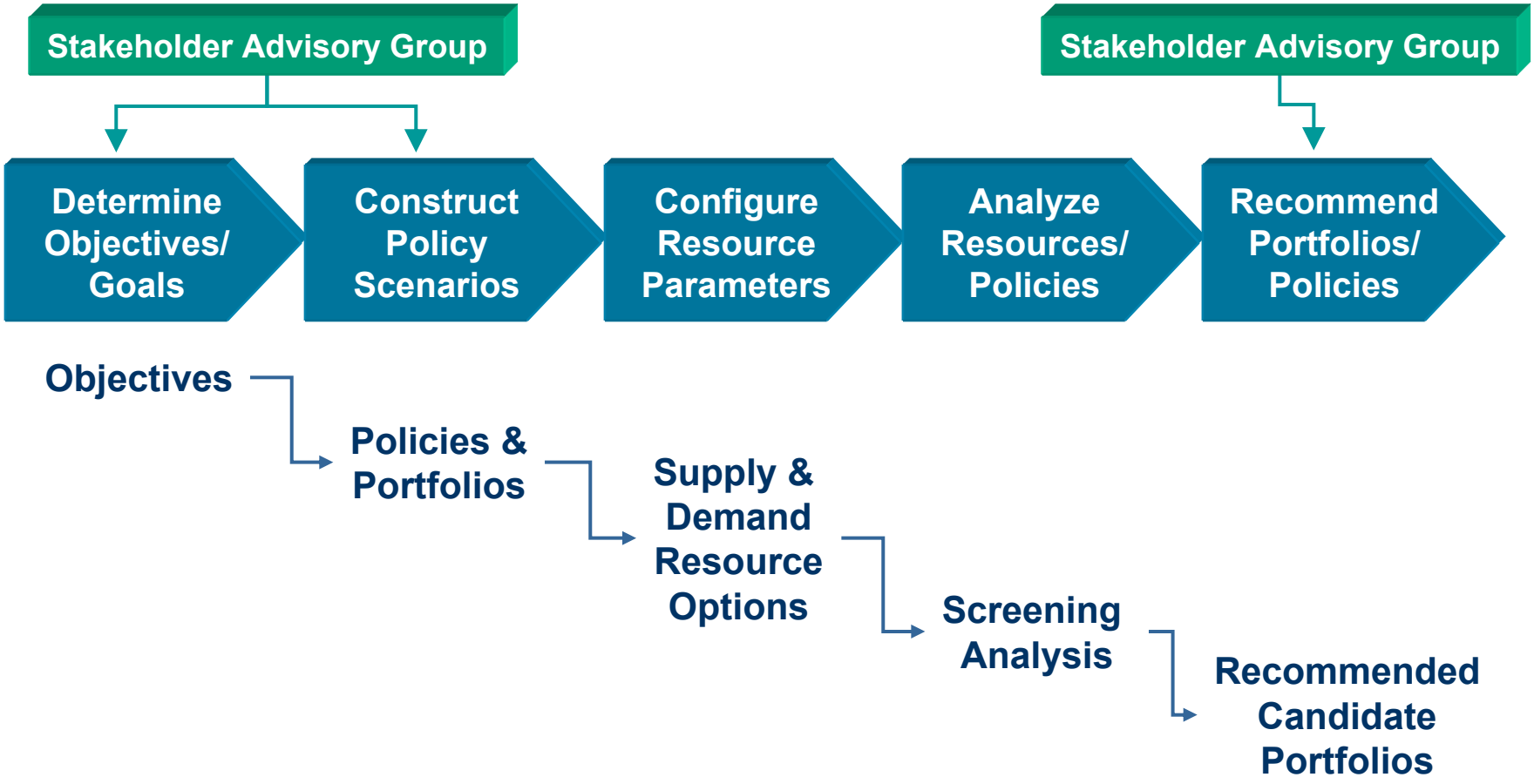
Emissions Cost Impact on Retail Rates (Cents/KWh)	2012	2013	2014	2015	2016	2017	2018	2019	2020
Investor Owned Utilities									
PG&E	0.07	0.02	(0.02)	(0.06)	(0.11)	(0.10)	(0.04)	0.00	0.04
SCE	0.09	0.11	0.14	0.15	0.16	0.10	0.08	0.08	0.07
SDG&E	0.05	0.01	(0.00)	(0.02)	(0.02)	0.01	0.03	0.07	0.10
SMUD	0.09	0.07	0.08	0.03	0.04	0.07	0.07	0.07	0.07
NorCal	0.07	0.02	0.01	0.02	0.05	0.11	0.12	0.12	0.12
Southern California Publicly Owned Utilities									
LADWP	(0.13)	(0.16)	(0.15)	(0.13)	(0.09)	(0.02)	(0.01)	(0.04)	0.01
Anaheim	(0.18)	(0.07)	0.04	0.10	0.15	0.16	0.08	(0.05)	(0.16)
Azusa	(0.21)	(0.09)	0.01	0.07	0.10	0.08	(0.02)	(0.17)	(0.31)
Banning	(0.29)	(0.18)	(0.09)	(0.04)	(0.01)	(0.01)	(0.11)	(0.25)	(0.38)
Burbank	(0.22)	(0.19)	(0.17)	(0.16)	(0.14)	(0.09)	(0.11)	(0.14)	(0.16)
Colton	(0.22)	(0.21)	(0.18)	(0.14)	(0.10)	(0.03)	(0.05)	(0.11)	(0.17)
Glendale	(0.17)	(0.12)	(0.08)	(0.05)	(0.03)	(0.01)	(0.05)	(0.11)	(0.16)
IID	(0.00)	(0.02)	(0.02)	(0.01)	0.01	0.07	0.07	0.04	0.01
Pasadena	(0.21)	(0.17)	(0.16)	(0.13)	(0.10)	(0.05)	(0.07)	(0.12)	(0.15)
Riverside	(0.28)	(0.36)	(0.39)	(0.40)	(0.38)	(0.26)	(0.20)	(0.19)	(0.17)
Vernon	0.14	0.09	0.04	0.00	(0.02)	0.04	0.07	0.09	0.12
Rest of SoCal	0.13	0.09	0.05	0.01	0.00	0.07	0.10	0.12	0.13
Water Ag	0.14	0.20	0.09	0.12	0.16	0.23	0.25	0.23	0.21
Legacy CHP	(1.43)	(1.06)	(0.78)	(0.61)	(0.55)	(0.78)	(1.08)	(1.42)	(1.75)
Total	0.00	(0.00)	(0.00)	0.00	0.00	0.00	(0.00)	0.00	(0.00)

Executive Summary
(90 Minutes)

PWP CO_2 Reduction Goal



Phase I Process – Narrowing the range of possibilities



Approach to Screening

- Several Steps:
  - Evaluate all demand and supply side options against our key objectives (either quantitatively using screening tool or qualitatively)
  - Eliminate the resource options that are worse in most or all criteria from further consideration and determine the “most favored” resources for the Policy analysis.
  - Evaluate combinations of portfolios against increasing levels of environmental stewardship to determine
    - Which portfolios best meet minimum criteria and should be considered in Phase II (risk analysis)
    - The cost of higher levels of environmental stewardship

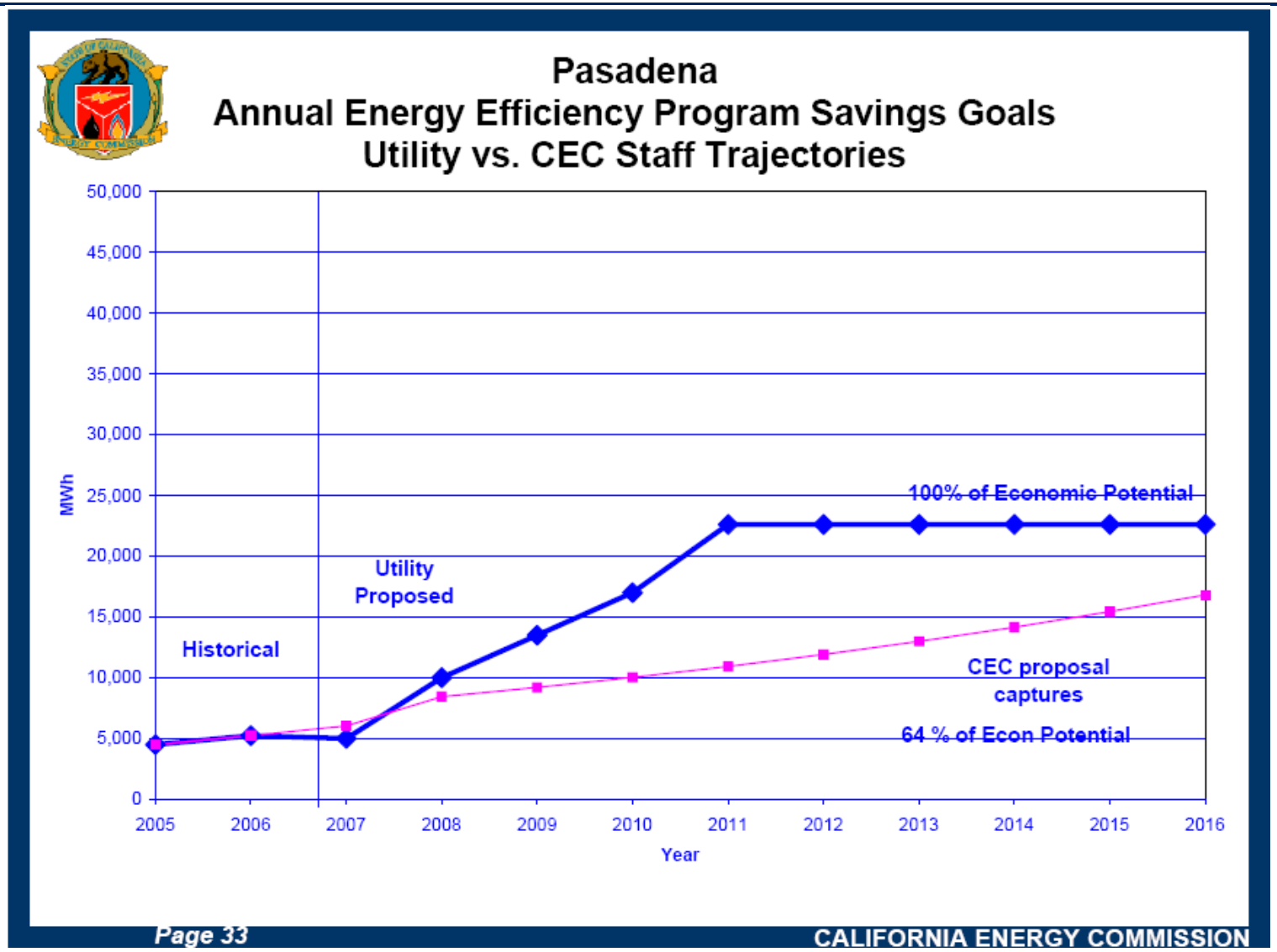
Resource Screening within Portfolio

- Initial generation screening was conducted to determine the relative costs and carbon emissions for different resource types
- This information is used as a benchmark for future portfolio creation and as a baseline comparison between generation types.
- Methodology
  - Ensure all existing requirements are met (wind and geothermal expansion assumed to meet existing RPS)
  - Once the base RPS portfolio was established, other generation options were tested by adding 5 MW of available capacity for each type in 2010.

Screening Criteria Matrix

Resource Type	Generation Option	CO2 Emissions	Costs	Costs/ CO2 Red.	Risk Exposure	Reliability	Capital Req.
Baseload	Coal						
	Geothermal						
	Landfill						
	Nuclear						
Intermediate/ Peaking	Gas CC						
	Gas CT						
Intermittent	Solar PV						
	Solar Thermal						
	Wind						

PWP EE Targets: 100% of Economic Potential



NRDC Review of Public-Owned Utility EE Targets

Table 1: Top Ten POUs Ranked by Savings as Percent of Sales

	Utility	2016 Cumulative Annual Energy Saving Target as Percent of 2016 Energy Forecast
1.	SMUD	12.9%
2.	Pasadena	12.5%
3.	Needles	10.3%
4.	Glendale	10.0%
5.	Imperial Irrigation District	9.4%
6.	Riverside	9.3%
7.	Burbank	9.1%
8.	Island Energy	8.3%
9.	Port of Oakland	8.2%
10.	LADWP	7.8%

NRDC Review of Public-Owned Utility EE Targets

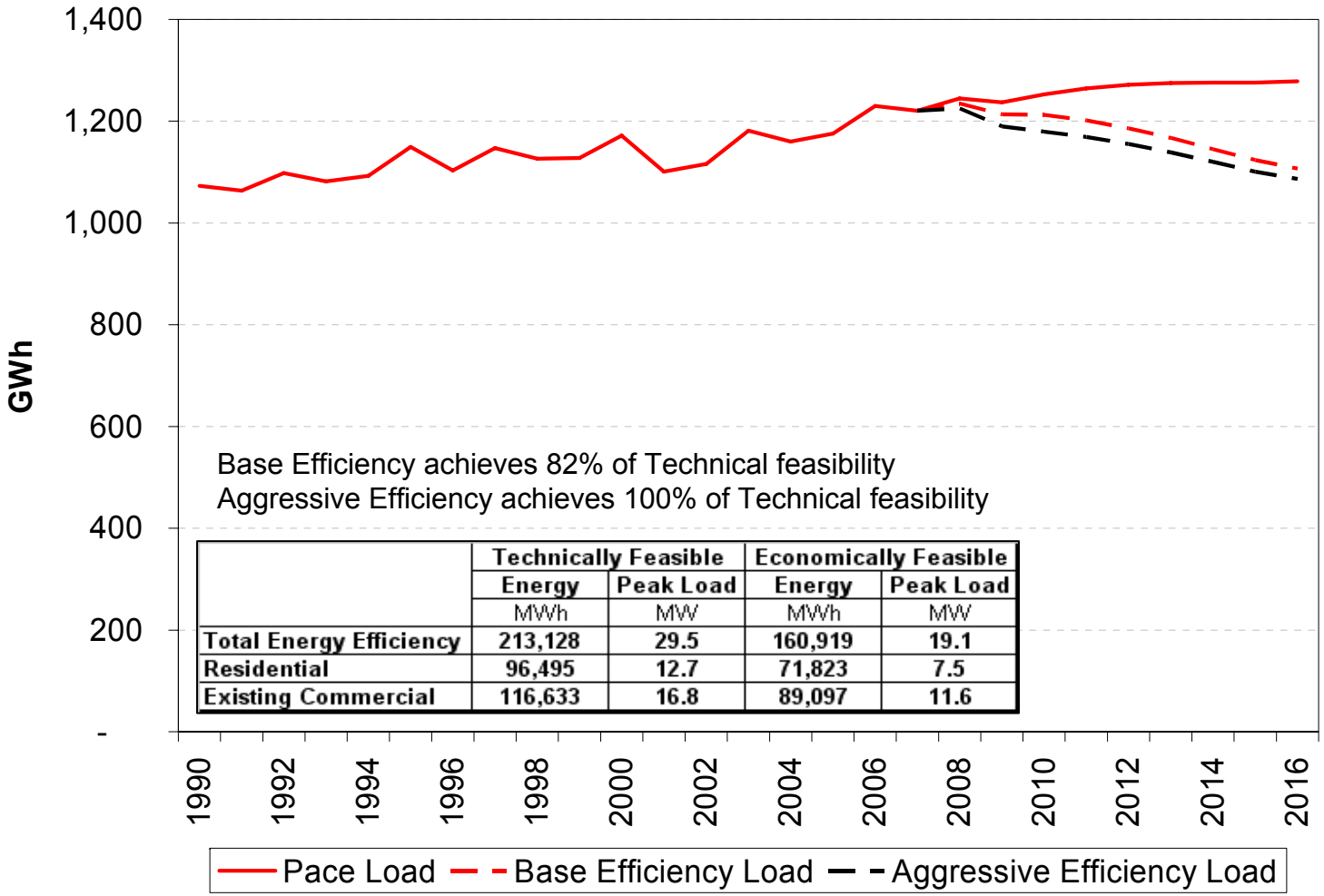
Table 3: Top Ten POUs Ranked by Target as Percent of Economic Potential

	Utility	2016 Energy Saving Target as Percent of Economic Potential
1.	Pasadena	100%
2.	Island Energy	79%
3.	Port of Oakland	72%
4.	Glendale	64%
5.	SMUD	63%
6.	Burbank	62%
7.	Riverside	61%
8.	Hercules	54%
9.	Corona	53%
10.	Anaheim	53%

Note: Redding, Palo Alto, and Vernon did not report economic potentials, and therefore could not be included in this comparison. All economic potentials are from the RMI report, except SMUD's, which is from the 2006 Itron study commissioned by SMUD.

Energy Efficiency Treatment in Phase 1 Screening

Performed scenarios with varying levels of efficiency deployment, based on RMI calculator

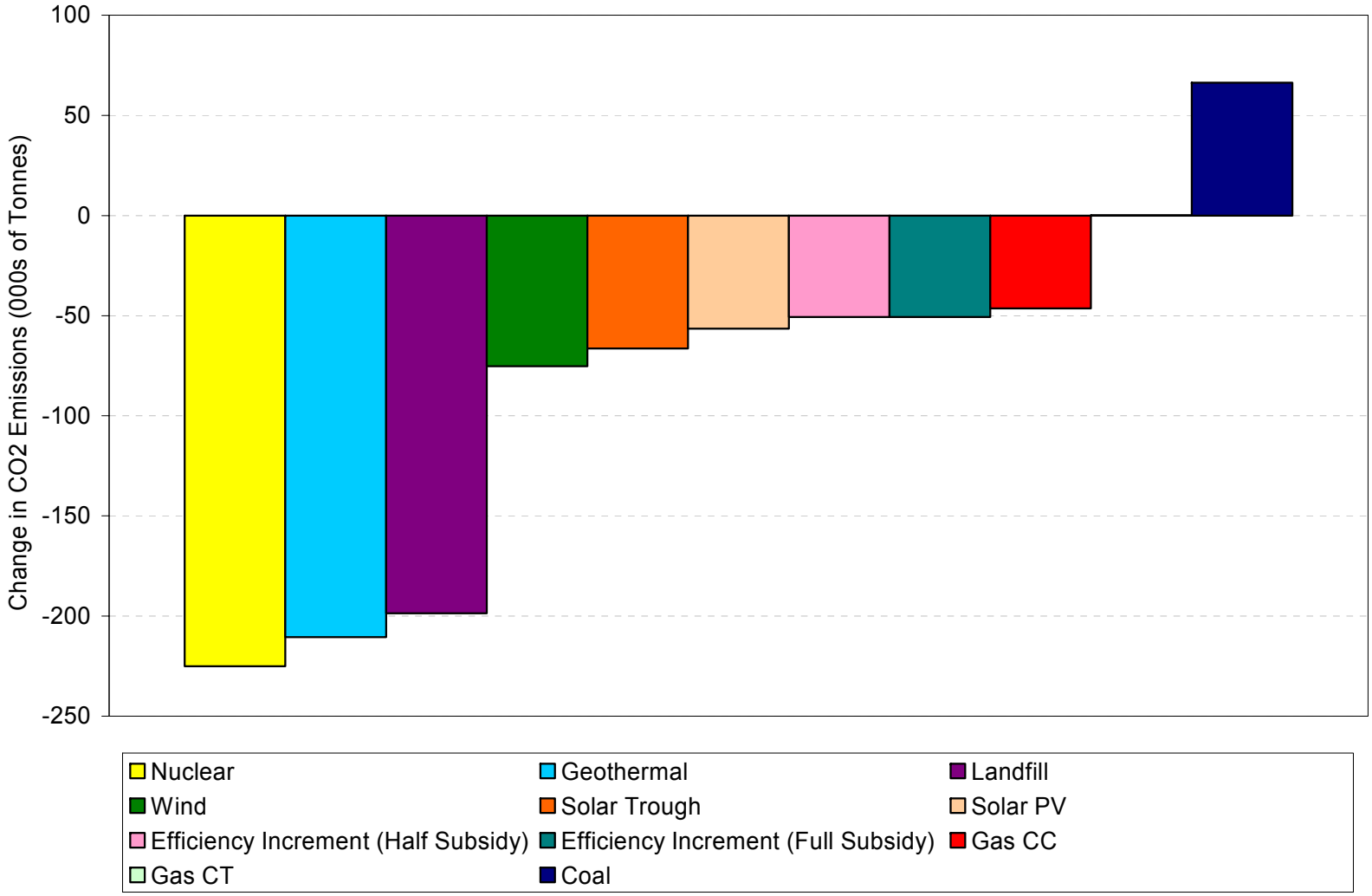


Base Efficiency achieves 82% of Technical feasibility
Aggressive Efficiency achieves 100% of Technical feasibility

	Technically Feasible		Economically Feasible	
	Energy	Peak Load	Energy	Peak Load
	MWh	MW	MWh	MW
Total Energy Efficiency	213,128	29.5	160,919	19.1
Residential	96,495	12.7	71,823	7.5
Existing Commercial	116,633	16.8	89,097	11.6

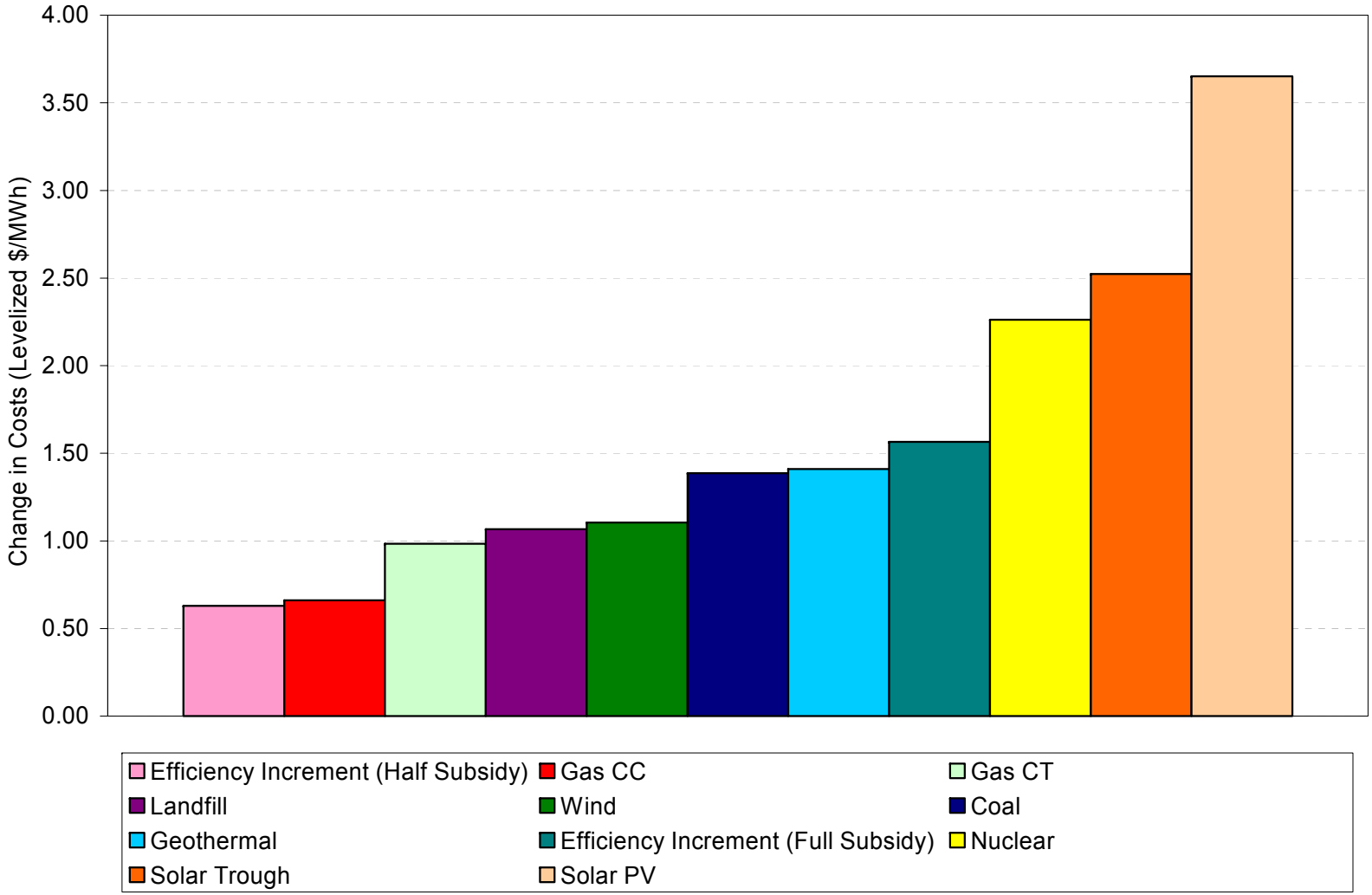
CO2 Emissions Reduction
Hypothetical 5 MW Addition

Resource Type	Generation Option	CO2 Emissions	Costs	Costs/ CO2 Red.	Risk Exposure	Reliability	Capital Req.
Baseload	Coal	9					
	Geothermal	2					
	Landfill	3					
	Nuclear	1					
Intermediate/ Peaking	Gas CC	7					
	Gas CT	8					
Intermittent	Solar PV	6					
	Solar Thermal	5					
	Wind	4					



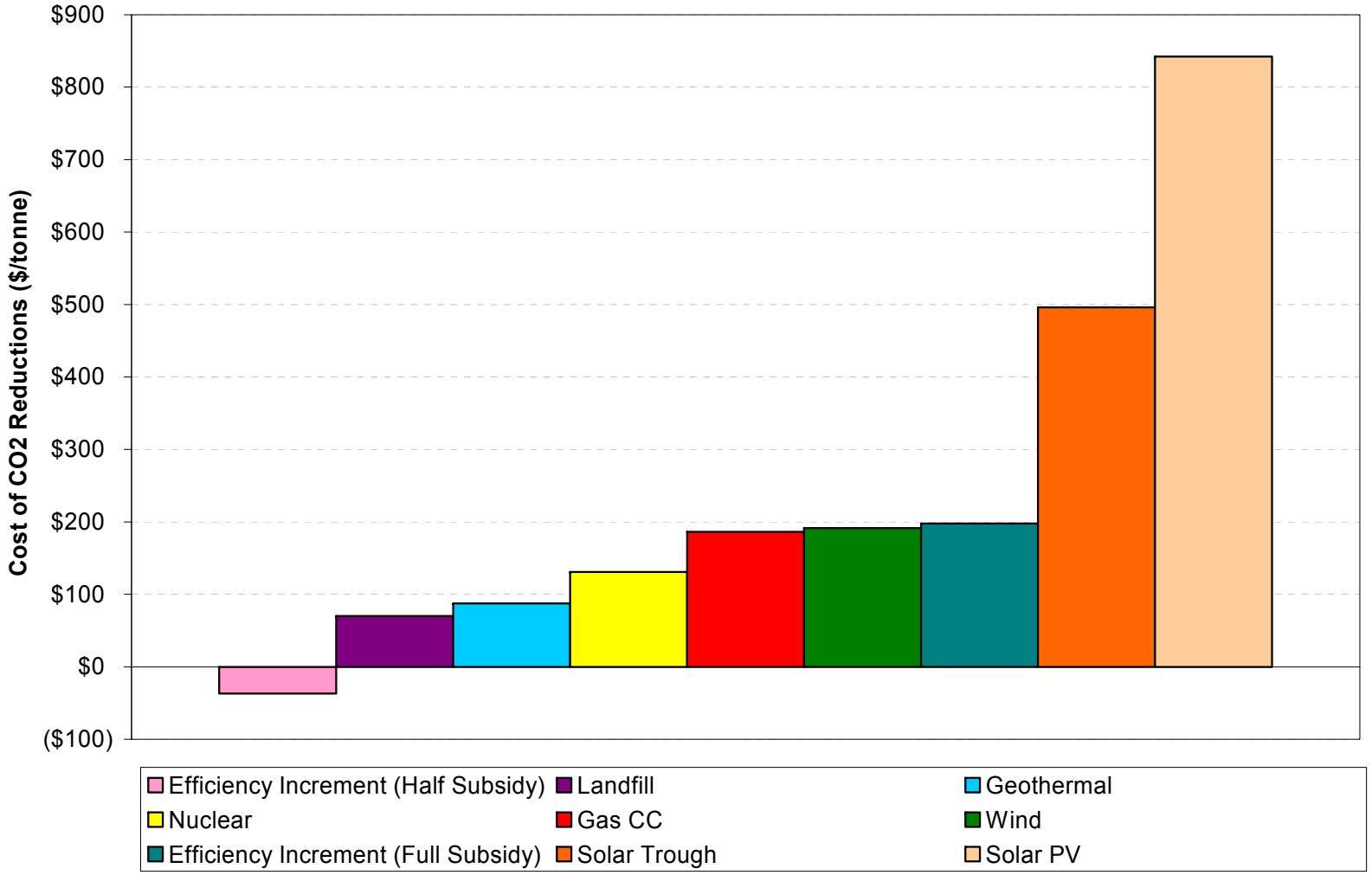
Portfolio Cost Increase
Hypothetical 5 MW Addition

Resource Type	Generation Option	CO2 Emissions	Costs	Costs/ CO2 Red.	Risk Exposure	Reliability	Capital Req.
Baseload	Coal	9	5				
	Geothermal	2	6				
	Landfill	3	3				
	Nuclear	1	7				
Intermediate/ Peaking	Gas CC	7	1				
	Gas CT	8	2				
Intermittent	Solar PV	6	9				
	Solar Thermal	5	8				
	Wind	4	4				

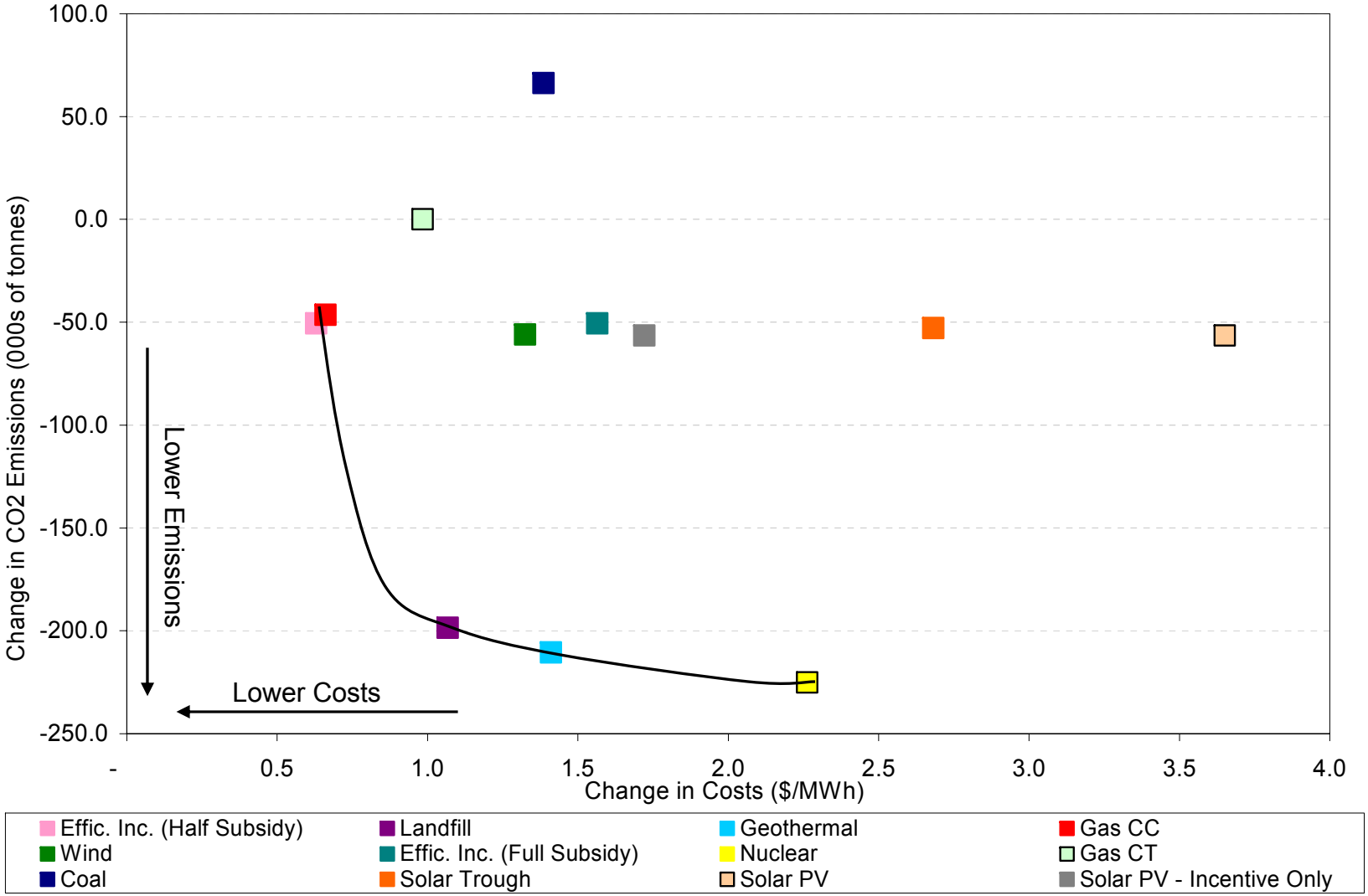


Cost of CO2 Reduction
Hypothetical 5 MW Addition

Resource Type	Generation Option	CO2 Emissions	Costs	Costs/ CO2 Red.	Risk Exposure	Reliability	Capital Req.
Baseload	Coal	9	5	9			
	Geothermal	2	6	2			
	Landfill	3	3	1			
	Nuclear	1	7	3			
Intermediate/ Peaking	Gas CC	7	1	4			
	Gas CT	8	2	8			
Intermittent	Solar PV	6	9	7			
	Solar Thermal	5	8	6			
	Wind	4	4	5			



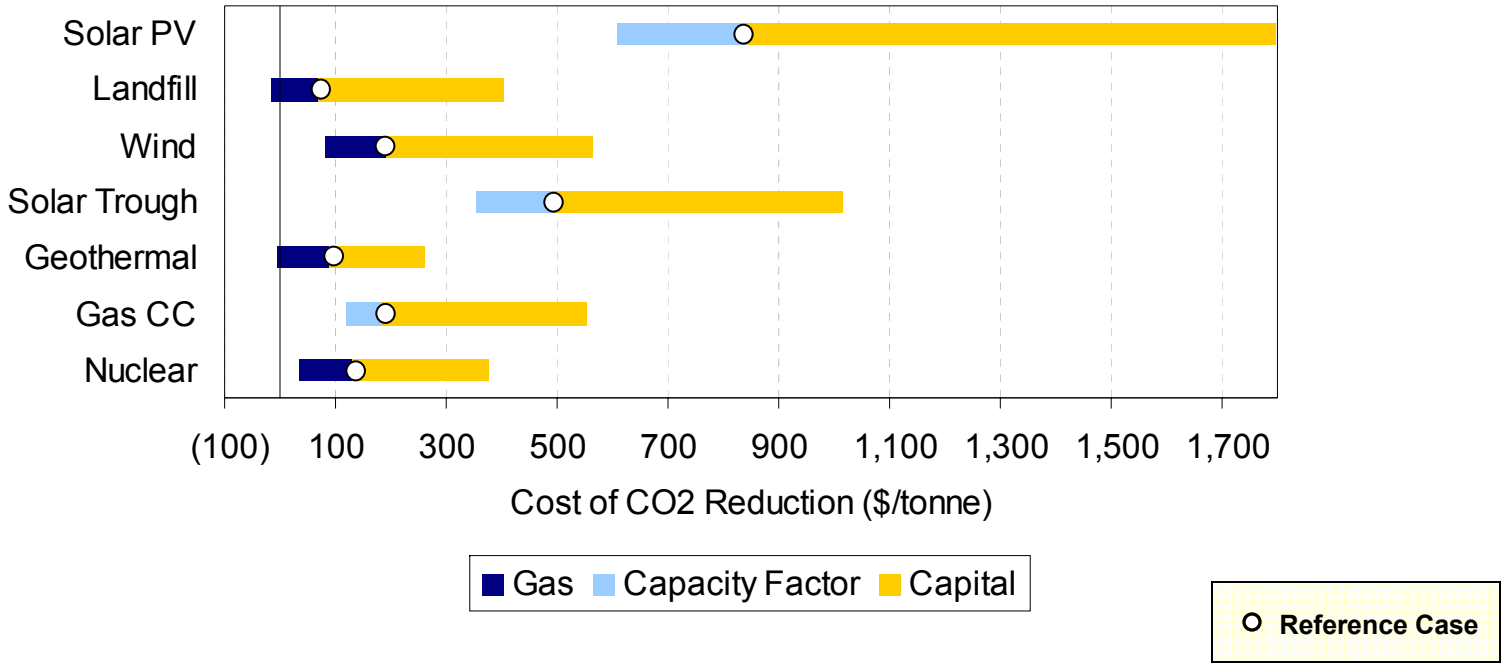
CO2 Reduction vs. Cost - Hypothetical 5 MW Addition



Uncertainty Analysis Summary

Resource Type	Generation Option	CO2 Emissions	Costs	Costs/ CO2 Red.	Risk Exposure	Reliability	Capital Req.
Baseload	Coal	9	5	9	9		
	Geothermal	2	6	2	1		
	Landfill	3	3	1	3		
	Nuclear	1	7	3	2		
Intermediate/ Peaking	Gas CC	7	1	4	4		
	Gas CT	8	2	8	4		
Intermittent	Solar PV	6	9	7	8		
	Solar Thermal	5	8	6	7		
	Wind	4	4	5	6		

- Uncertainty around capital costs poses greatest upside risk for all technologies



Summary Technology Ranking

- Geothermal and landfill gas options are preferred due to strong performance on CO2 and cost metrics
- Wind option is a likely renewable backup if/when geothermal and landfill resources are unavailable
- Gas-fired options available at lower capital cost and to balance intermittent options

Rankings: 1 (Best) to 9 (Worst)

Resource Type	Generation Option	CO2 Emissions	Costs	Costs/ CO2 Red.	Risk Exposure	Reliability	Capital Req.	Summary
Baseload	Coal	9	5	9	9			
	Geothermal	2	6	2	1			
	Landfill	3	3	1	3			
	Nuclear	1	7	3	2			
Intermediate/ Peaking	Gas CC	7	1	4	4			
	Gas CT	8	2	8	4			
Intermittent	Solar PV	6	9	7	8			
	Solar Thermal	5	8	6	7			
	Wind	4	4	5	6			

Preferred Options

Low capital cost

Solar initiative

Performs adequately across all metrics

Resource Options

- Existing Fleet
  - Consider coal replacement options
- Base Load Renewables
  - Geothermal
  - Landfill Gas
- Intermediate Load
  - Gas-fired combined cycle
- Intermittent Renewables
  - Wind
- Local Renewables
  - Feed-in tariff for local options
- Energy Efficiency
- Market
  - Resource Adequacy for Capacity
  - Energy purchases from market

Portfolio Development

		Carbon Reduction Strategy 1	Carbon Reduction Strategy 2	Carbon Reduction Strategy 3	Carbon Reduction Strategy 4
Carbon Reduction Goals		10% by 2010 20% by 2020	10% by 2010 30% by 2020	20% by 2010 60% by 2020	20% by 2010 80% by 2020
RPS Goals and Targets		2007 IRP RPS Goals	Current CA RPS Goal	Aggressive RPS	Green
		10% by 2010 20% by 2017	20% by 2010 33% by 2020	20% by 2010 50% by 2020	20% by 2010 80-90% by 2020
Plan Concepts	Existing Portfolio	√	√		
	Local Fossil Generation	√			
	Coal Displacement		√	√	√
	Aggressive Efficiency & Technology	√	√		

Policy Screening Approach

- Determine the “Best Portfolio” for each Strategy and Plan Objective Element
- Select the “Best Portfolio” for each Strategy among the Plan element objectives
- Determine the Cost impact of different strategies
- Select the Portfolios that will be evaluated further in a risk analysis in Phase II.

Determine the “Best Portfolio” among Options for each Strategy and Plan Option Combination

- Start with the Preferred Resources in the Resource Screening (Landfill, Geothermal, then Wind, then CC)
- Add resources when needed to either meet a reserve requirement, the carbon reduction requirement or the renewable or energy efficiency requirement
- Evaluate alternative portfolios that limit the penetration of resources in a given year (e.g. limit amount of landfill or geothermal available)
- Change the timing of the portfolio additions
- Consider more diverse portfolio options

Existing Portfolio Plus Renewables
30% CO2 Reduction by 2020

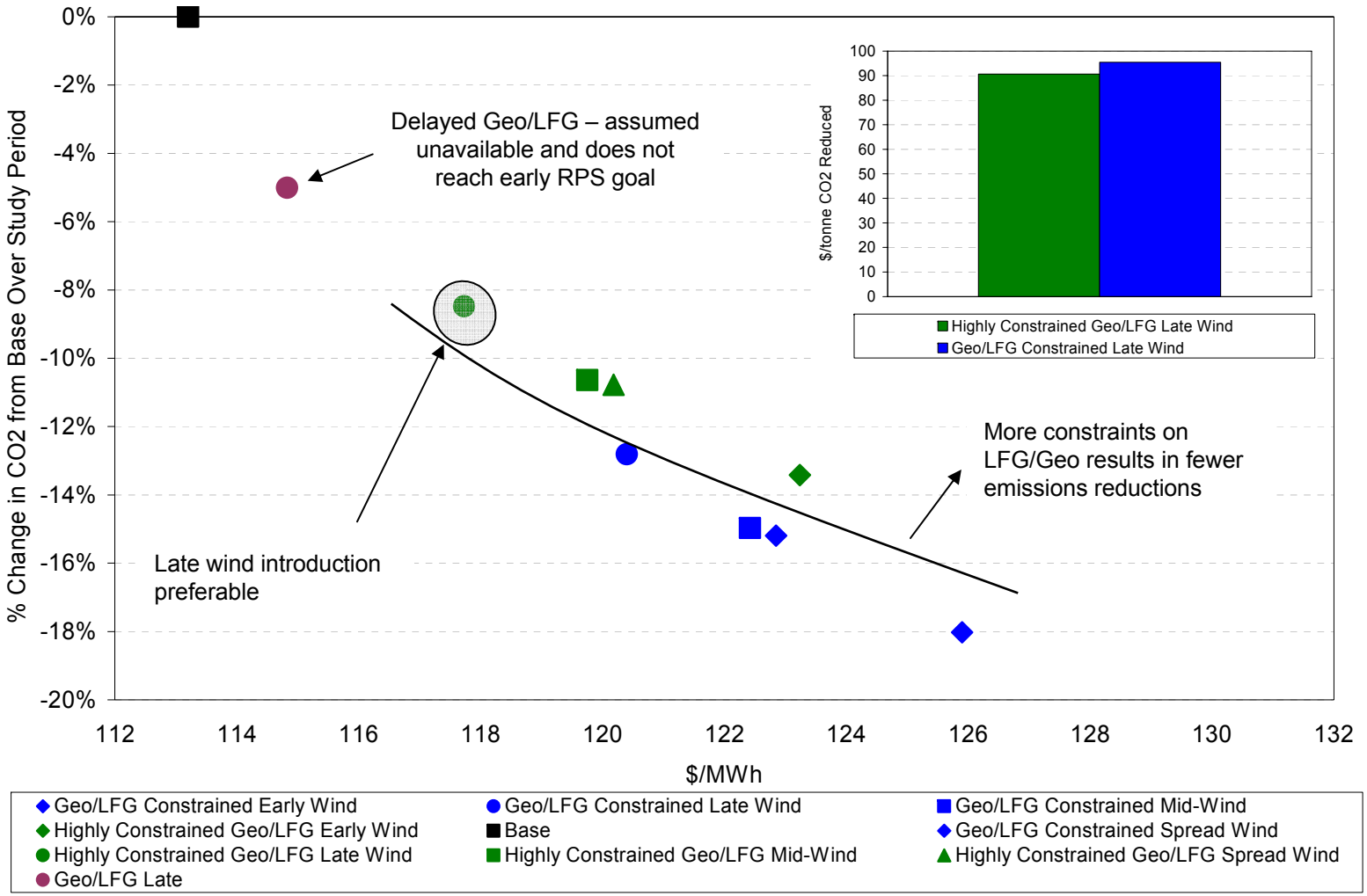
Plan Concepts		1	2	3	4
	Existing Portfolio	√	√		
	Local Fossil Generation	√			
	Coal Displacement		√	√	√
	Aggressive Efficiency & Technology	√	√		

*Assumes that geothermal and landfill expansion is constrained and must be supplemented by wind

	Constrained Geothermal/Landfill												Highly Constrained Geothermal/Landfill											
	Early Wind			Late Wind			Mid-Wind			Spread Wind			Early Wind			Late Wind			Mid-Wind			Spread Wind		
	Geo	LFG	Wind	Geo	LFG	Wind	Geo	LFG	Wind	Geo	LFG	Wind	Geo	LFG	Wind	Geo	LFG	Wind	Geo	LFG	Wind	Geo	LFG	Wind
2008																								
2009																								
2010	10	10	35	10	10		10	10		10	10	8.75	5	5	65	5	5		5	5		5	5	16.25
2011																								
2012																								
2013												8.75												16.25
2014																								
2015									35												65			
2016																								
2017												8.75												16.25
2018																								
2019																								
2020						35						8.75						65						16.25
2021																								
2022																								
2023																								
2024																								
2025																								
2026																								
2027																								
2028																								
Total	10	10	35	10	10	35	10	10	35	10	10	35	5	5	65	5	5	65	5	5	65	5	5	65

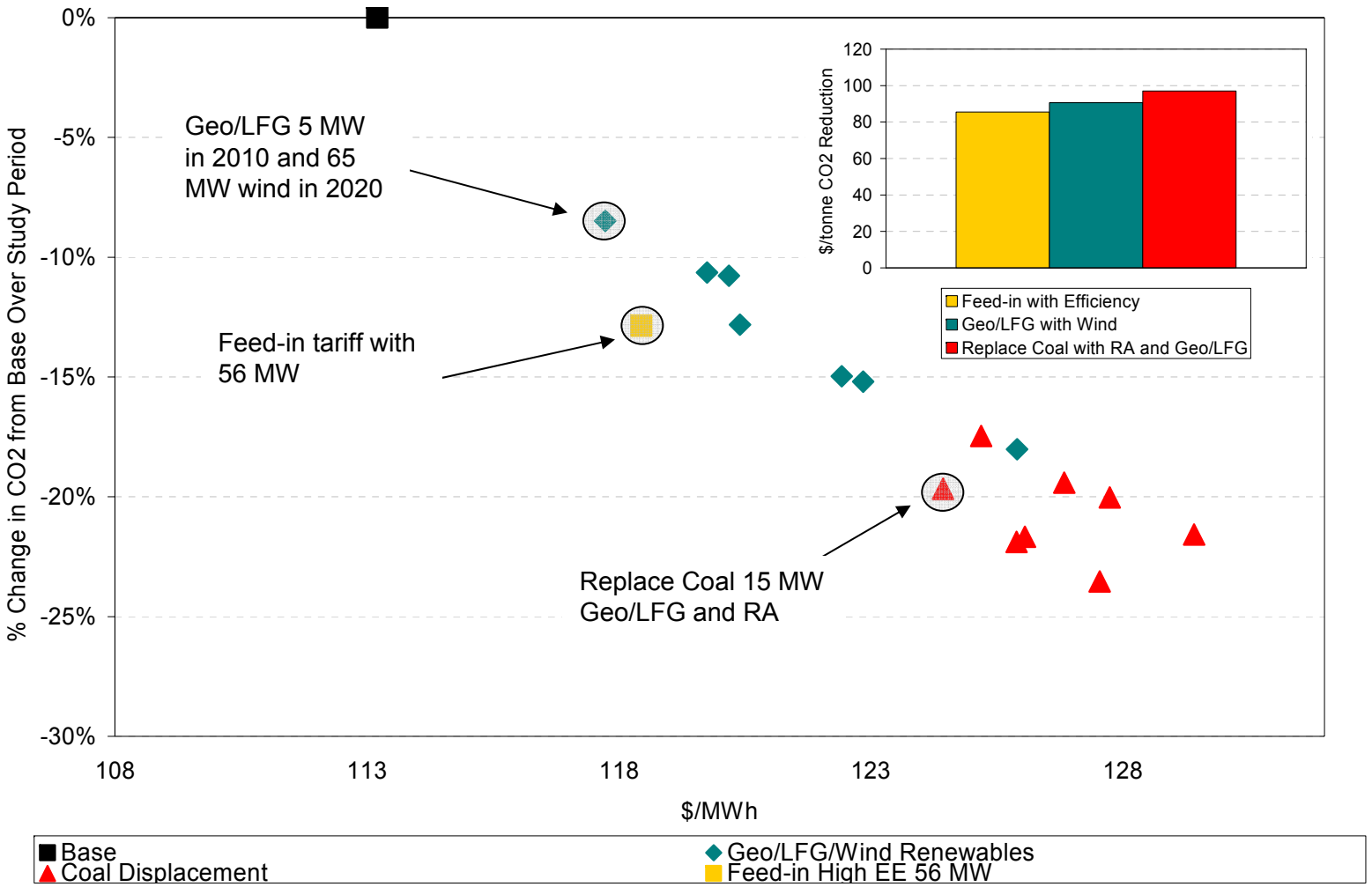
Existing Portfolio Plus Renewables
30% CO2 Reduction by 2020

Plan Concepts	1	2	3	4
Existing Portfolio	√	√		
Local Fossil Generation	√			
Coal Displacement		√	√	√
Aggressive Efficiency & Technology	√	√		



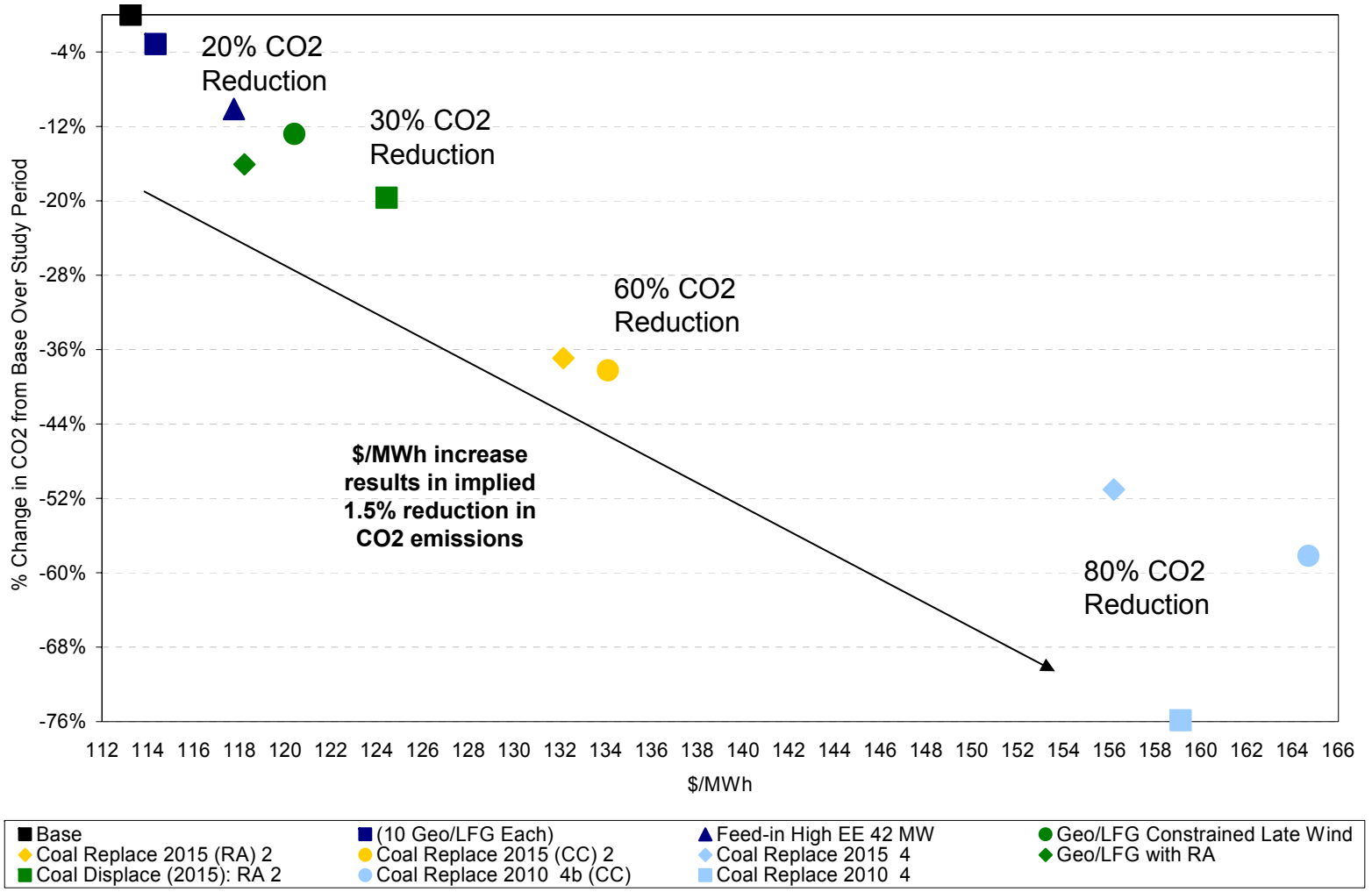
Plan Comparisons
30% CO2 Reduction by 2020

Plan Concepts		1	2	3	4
	Existing Portfolio	√	√		
	Local Fossil Generation	√			
	Coal Displacement		√	√	√
	Aggressive Efficiency & Technology	√	√		

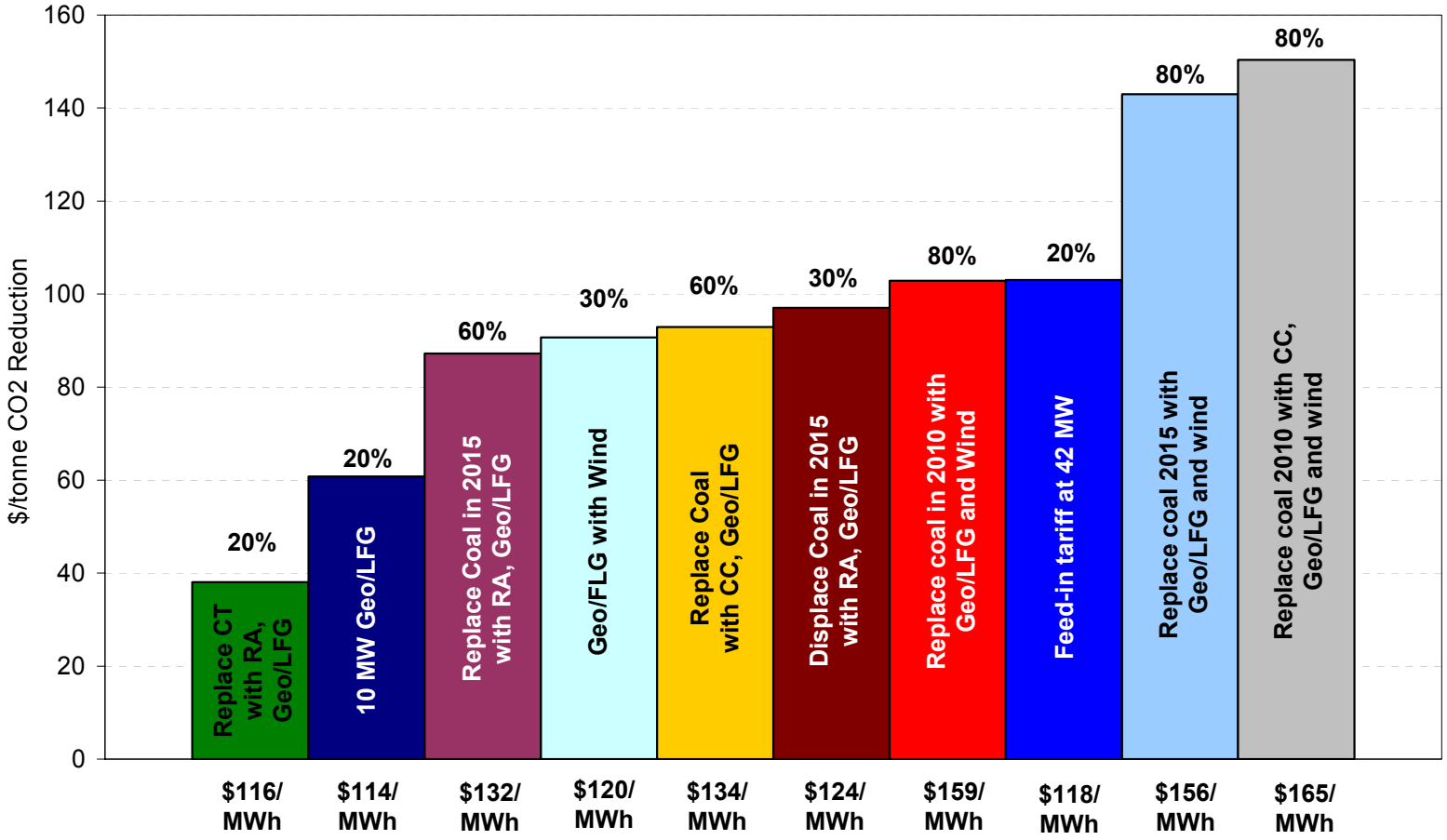


Portfolio Plan Comparisons

Plan Concepts	1	2	3	4
Existing Portfolio	√	√		
Local Fossil Generation	√			
Coal Displacement		√	√	√
Aggressive Efficiency & Technology	√	√		



Portfolio Plan Comparisons



Recommended Portfolio Combinations for Phase II

	Geo/LFG		Late Wind			CT Replace with RA Geo/LFG			Coal Displace (2015): RA 2			Coal Replace 2015 (RA) 2			Coal Replace 2015 (CC) 2			Coal Replace 2010 4			Coal Replace 2015 4			Coal Replace 2010 4b (CC)			
	Geo	LFG	Geo	LFG	Wind	RA	Geo	LFG	RA	Geo	LFG	RA	Geo	LFG	CC	Geo	LFG	Geo	LFG	Wind	Geo	LFG	Wind	CC	Geo	LFG	Wind
2008																											
2009																											
2010			10	10			15	15					15	15		15	15	50	50	150	15	15	140	60	5	5	150
2011						112																					
2012																											
2013																											
2014																											
2015									47	15	15	30	15	15	30	15	15				35	35			45	45	
2016																											
2017																											
2018																											
2019																											
2020	10	10			35																						
2021																											
2022																											
2023																											
2024																											
2025																											
2026																											
2027																											
2028																											
Total	10	10	10	10	35	112	15	15	47	15	15	30	30	30	30	30	30	50	50	150	50	50	140	60	50	50	150

$/tonne	$61	$91	$42	$97	$87	$93	$103	$143	$150
$/MWh	$114	$120	$116	$124	$132	$134	$159	$156	$165

Policy Conclusions

- The most cost effective policy programs for each strategy include geothermal and landfill options
- Delaying capacity expansion until it is required for reserve margin or RPS purposes leads to lower costs per tonne of CO2 reduced
- Each $/MWh increase in levelized costs is expected to lead to a 1.5% reduction in CO2 emissions from the base over the entire study period
- Premiums associated with:
  - Higher levels of renewables, including wind
  - Gas-fired expansion over resource adequacy

Phase II Process – Evaluating environmental, cost and risk tradeoffs