2006 Integrated Resource Plan:

Round 1 Modeling Results

IRP Stakeholders

June 29, 2006

Seattle City Light

Topics

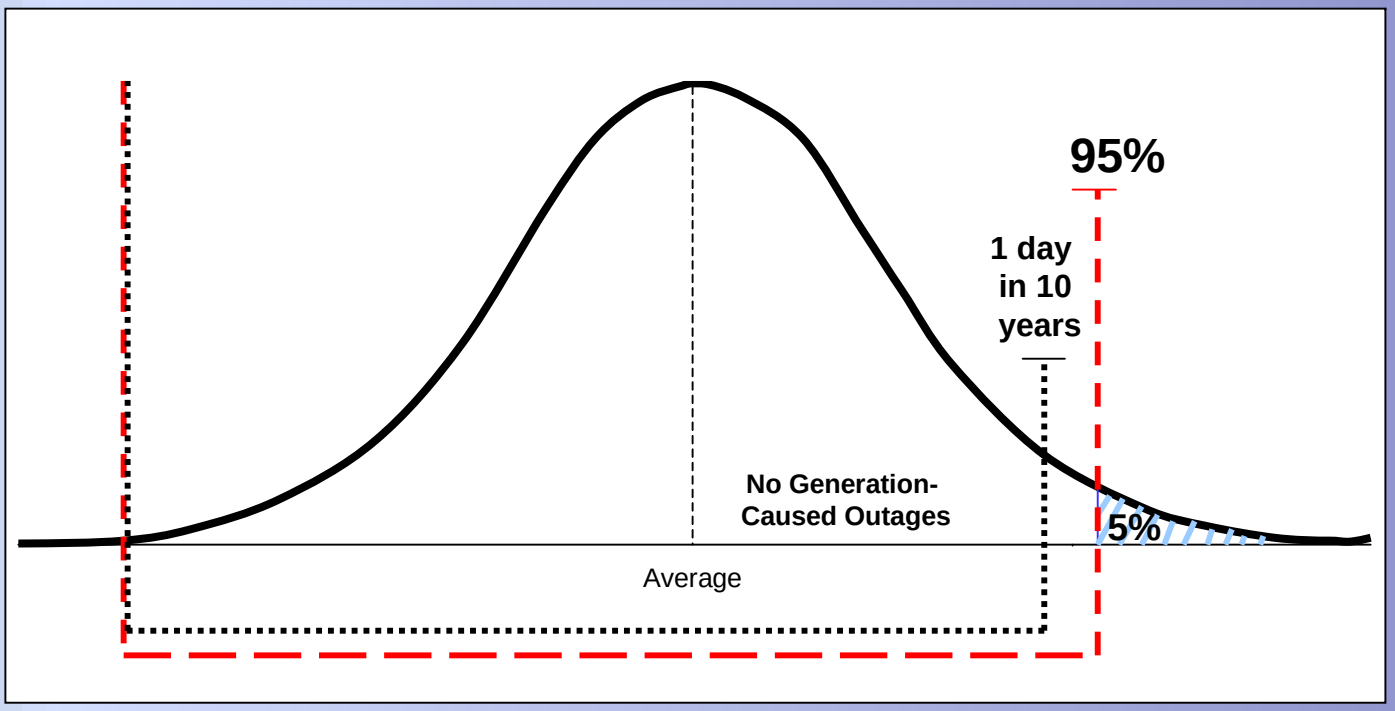
- Resource adequacy criterion, need for new resources and portfolios modeled
- Early results of Round 1 portfolio analysis
- U.S. energy scenarios: portfolio fixed, variable, and environmental costs by scenario
- What we have learned so far from Round 1
- Plans for Round 2

Background

- Seattle City Light:
  - Analyzed how much power resources are needed to ensure having enough at a 95% confidence level
  - Established a wide range of resource portfolios that could meet the 95% confidence level
  - Modeled how the portfolios would operate to serve load under a wide range of hydro conditions and electric demands for Seattle
  - Modeled how the portfolios would operate to serve load under four different potential futures for the United States
    - Four different sets of economic, environmental, and energy price assumptions
  - Today we will discuss the Round 1 results

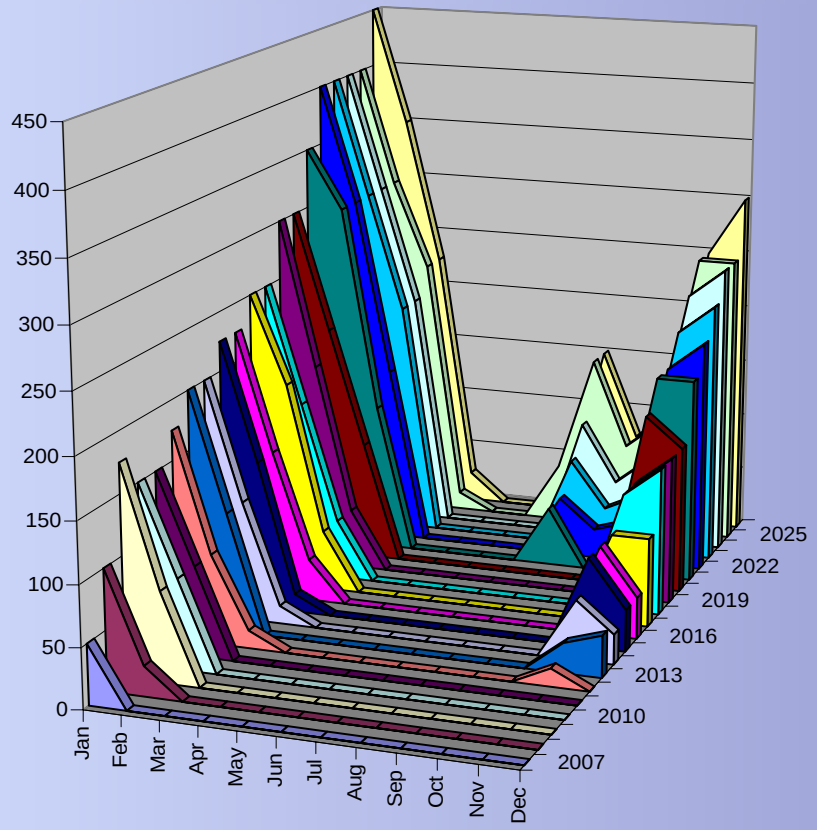
Resource Adequacy Criterion

Probability Distribution

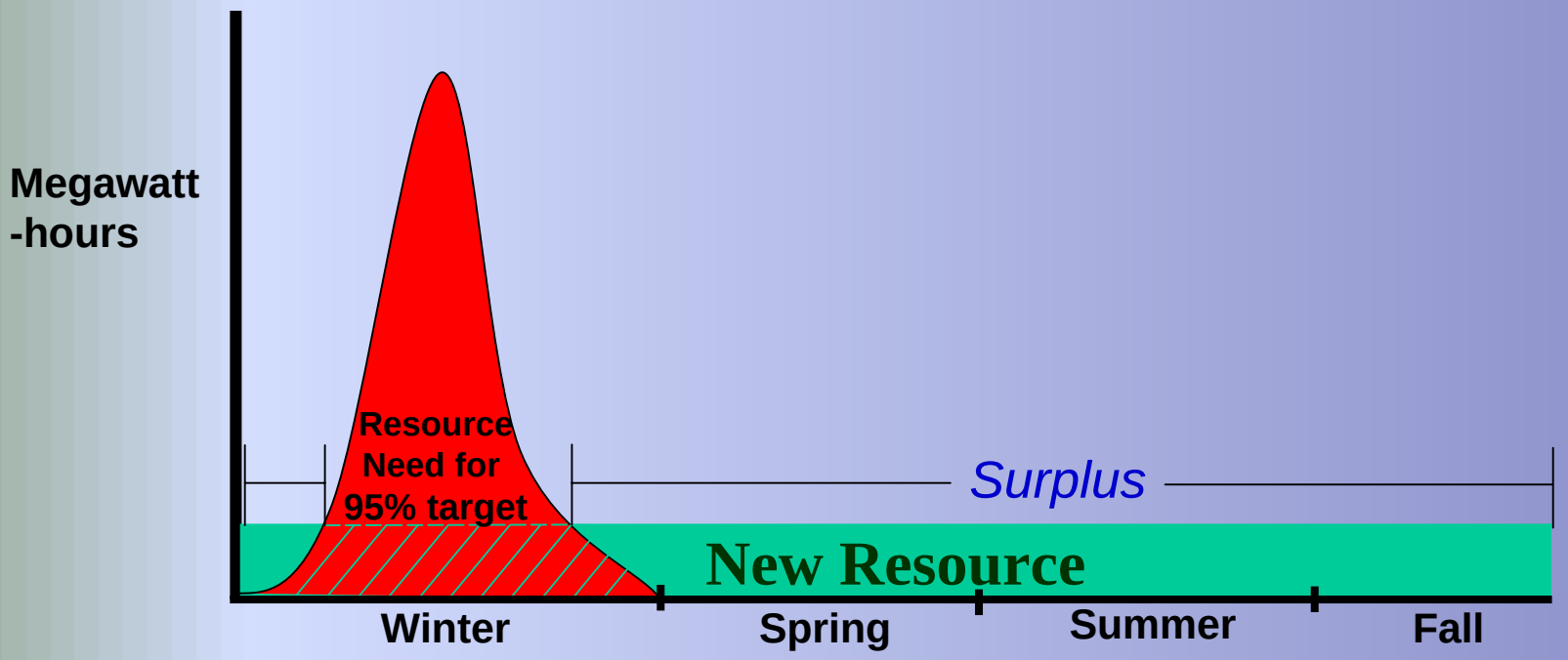


Resource Additions for the 95% Criterion

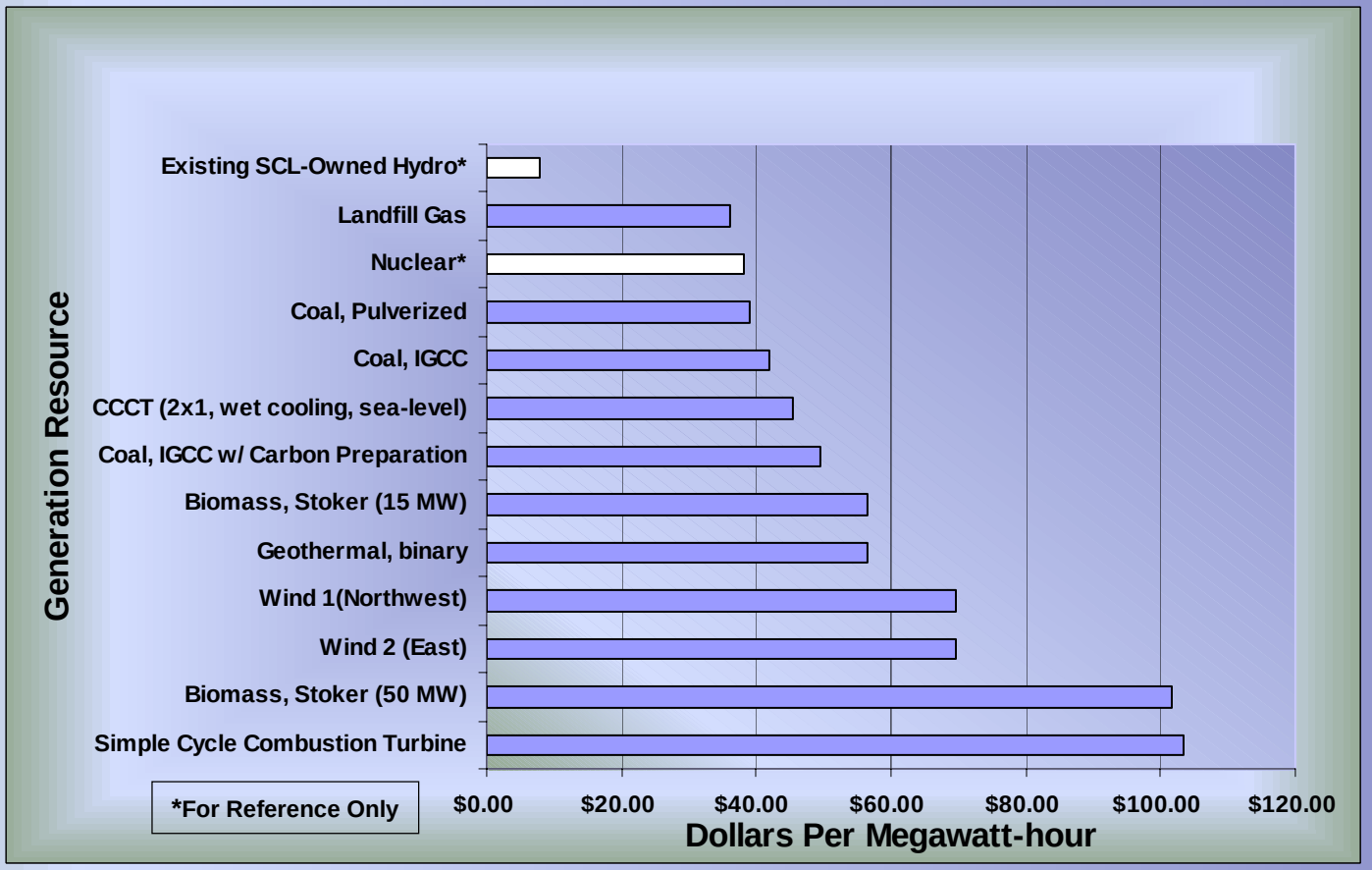
aMW



Meeting Seattle's Winter Needs Can Cause Surplus in Other Seasons



A Seattle Perspective on Resources
(Transmission Loaded, Average $/MWh)



Total Resource Additions by Portfolio: 2007 to 2026

Capacity in Megawatts

	Rely on Market	Renew-ables	Hydro, Wind, & Gas	Div-erse	Gas-Fired	50:50 Block/ Slice	100% Block	IGCC and Wind	Coal and Gas
Conservation		140	140	140	140	140	140	140	140
Exchange		100	100	100	100	*100*	100	100	100
Call Option*		*70*	*50*	*50*			*100*	*70*	
Hydro		60	60						
Wind		750	150	450		150		450	
Geothermal		25							
Landfill Gas		25	25	25					
Biomass		25		50					
CHP (co-gen.)			25						
CC Turbine			150	100	150	350	600		225
SC Turbine			50	50	50		50		
IGCC - Coal								300	
Conv. Coal									150
2026 Total	**0**	**1,125**	**750**	**915**	**590**	**640**	**890**	**990**	**615**

Round 1 Results

Reference Case

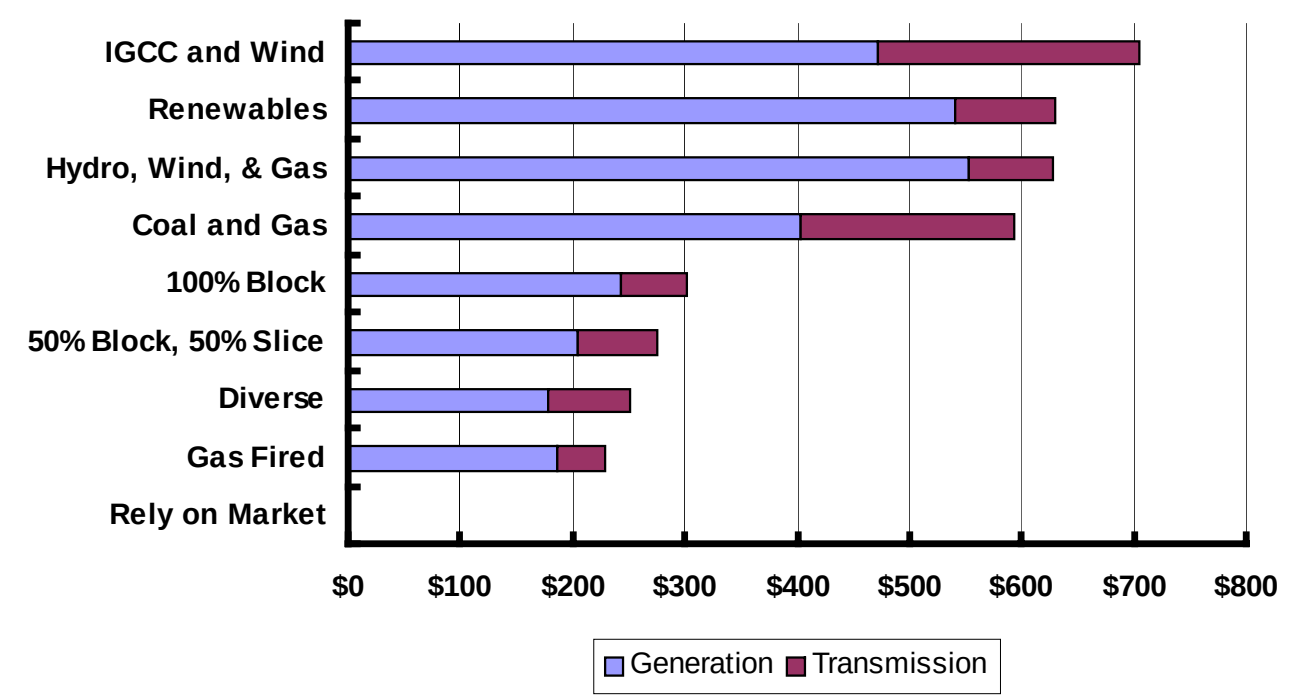
Costs

Cost Summary

- Resource portfolios with coal or renewables have the highest capital costs
- Transmission strongly impacts the costs of distant resources
- Resource portfolios with low capital costs or with delayed capital costs tend to perform better
- Adding the cost of offsets for carbon dioxide emissions improved the relative cost performance of the renewables portfolio

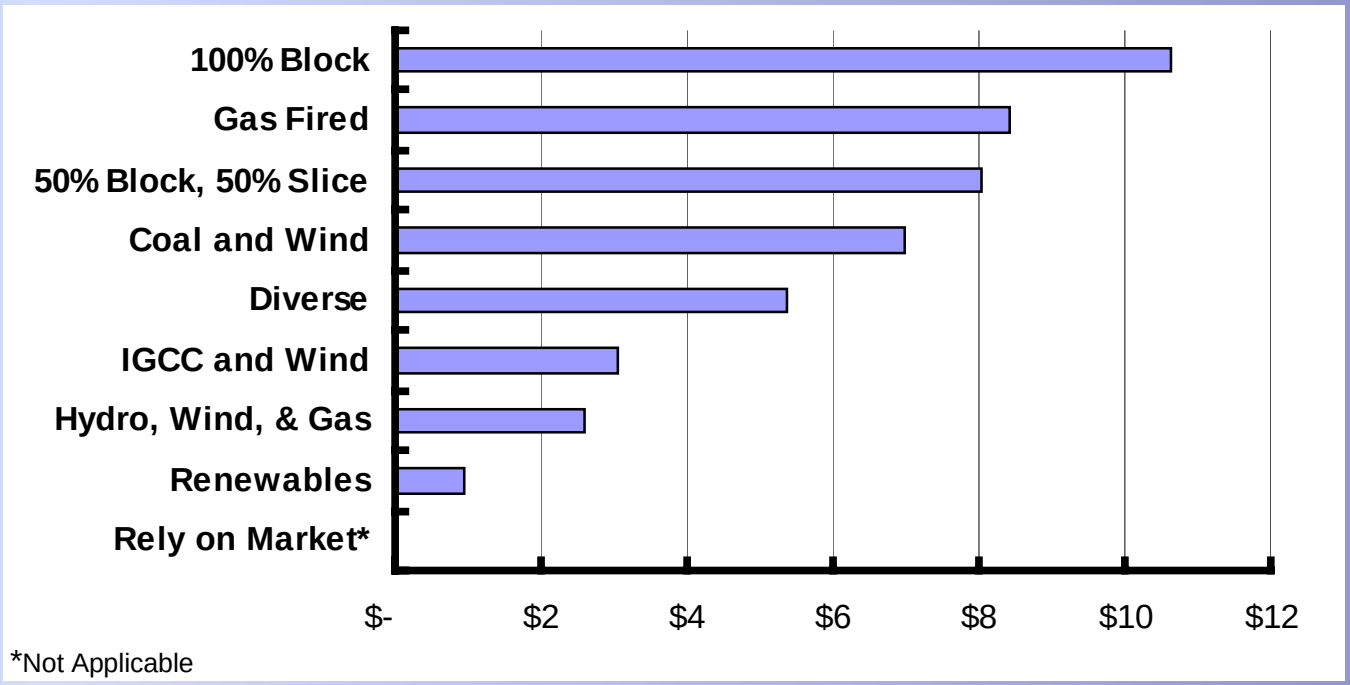
Capital Costs

20-year NPV in Millions of Dollars



Fuel Costs

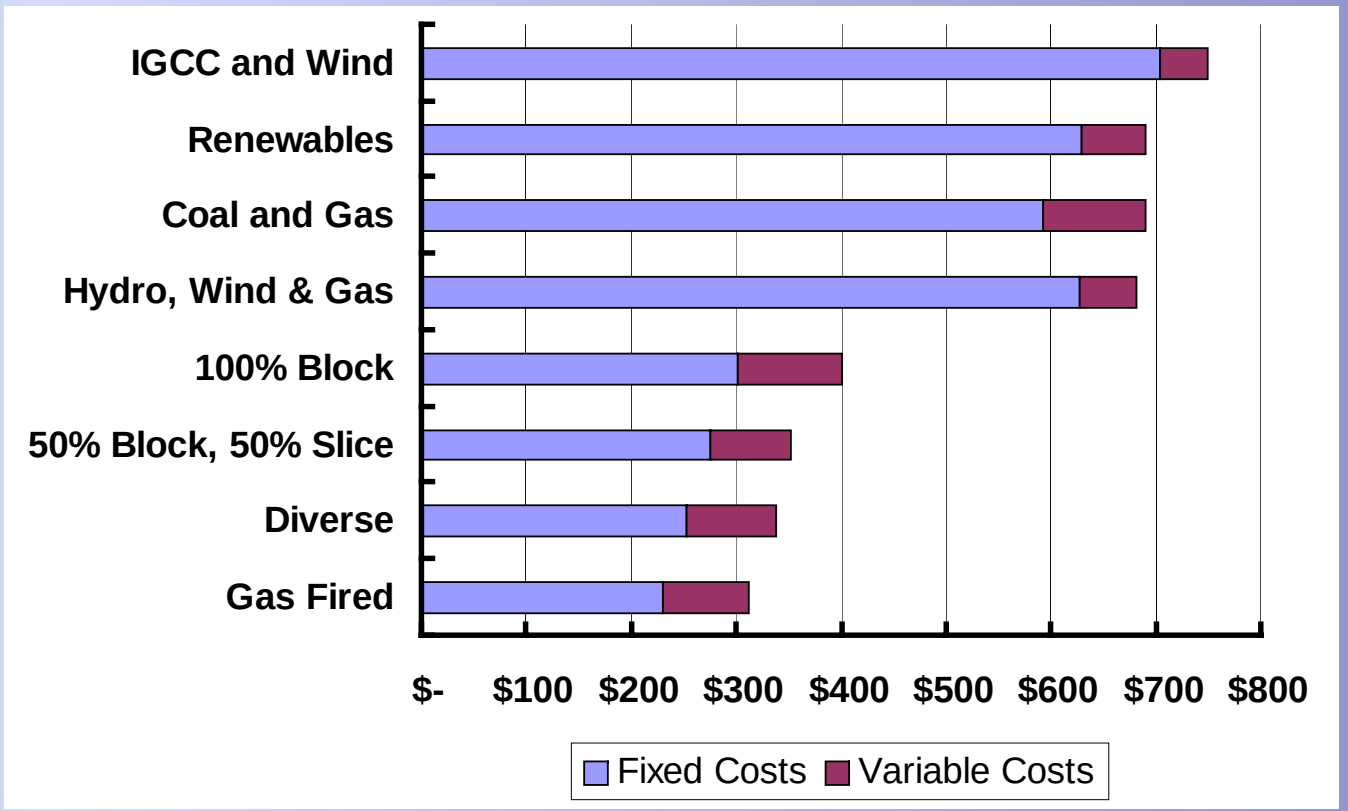
20-year NPV in Millions of Dollars



*Not Applicable

Portfolio Costs
Before Environmental Costs

20-year NPV in Millions of Dollars



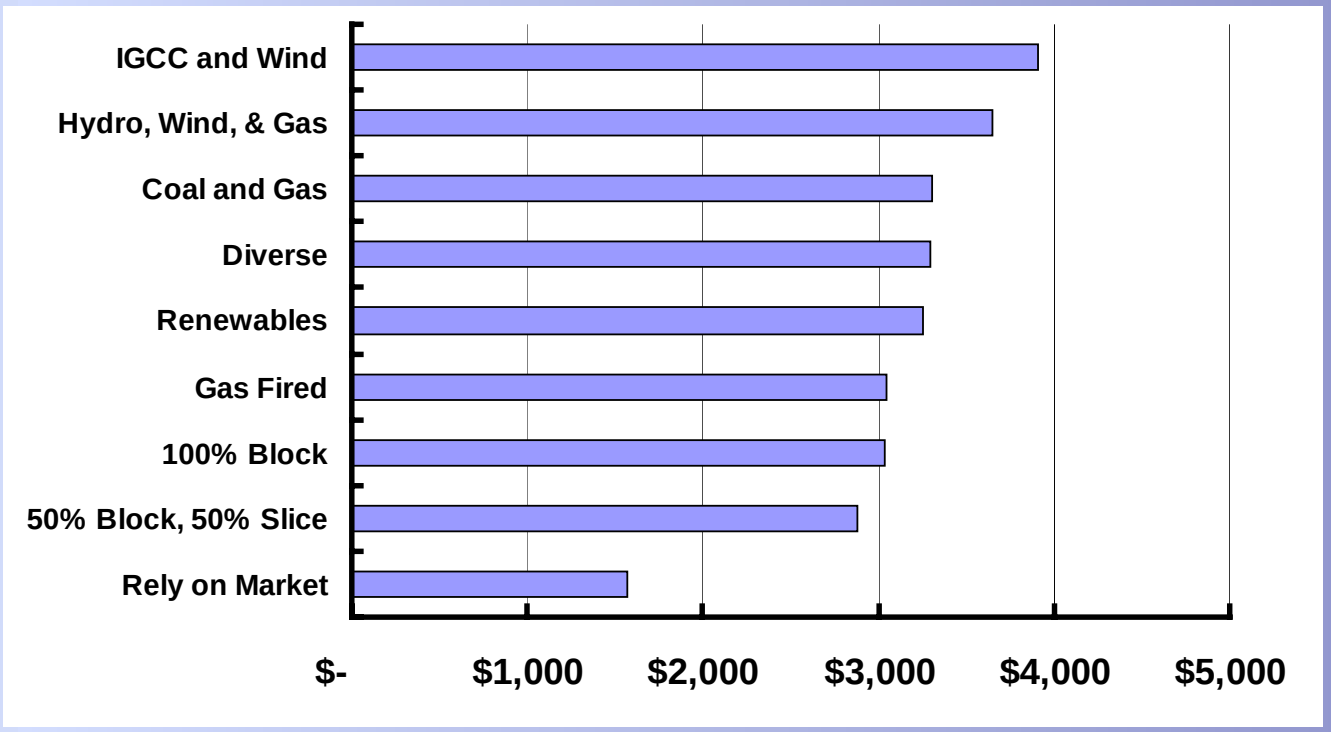
Market Transactions

Market Impact Summary

- All portfolios have unneeded generating capacity three of four seasons and sell into the western spot market
  - "Dispatchable" resources can operate when market prices are high, and shut down when market prices are low, improving their financial performance
  - Portfolios that have resources that are tailored to winter needs avoid costs at times when the resources are unneeded, improving their performance
- Market sales are important to consider because of the seasonal nature of the resource need

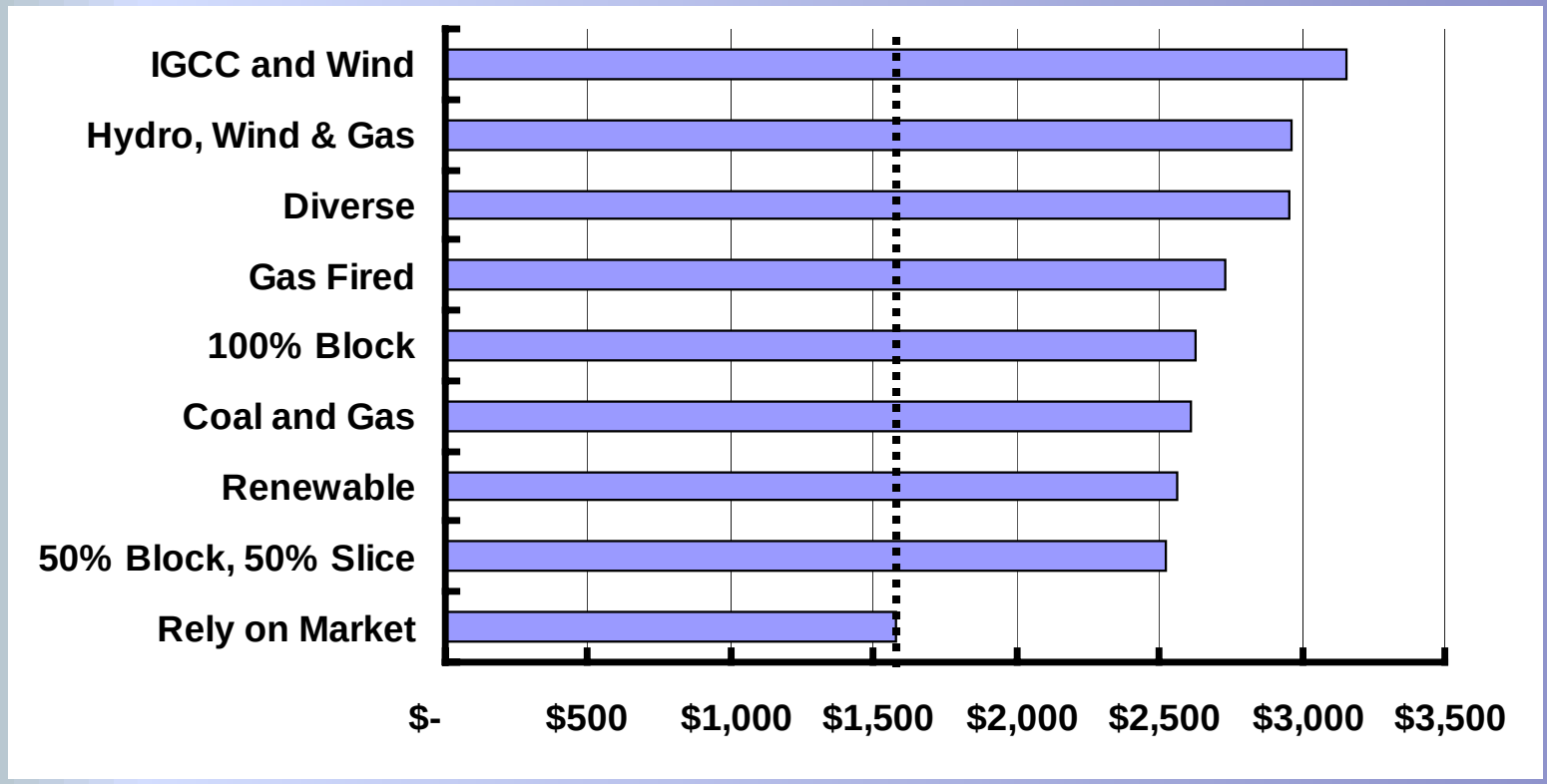
Net Market Sales

20-year NPV in Millions of Dollars



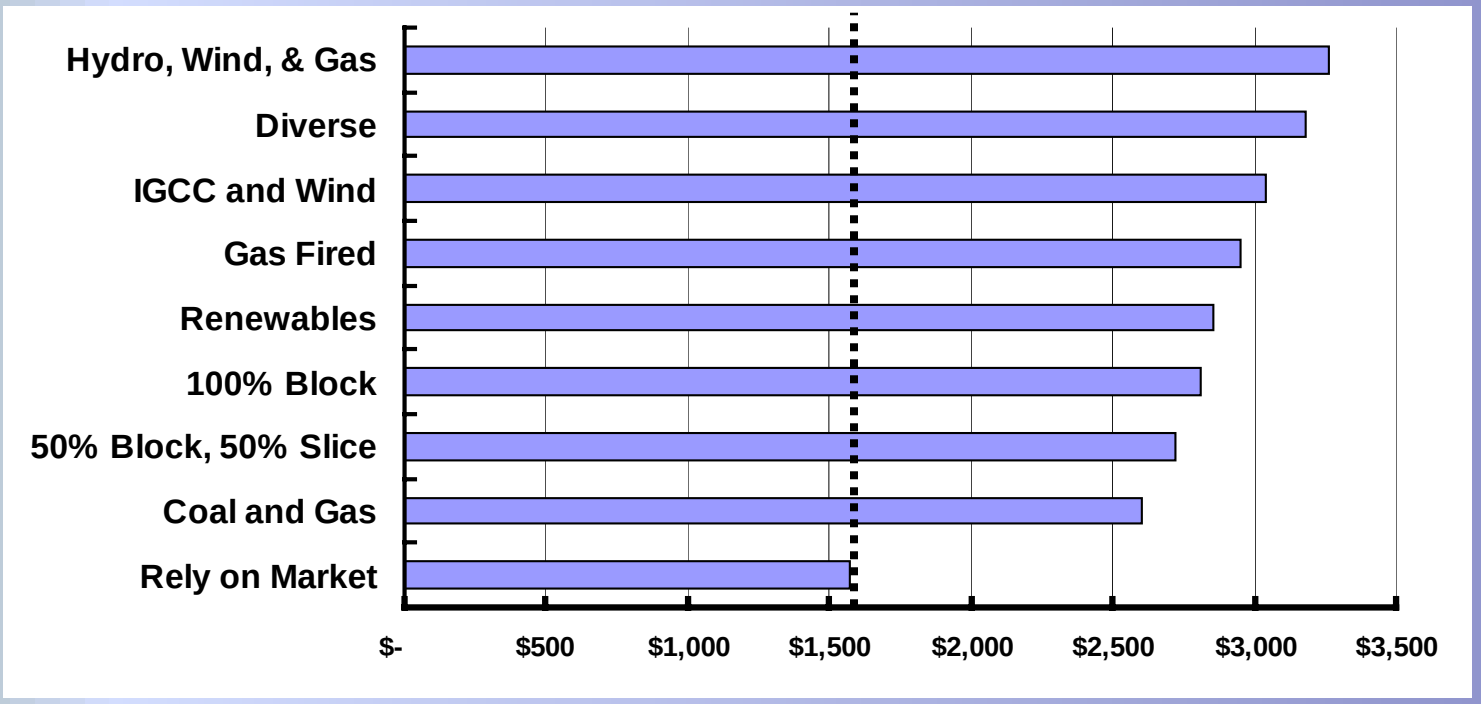
Portfolio Net Revenue

After Sales, Before Environmental Externalities



Portfolio Net Revenue
After Sales, After Environmental Externalities

20-year NPV in Millions of Dollars



Environment

Environment Summary

- Environmental performance measured on emissions, based on the costs of control equipment to mitigate them
  - Carbon dioxide emissions are treated as a direct cost for offsets
  - Sulfur dioxide, nitrogen dioxide, particulate, and mercury viewed as indirect costs, since emissions still occur even with controls
- Market transactions can strongly affect emissions
  - Market sales created a net credit for those resource portfolios that did not contain coal-fired generation

Environmental Accounting

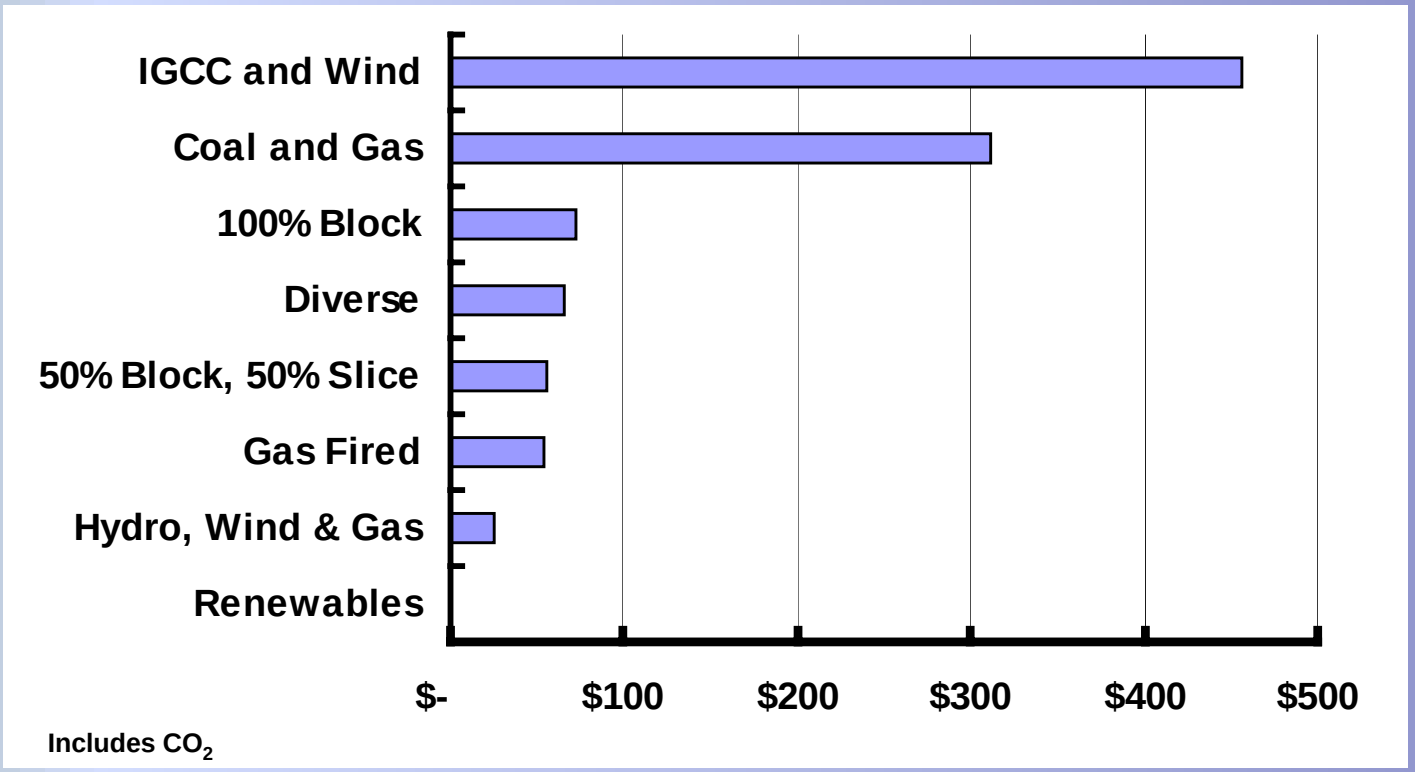
Thousands of Tons of Direct Emissions in Reference Case

	Carbon Dioxide	Sulfur Dioxide	Nitrogen Oxide	Mercury	Particulate	Total Cost (Millions)
Rely on Market	*					*
Green	6,770		1			$0**
100% Block	20,557		5			$72
50% Block: 50% Slice	14,922		4			$56
Hydro, Wind & Gas	7,078		1			$25
Diverse	18,221		5			$65
Gas-Fired	14,404		3			$54
Coal and Gas	28,861	162	11	.00044	*	$312
IGCC and Wind	25,139	312	8	.00004	11	$456

*Calculations Incomplete; **Biomass and landfill gas treated as zero CO_2 emissions for environmental accounting

Environmental Costs
(Before Effects of Market Purchases/Sales)

20-year NPV in Millions of Dollars

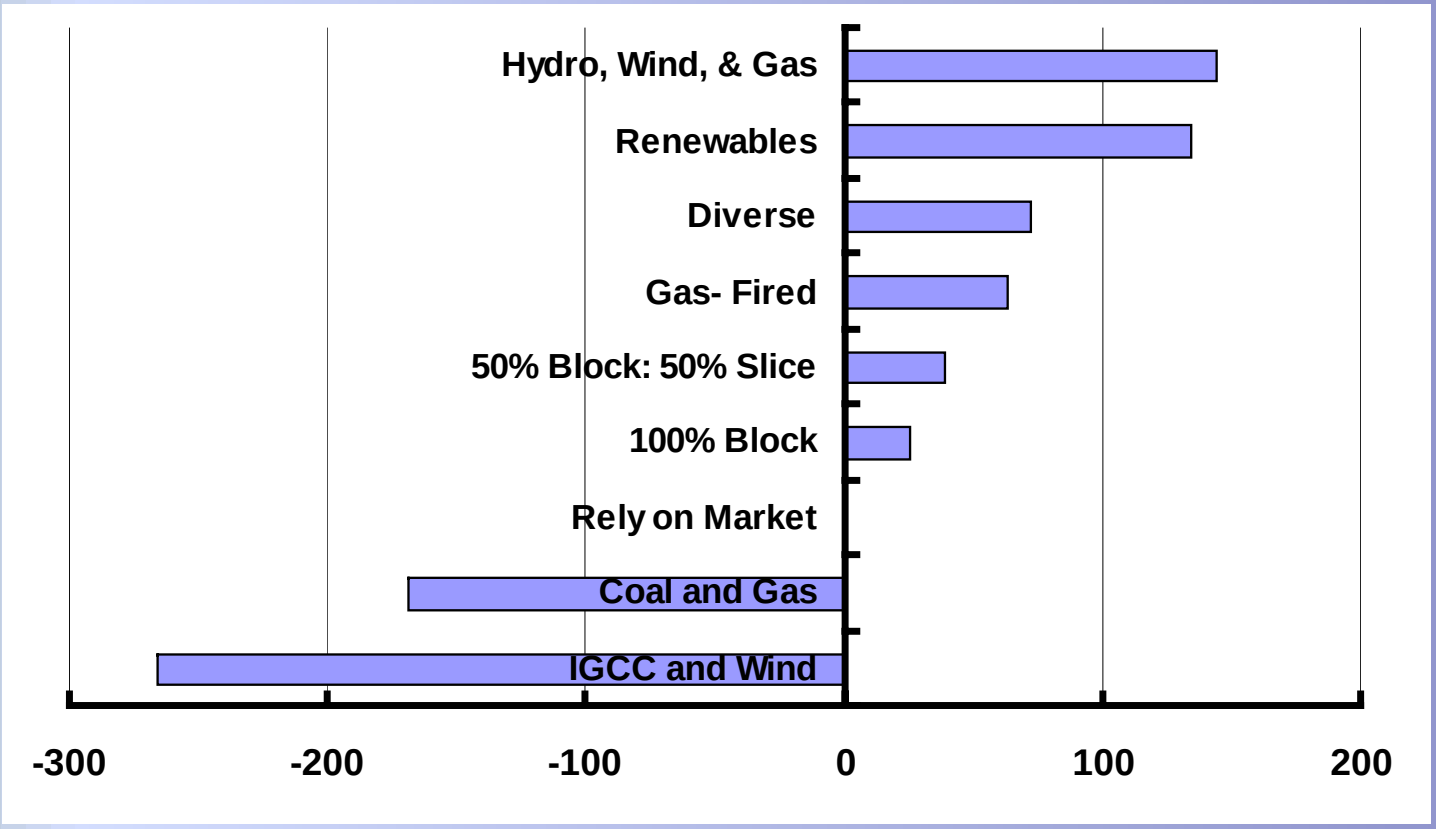


Includes CO_2

Portfolio Environmental Impacts

Net Benefits (+) or Costs (-) After Market Purchases/Sales

20-year NPV in Millions of Dollars



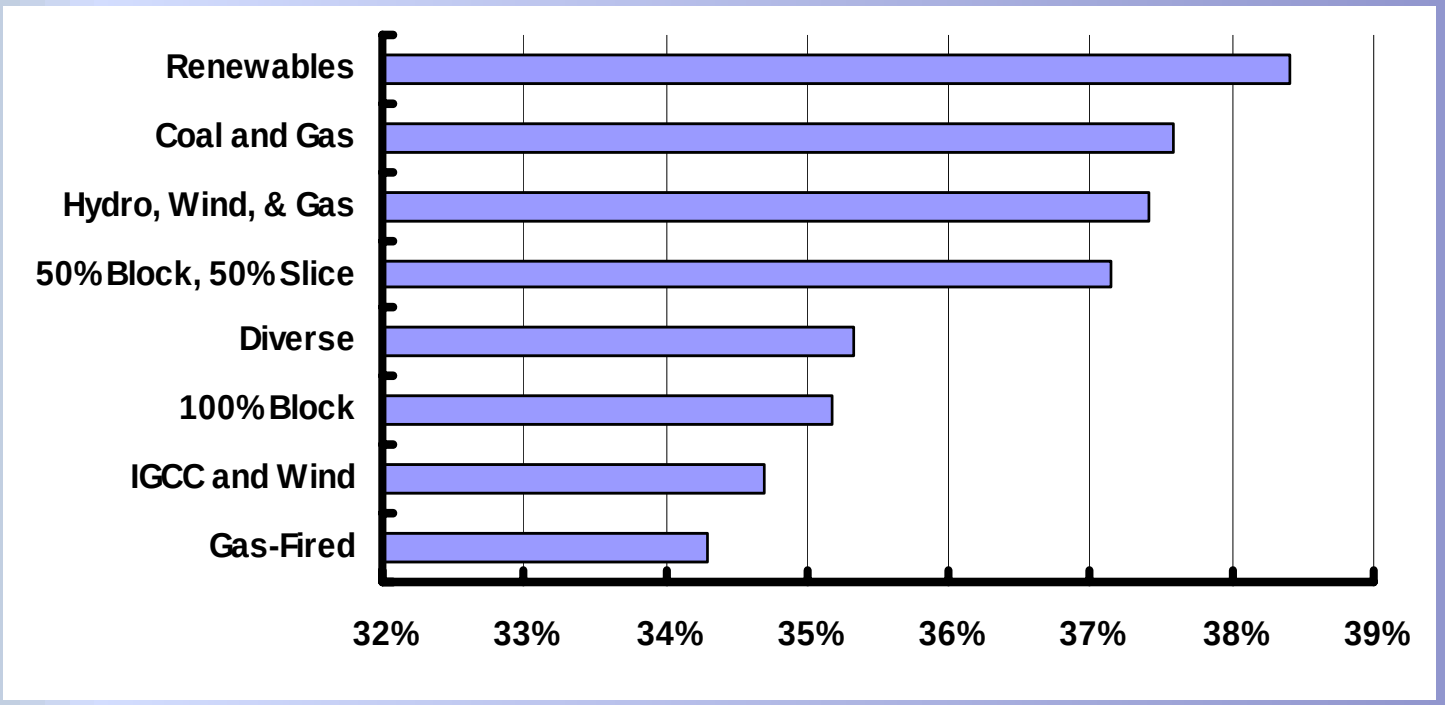
Risk

Risk Summary

- Resources with high capital costs and low operating costs scored well on the market risk measure
- Natural gas-fired resources performed the worst on market risk measures
- The same portfolio can perform very differently on market risk and cost risk

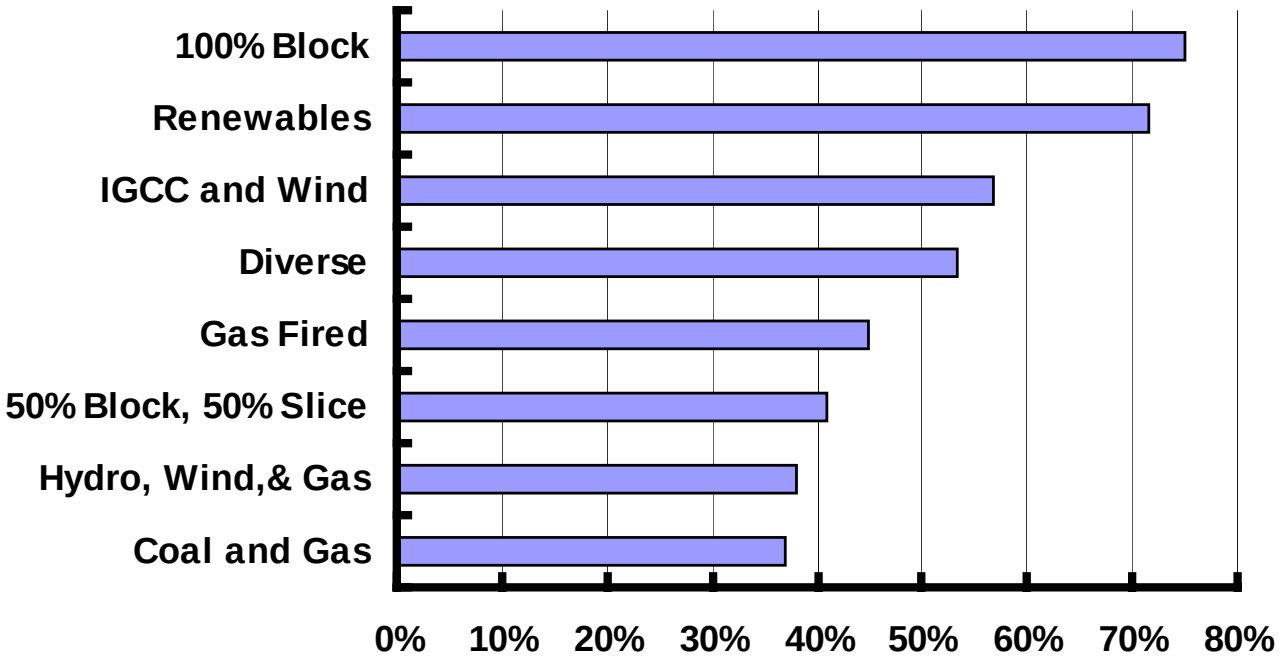
Market Risk Reduction by Portfolio: Difference From "Rely on Market"

Based Upon the Coefficient of Variation (σ/μ) of Net Purchases and Sales



Risk From Variable Costs by Portfolio

Coefficient of Variation (σ/μ) for Portfolio Variable Costs



Scenarios

Round 1 Results

Energy Scenarios for the U.S.

Global Energy Decisions

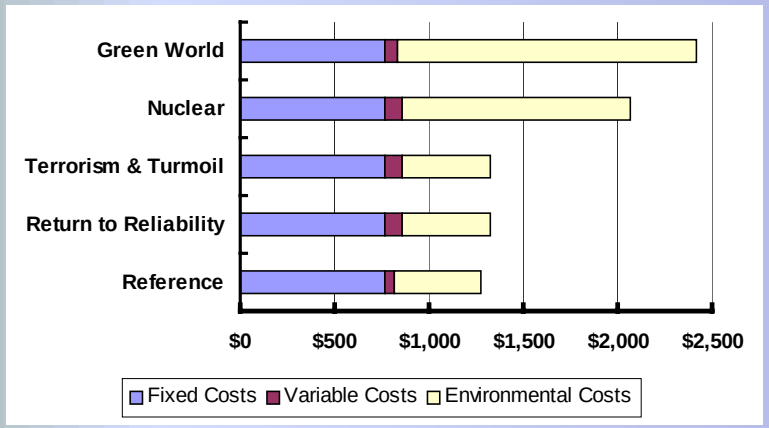
	Reference Forecast	Terrorism & Turmoil	Green World	Nuclear Resurgence	Return to Reliability
Economic Growth	Medium	Slow	Medium	High	Medium
Gas Supply	LNG arrives (6 new US plants)	LNG constrained; N. Amer. growth	Tight supplies followed by LNG	LNG constrained N. Amer. growth	LNG constrained; N. Amer. growth
Gas Price	Normal	Higher mid-term	Higher long term	High, then lower after 2022	Normal
Environmental Regulation	No new	No new	Four pollutants, fast compliance	Four pollutants by 2020	No new
Coal Generation	No new before 2015 in US West	No new before 2015 in US West	Retires 466 GW by 2025	Retire coal by 2015	Adds coal over Reference levels
Transmission	Existing levels	Existing levels	Increase capacity by 1%	Increase capacity by 5% by 2020	Increase capacity by 20%
Nuclear Build	0 plants	0 plants	2 plants	42 1,000 MW plants by 2026	2 plants

Scenario Summary

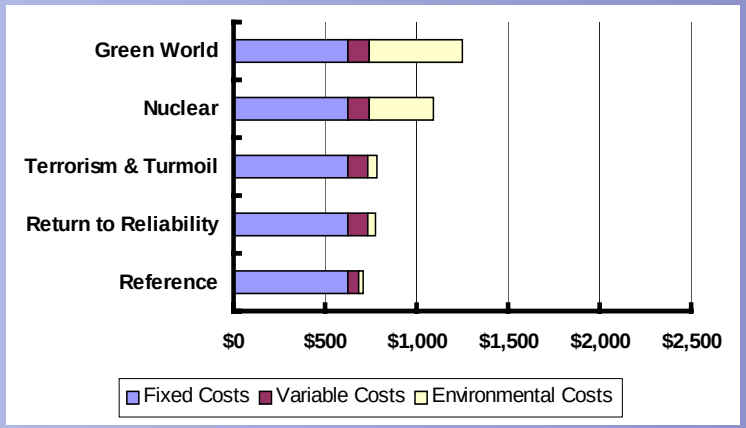
- Environmental policy has by far the greatest impact on portfolio performance in the scenarios
  - Green World and Nuclear Resurgence have a high cost for carbon dioxide emissions
- Other factors create little differentiation in overall portfolio performance

Portfolio Costs by Scenario

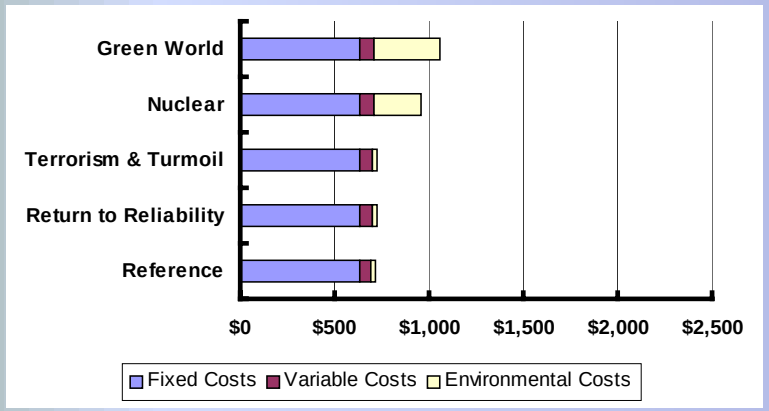
IGCC and Wind



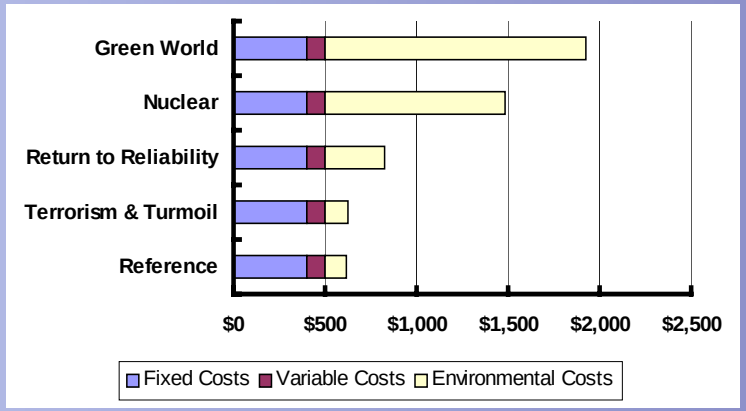
Hydro, Wind, & Gas



Renewables

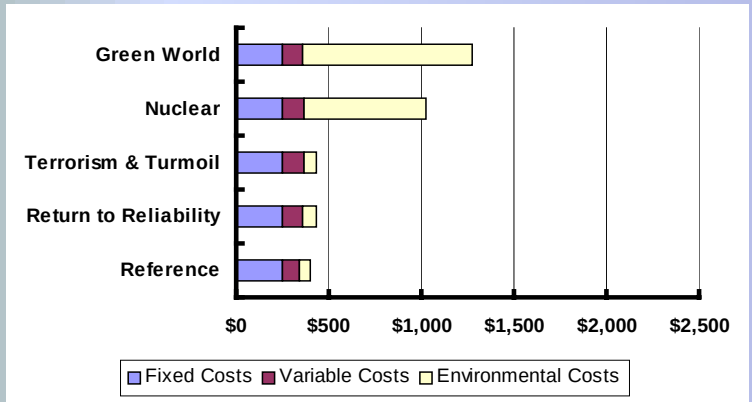


Coal and Gas

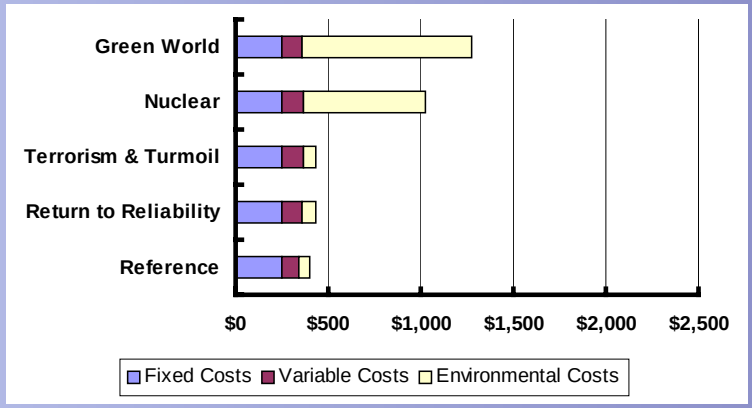


Portfolio Costs by Scenario *(continued)*

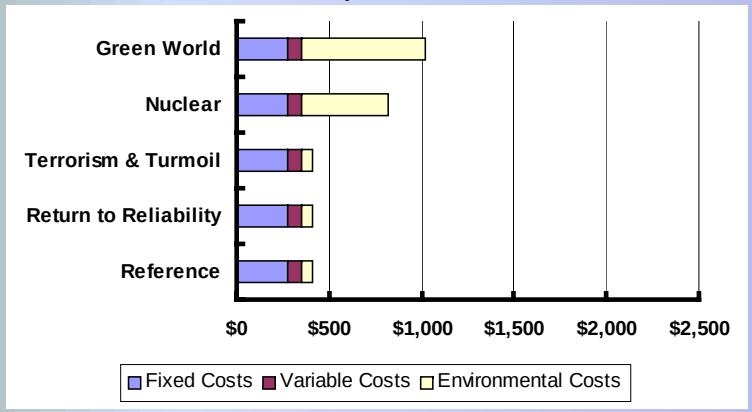
100% Block



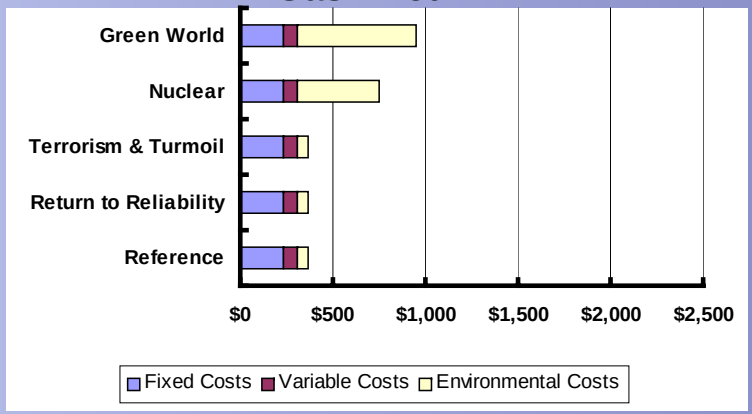
Diverse



50% Block, 50% Slice



Gas-Fired



What Have We Learned in Round 1?

- Large Numbers of Renewable Generation Plants Required to Meet Resource Adequacy Target
  - Two portfolios could meet Washington RPS Initiative targets
- Renewables Strongly Reduce Market Risk
- Renewables Do Not Perform Well on Variable Cost Risk, but Variable Costs are Proportionately Smaller
- Environmental Accounting
  - Market sales from Seattle provide a net environmental benefit for most portfolios

What Have We Learned in Round 1? *(continued)*

- Carbon Dioxide Mitigation Costs are Important
  - Coal-based resources have high CO_2 mitigation costs
- Biggest Impacts from Scenarios with High Greenhouse Gas Emissions Costs
  - Best Performers Were:
    - Renewables, Gas-Fired, 50% Block: 50% Slice
  - Worst Performers Were:
    - IGCC and Wind, Coal and Gas, 100% Block
- Transmission Capital Costs Can Strongly Impact Portfolios With Distant Resources

What Have We Learned in Round 1? *(continued)*

- Converting BPA Slice to Block
  - Lowers hydro risk and improves performance in early years
  - More resources must be added to offset the loss
- 100% Block and Gas-Fired Performance
  - Low capital costs, economic dispatch, moderate environmental impacts
- Conservation, “Shaped” Resources, and Dispatchable Resources Improve Performance

What's Next?
Plans for Round Two

- Goals for Round Two
  - Focus in on issues that emerge from Round One
  - Strengthen analytical implementation
  - Provide information and insights to support development of City Light's long-term resource strategy

- Your Questions and Comments on Round One Can Help Us Define Round Two
  - Reactions to results from Round One
  - Topics and areas of emphasis for Round Two
  - Ideas for assumptions and analysis

What's Next?
Plans for Round Two

- Current List of Topics for Round Two
  - Evaluate a range of conservation amounts and timing
  - Consider opportunities to improve the seasonal balance of City Light's resource portfolio (resource shaping)
  - Analyze varying proportions of two forms of BPA Power Purchases (Block and Slice)
- Analytical Enhancements for Round Two
  - Further integrate analysis of conservation within the portfolio
  - Formalize measures of key objectives: cost, reliability, environmental impact, and risk

What's Next?
Plans for Round Two

- Round Two Portfolio Modeling Tasks
  - Complete analytical enhancements
  - Formulate a range of candidate resource portfolios
  - Perform model runs
  - Gather, interpret and present results

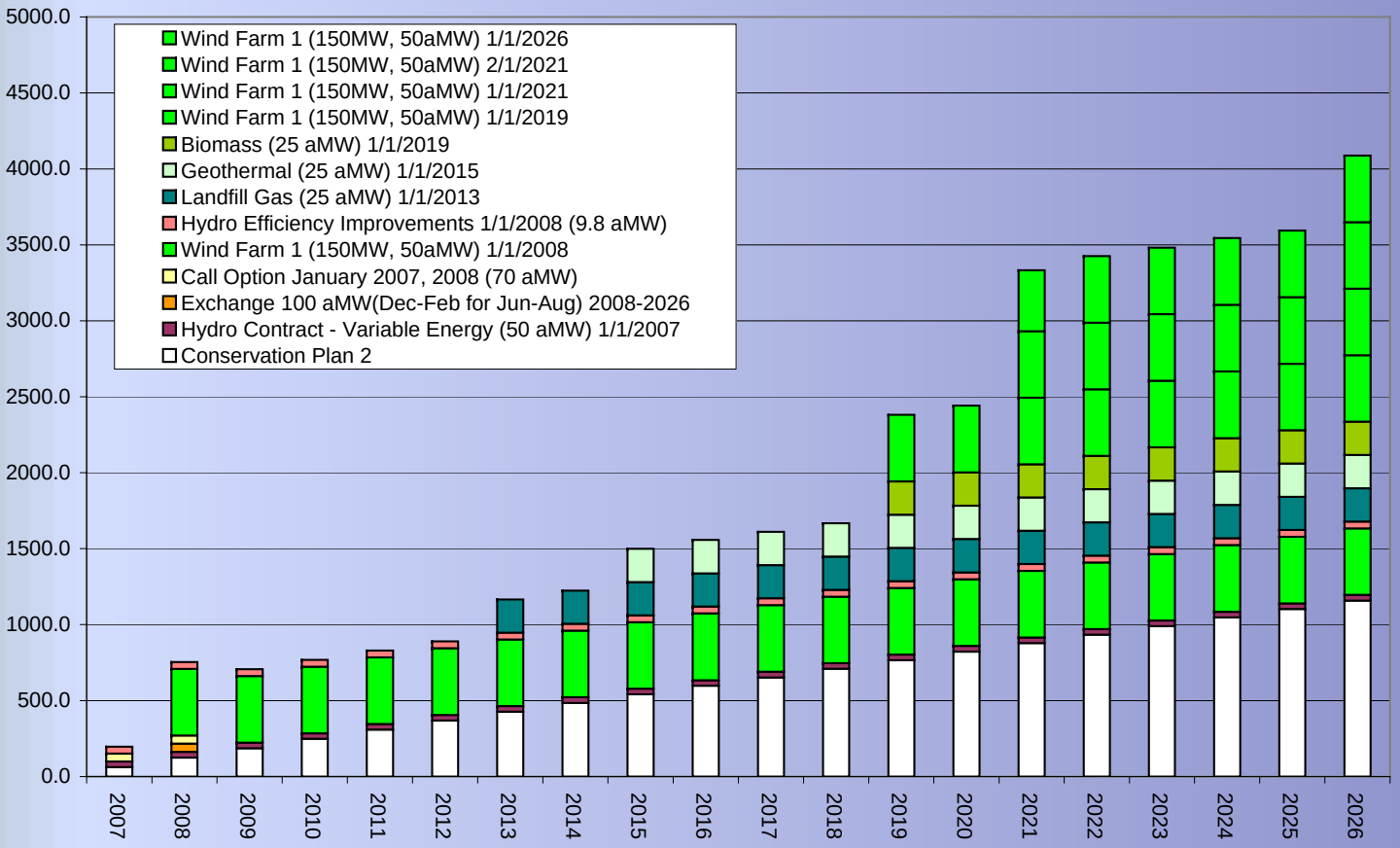
- Public Involvement Process
  - Public Meeting (July 18)
  - Stakeholder Group meeting on Round Two Results (first half September)

Appendix A

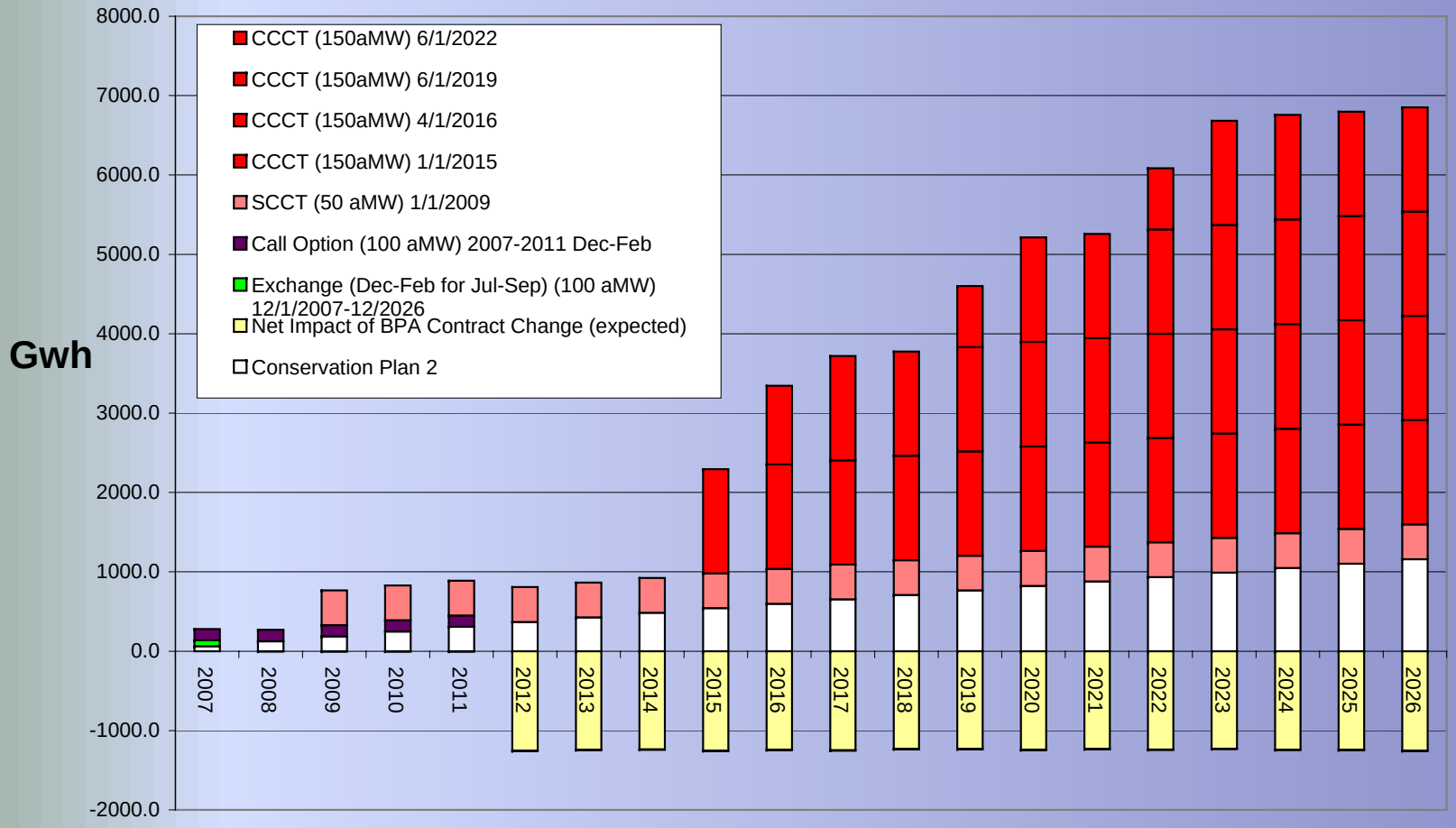
Round One Portfolios

Renewables

Gwh



100% Block


Gwh
8000.0
7000.0
6000.0
5000.0
4000.0
3000.0
2000.0
1000.0
0.0
-1000.0
-2000.0
CCCT (150aMW) 6/1/2022
CCCT (150aMW) 6/1/2019
CCCT (150aMW) 4/1/2016
CCCT (150aMW) 1/1/2015
SCCT (50 aMW) 1/1/2009
Call Option (100 aMW) 2007-2011 Dec-Feb
Exchange (Dec-Feb for Jul-Sep) (100 aMW) 12/1/2007-12/2026
Net Impact of BPA Contract Change (expected)
Conservation Plan 2
2007
2008
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2011
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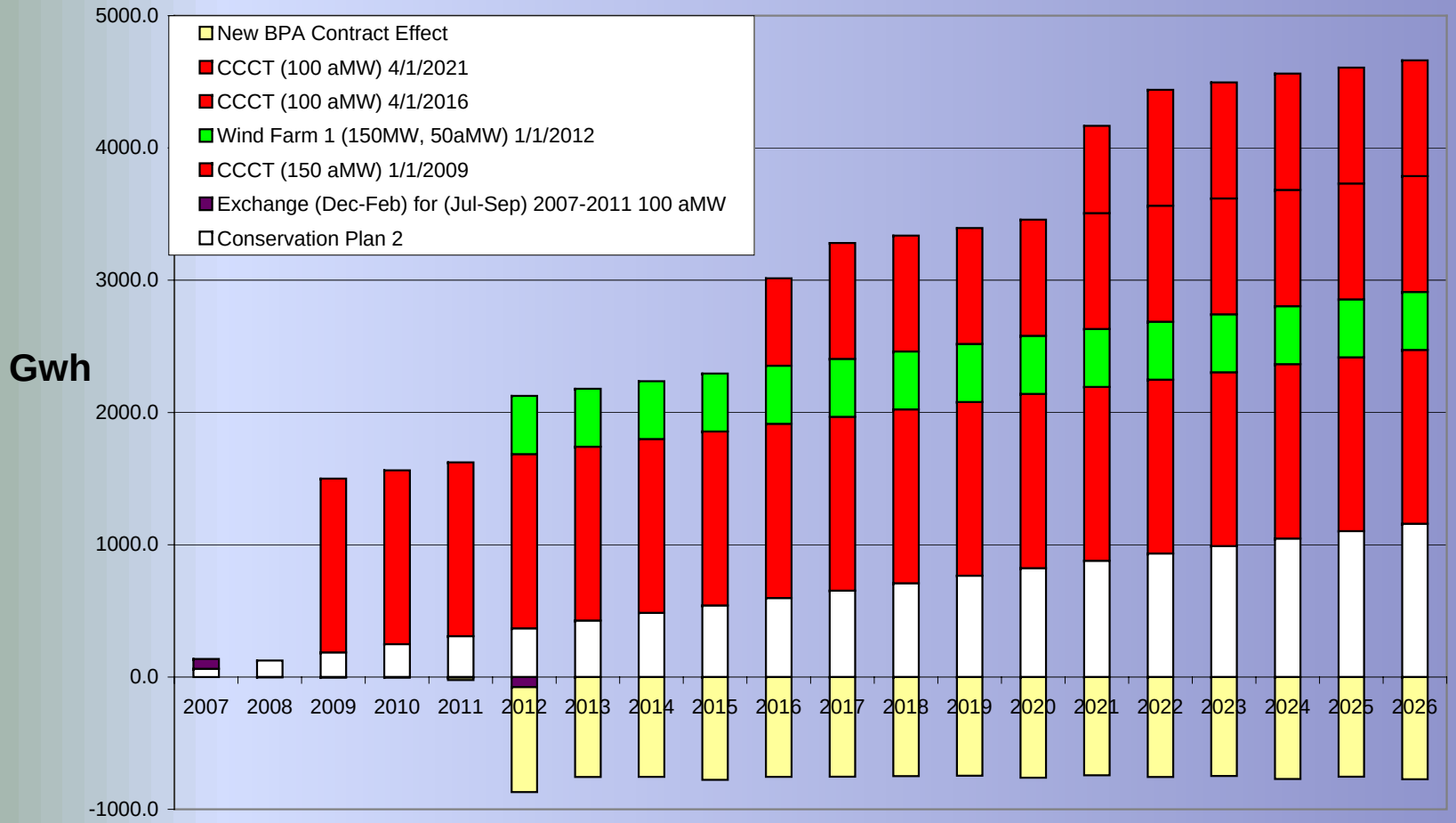
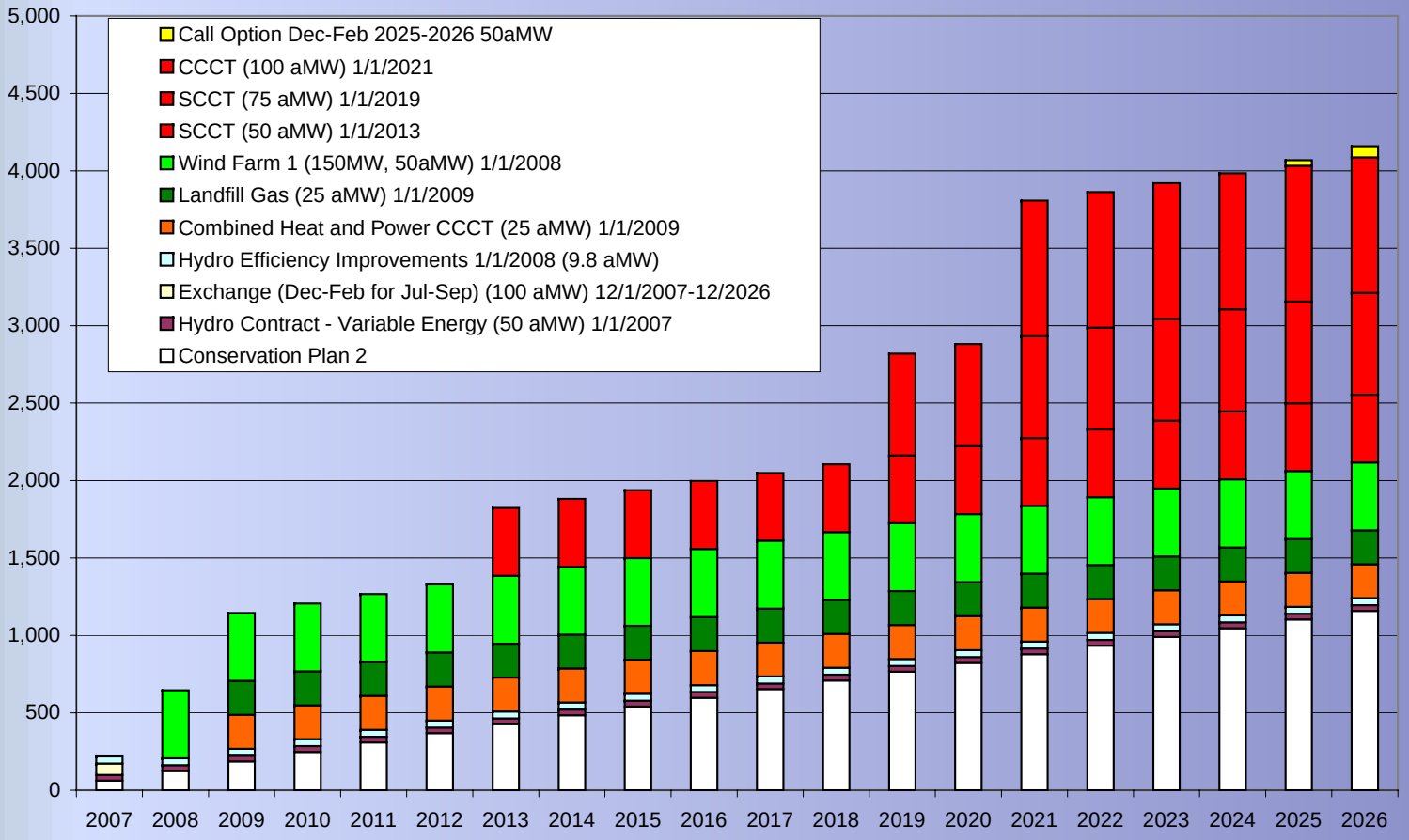
2025
2026

50% Block, 50% Slice



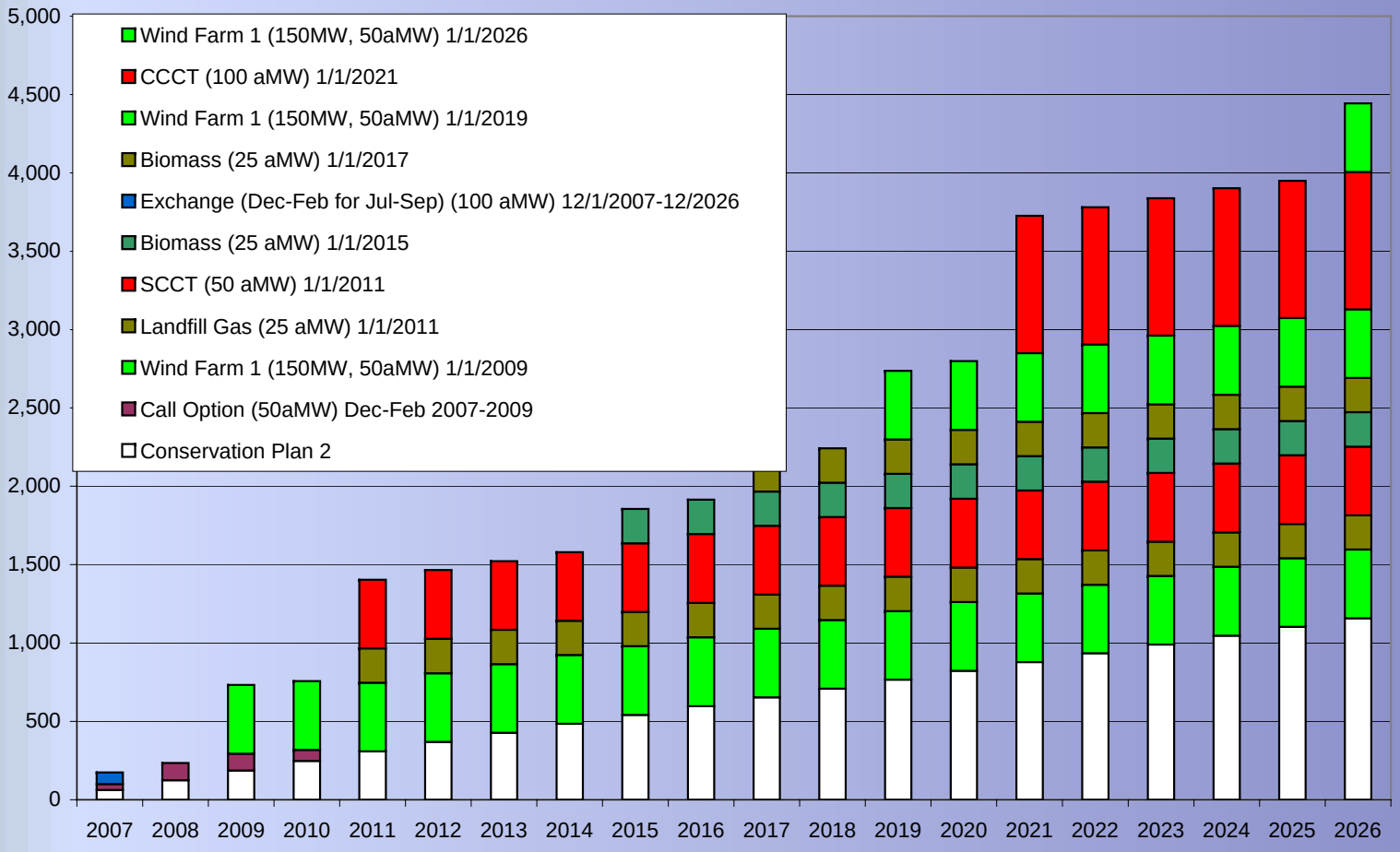
Hydro, Wind, & Gas

Gwh



Diverse

Gwh


5,000
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Wind Farm 1 (150MW, 50aMW) 1/1/2026
CCCT (100 aMW) 1/1/2021
Wind Farm 1 (150MW, 50aMW) 1/1/2019
Biomass (25 aMW) 1/1/2017
Exchange (Dec-Feb for Jul-Sep) (100 aMW) 12/1/2007-12/2026
Biomass (25 aMW) 1/1/2015
SCCT (50 aMW) 1/1/2011
Landfill Gas (25 aMW) 1/1/2011
Wind Farm 1 (150MW, 50aMW) 1/1/2009
Call Option (50aMW) Dec-Feb 2007-2009
Conservation Plan 2
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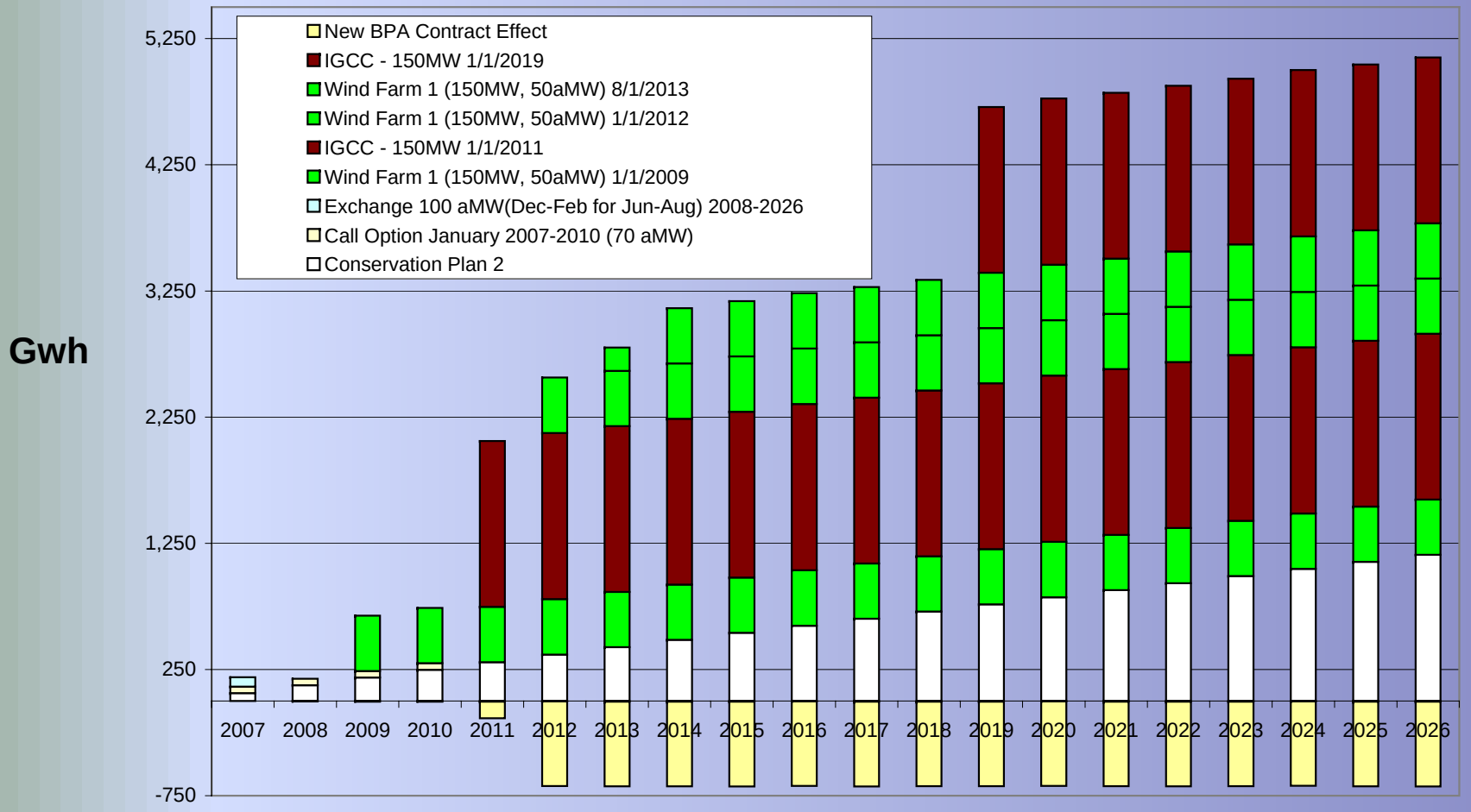
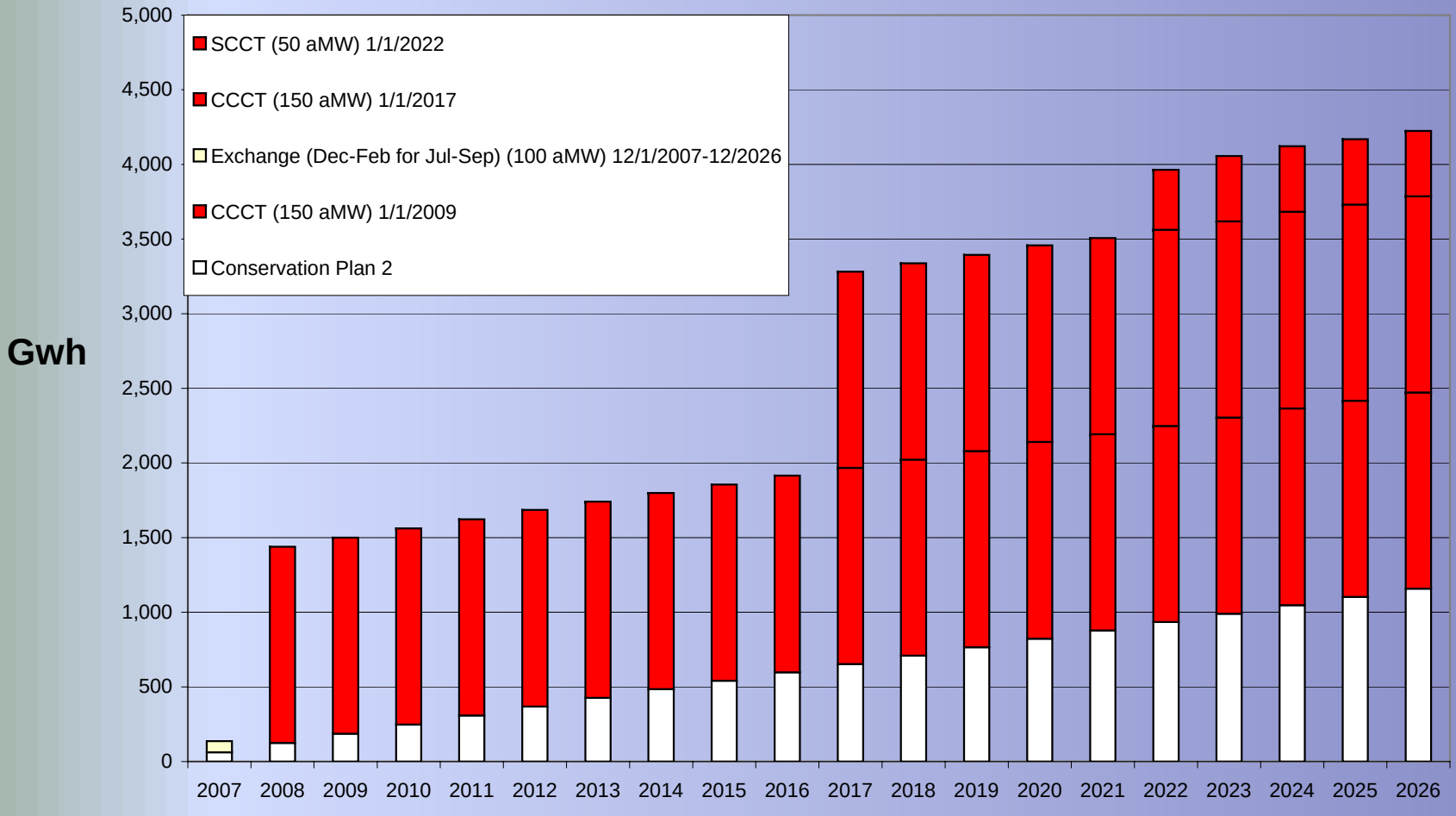
IGCC and Wind



Gas-Fired


Gwh
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4,000
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SCCT (50 aMW) 1/1/2022
CCCT (150 aMW) 1/1/2017
Exchange (Dec-Feb for Jul-Sep) (100 aMW) 12/1/2007-12/2026
CCCT (150 aMW) 1/1/2009
Conservation Plan 2
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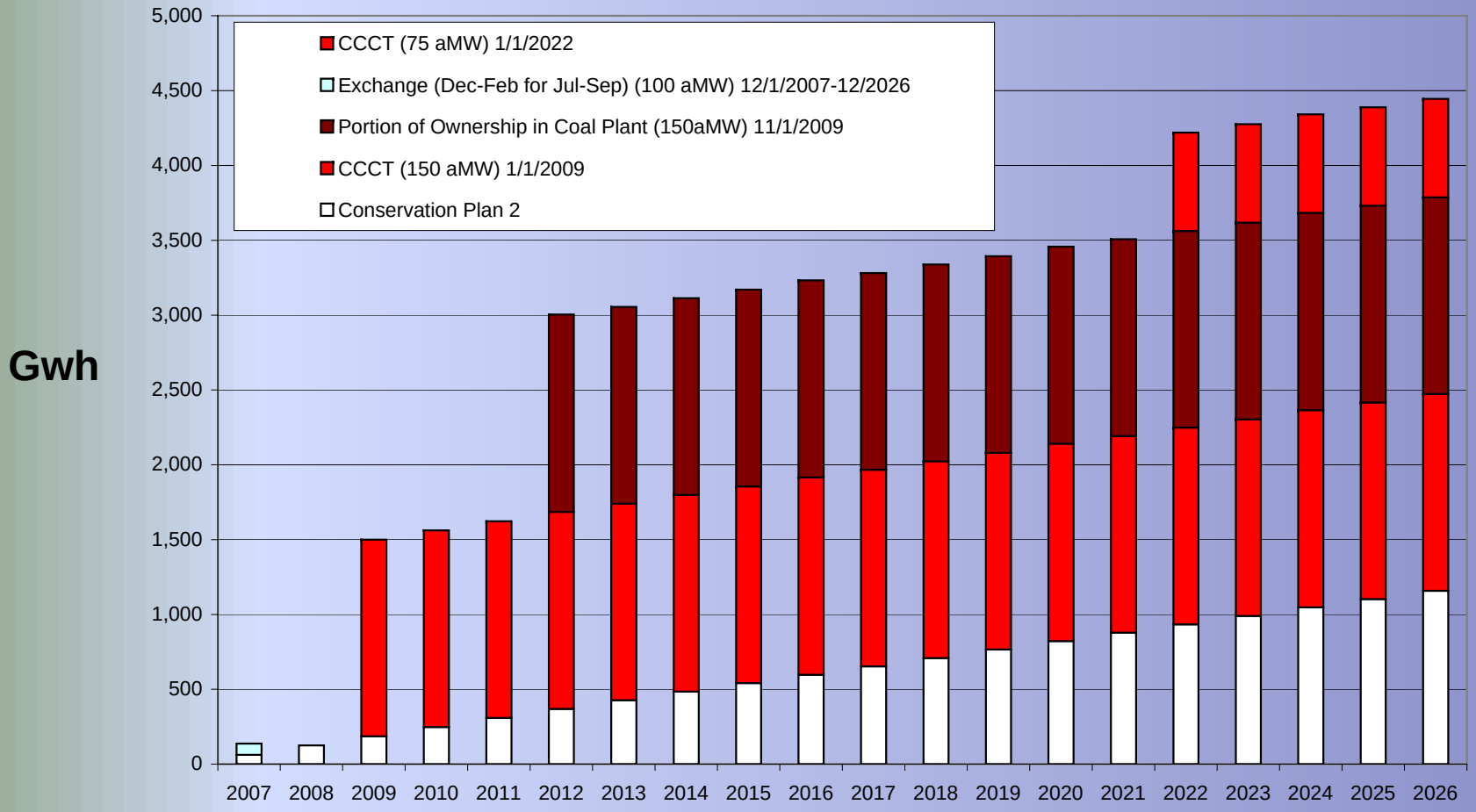
Coal and Gas


Gwh
5,000
4,500
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3,000
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2,000
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0
CCCT (75 aMW) 1/1/2022
Exchange (Dec-Feb for Jul-Sep) (100 aMW) 12/1/2007-12/2026
Portion of Ownership in Coal Plant (150aMW) 11/1/2009
CCCT (150 aMW) 1/1/2009
Conservation Plan 2
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