

# Education, Outreach & Strategy

# Our Challenge

*How can we help decision makers  
understand our point of view?*

# Education

*“Myth Busters”*

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<b>Environmental regulations are job creators</b>	Environmental regulations mainly create construction jobs	Construction jobs are temporary jobs. Unreasonable burdens force industry to consider shedding permanent jobs.

# Outreach

*“He who frames the question controls  
the outcome of the debate”*



# Outreach

## The Art of Spin

### Argument 1

Where knowledge is limited, and the desire to learn the complex reality doesn't exist, opinion can be shaped by whoever generates the most powerful symbols.

### Argument 2

On a matter of only tangential interest, those in power tend to follow their publics' wishes, however they originate.

### Argument 3

There is little to be gained for those in power in resisting public opinion, and much to be gained by giving in.

### Conclusion

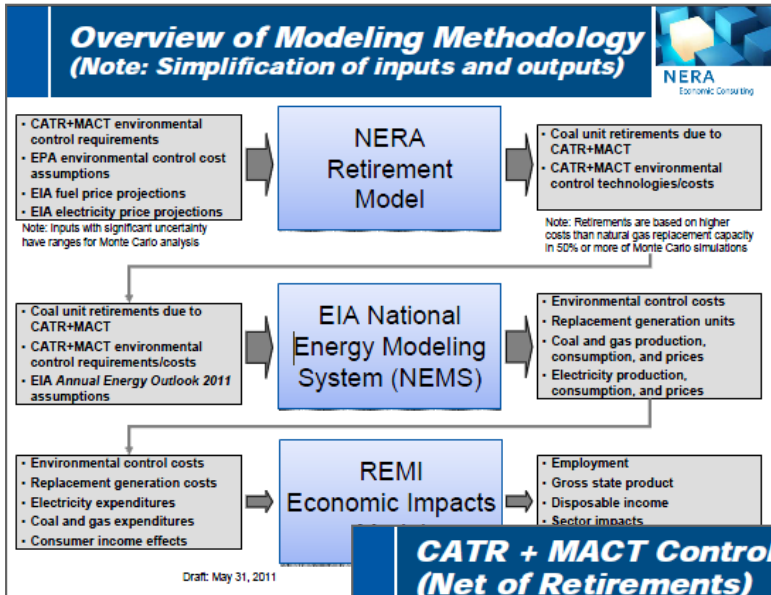
By shaping the battlefield of perception, it is thus possible to get those in power to change positions.

# Outreach

## Some generalizations about Energy & Environment:

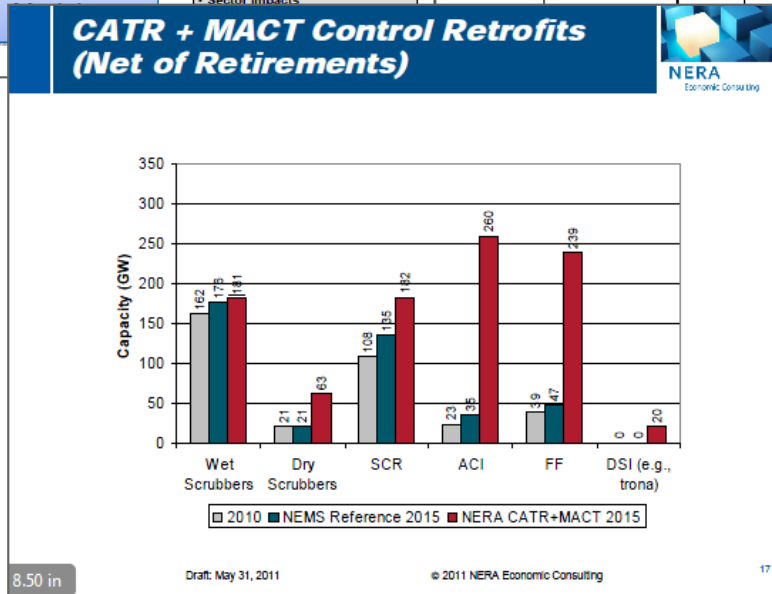
- These are highly complex issues.
  - Not many people really understand the issues.
- Leaders in DC have a huge range of issues to understand.
  - They rely on others to help inform their opinions
- Engineers understand these issues best
  - Knowledge offers the ability to exercise influence on the issues
- But . . . Engineers are not gifted at advocacy & persuasion

# Outreach for Economists & Engineers



### Input Assumptions for NERA Retirement Model

	Units	Value	Notes	Source	Uncertainty Range (Lognormal Distributions with Fat Right Tails)		
					Standard Deviation	90% Confidence Interval	Source
<b>Control Capital Costs</b>							
Scrubber	2010\$/kW	\$538	Varies by unit (value for 500 MW)	EPA	15% (\$80.70 for illustrative 500 MW)	\$403 - \$718	NEMS environmental control cost model documentation
SCR	2010\$/kW	\$201	Varies by unit (value for 500 MW)	EPA	15% (\$30.15 for illustrative 500 MW)	\$151 - \$268	NEMS environmental control cost model documentation
ACI	2010\$/kW	\$8	Same for all units	EPA	15% (\$1.20 for all units)	\$6 - \$11	NEMS environmental control cost model documentation
Fabric Filter	2010\$/kW	\$170	Same for all units	EPA	15% (\$25.50 for all units)	\$127 - \$227	NEMS environmental control cost model documentation
<b>Discount Rates</b>							
Public	Rate	0.07	Capital costs annualized over 10-20 years depending on unit age	EIA NEMS	0.005	0.06 - 0.08	Historical variation (www.zni.com)
Private	Rate	0.1183	Capital costs annualized over 10-20 years depending on unit age	EIA NEMS	0.005	0.109 - 0.129	Historical variation (www.zni.com)
<b>Prices</b>							
Coal (delivered to electricity sector)	2010\$/MMBtu	\$2.19	2015 U.S. Avg. (inputs are regional)	EIA NEMS	\$0.37	\$1.58 - \$3.03	Historical variation (Bloomberg)
Natural Gas Price (delivered to electricity sector)	2010\$/MMBtu	\$4.90	2015 U.S. Avg. (inputs are regional)	EIA NEMS	\$1.30	\$2.71 - \$7.56	Historical variation (Bloomberg)
Electricity Price (wholesale)	2010\$/MWh	\$48.35	2015 U.S. Avg. (inputs are regional)	EIA NEMS	\$2.60	\$43.52 - \$53.71	Historical variation in gas price and relationship between gas and elec. prices (Bloomberg)



### and EIA

	2011		100 MW		100 MW	
	EPAI	EIA	EPAI	EIA	EPAI	EIA
<b>Wet Scrubber</b>						
Capital (2010\$/kW)	\$538	\$485	\$622	\$580	\$650	\$762
Fixed O&M (2010\$/kW-year)	\$8.35	\$24.99	\$11.20	\$24.99	\$24.40	\$24.99
Variable O&M (2010\$/MWh)	\$2.11	\$0.44	\$2.11	\$0.44	\$2.11	\$0.44
Capacity Penalty	-1.84%	-5.00%	-1.84%	-5.00%	-1.84%	-5.00%
Heat Rate Penalty	1.87%	5.26%	1.87%	5.26%	1.87%	5.26%
<b>Dry Scrubber</b>						
Capital	\$460		\$532		\$727	
FOM	\$6.76		\$8.86		\$17.71	
VOM	\$2.70		\$2.70		\$2.70	
Capacity Penalty	-1.45%		-1.45%		-1.45%	
Heat Rate Penalty	1.47%		1.47%		1.47%	
<b>SCR</b>						
Capital (2010\$/kW)	\$201	\$165	\$217	\$184	\$268	\$225
Fixed O&M (2010\$/kW-year)	\$0.73	\$1.66	\$0.83	\$1.88	\$2.60	\$2.25
Variable O&M (2010\$/MWh)	\$1.38	\$0.34	\$1.38	\$0.34	\$1.38	\$0.34
Capacity Penalty	-0.58%	0.00%	-0.58%	0.00%	-0.58%	0.00%
Heat Rate Penalty	0.59%	0.00%	0.59%	0.00%	0.59%	0.00%
<b>ACI</b>						
Capital (2010\$/kW)	\$8	\$5	\$12	\$6	\$30	\$6
Fixed O&M (2010\$/kW-year)	\$0.03	\$1.71	\$0.06	\$1.71	\$0.12	\$1.71
Variable O&M (2010\$/MWh)	\$0.60	\$0.00	\$0.66	\$0.00	\$0.52	\$0.00
Capacity Penalty	-0.06%	0.00%	-0.06%	0.00%	-0.06%	0.00%
Heat Rate Penalty	0.06%	0.00%	0.06%	0.00%	0.06%	0.00%
<b>Fabric Filter</b>						
Capital (2010\$/kW)	\$170	\$78	\$187	\$78	\$230	\$78
Fixed O&M (2010\$/kW-year)	\$0.73	\$5.97	\$0.83	\$5.97	\$0.84	\$5.97
Variable O&M (2010\$/MWh)	\$0.16	\$0.00	\$0.16	\$0.00	\$0.16	\$0.00
Capacity Penalty	-0.50%	0.00%	-0.50%	0.00%	-0.50%	0.00%
Heat Rate Penalty	0.60%	0.00%	0.60%	0.00%	0.60%	0.00%
<b>DSI</b>						
Capital (2010\$/kW)	\$43		\$61		\$134	
Fixed O&M (2010\$/kW-year)	\$0.51		\$0.94		\$2.29	
Variable O&M (2010\$/MWh)	\$7.70		\$7.70		\$7.70	
Capacity Penalty	-0.79%		-0.79%		-0.79%	
Heat Rate Penalty	0.79%		0.79%		0.79%	

Draft: May 31, 2011

Notes: Heat rate of 11,000 Btu/kWh is assumed. EIA does not model dry scrubber retrofits.

NERA analysis of CATR + MACT for American Coalition for Clean Coal Electricity, May 2011

# Outreach for Everybody Else

*Put it in terms people can relate to!*

## ■ Boiler MACT applied to cars would require:

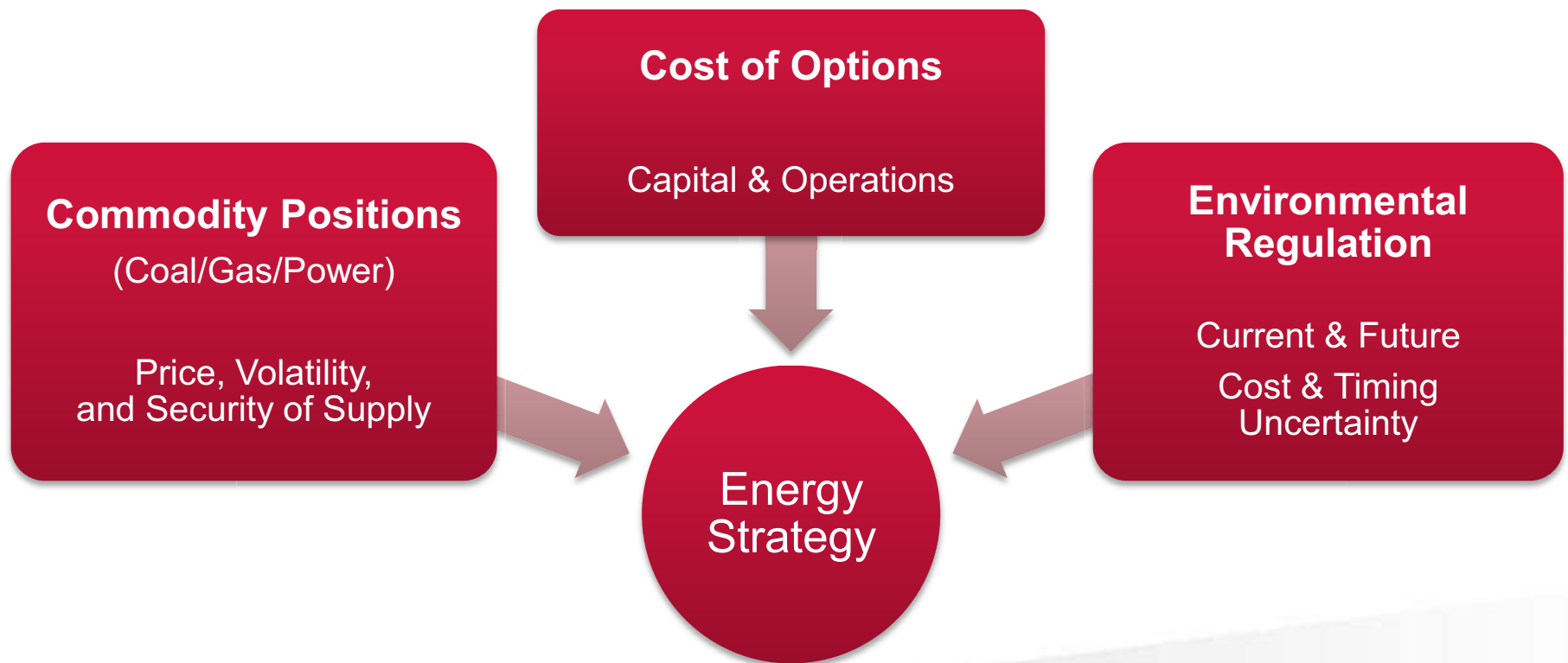
- Seats 8 *Honda Odyssey*
- 0-60 mph in less than 5 seconds *Chevrolet Corvette*
- Tows 10,000 lbs *Ford F-250 Super Duty*
- 4WD and off-road capability *Jeep Grand Cherokee*
- 200,000 mile trouble-free life *Lexus GS-350*
- 50 mpg *Toyota Prius*
- Less than \$20,000 *Hyundai Sonata*

## ■ Is that *really* achievable?

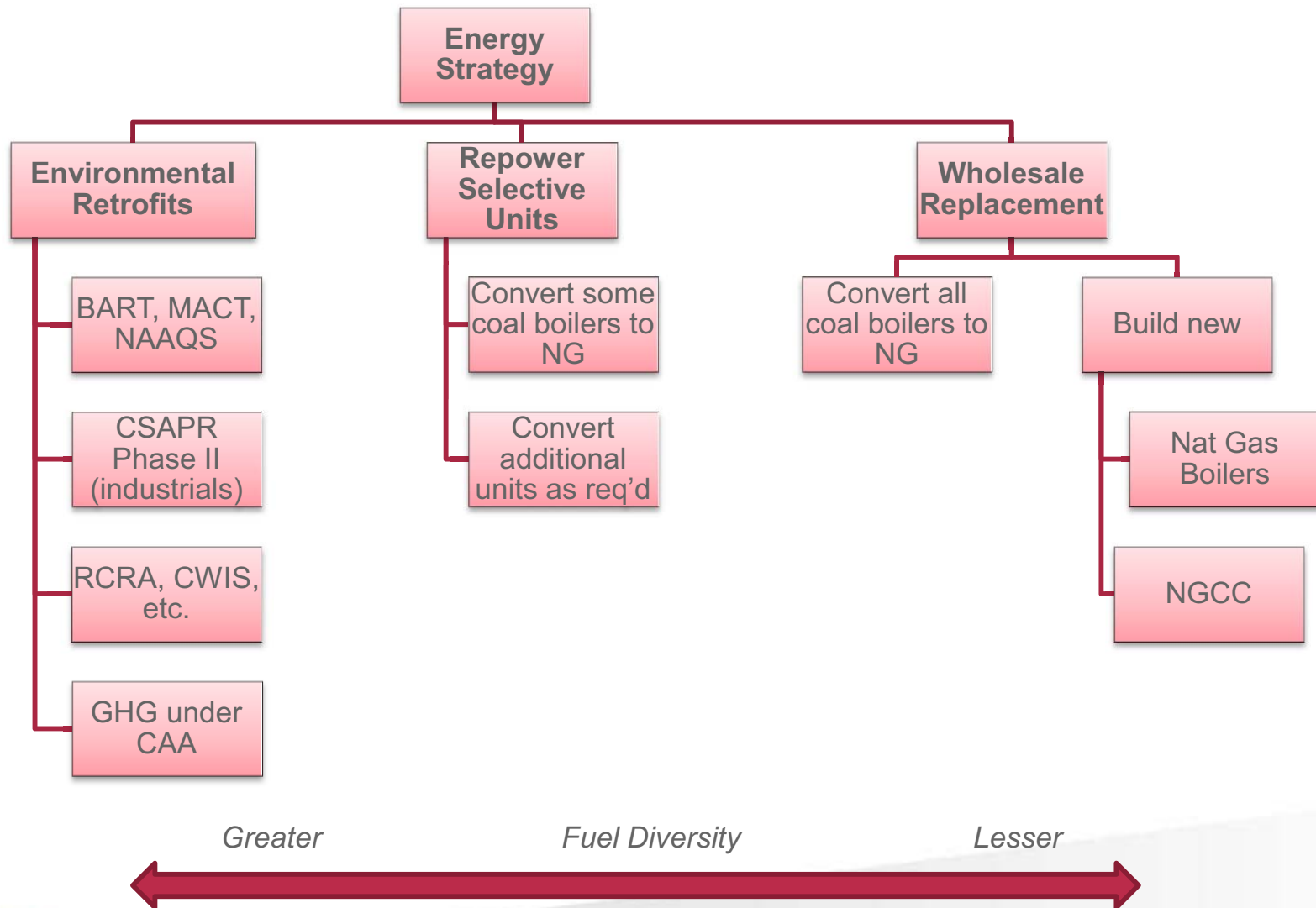
# Strategy

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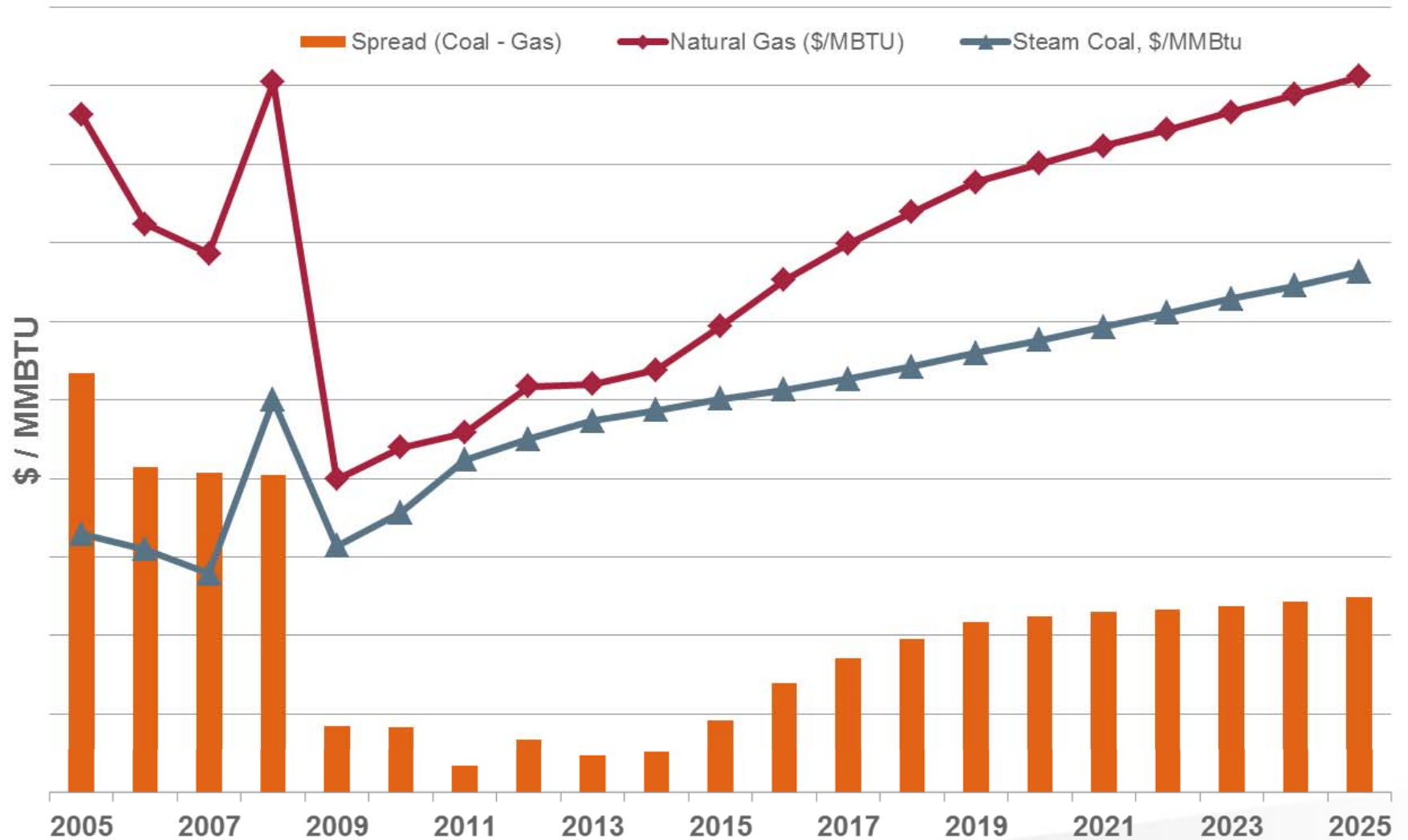
Strategic decisions for energy hinge on three key dimensions:



# Decision Pathways: First Pass



# Commodity Impact





# Regulatory Landscape

NAAQS – SO2



MACT / CISWI



NAAQS - Ozone



Regional Haze Phase I



NSPS for GHG  
Subpart Db

RCRA  
Regulation of  
Coal Ash

HWC MACT

CWA for Coal  
Mining Runoff

Cross-State Air  
Pollution Rule  
Phase II

Regional Haze  
Phase II

CWA 316(b)  
Cooling Water  
Intake Structures

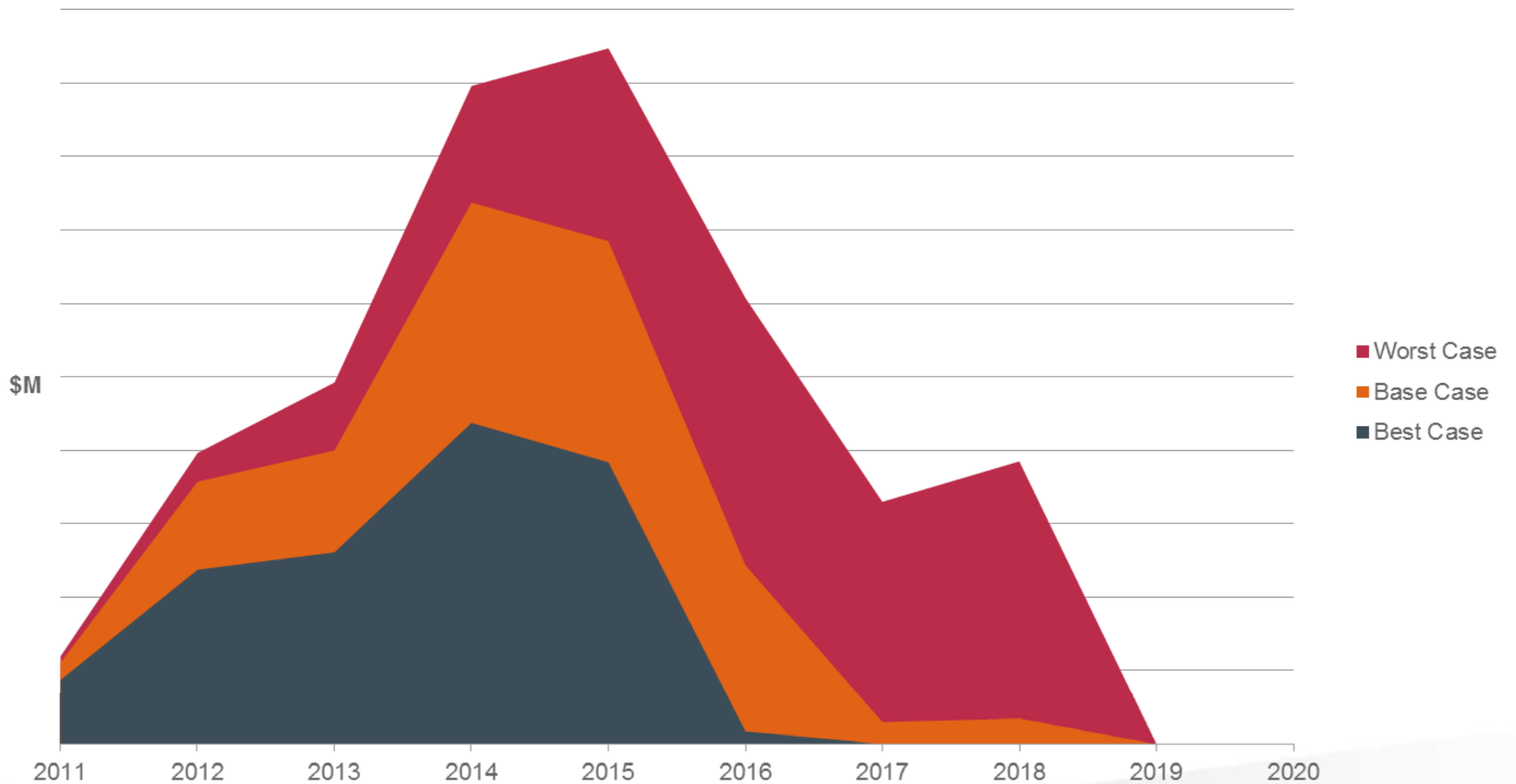
14 October 2011

CIBO Annual Meeting



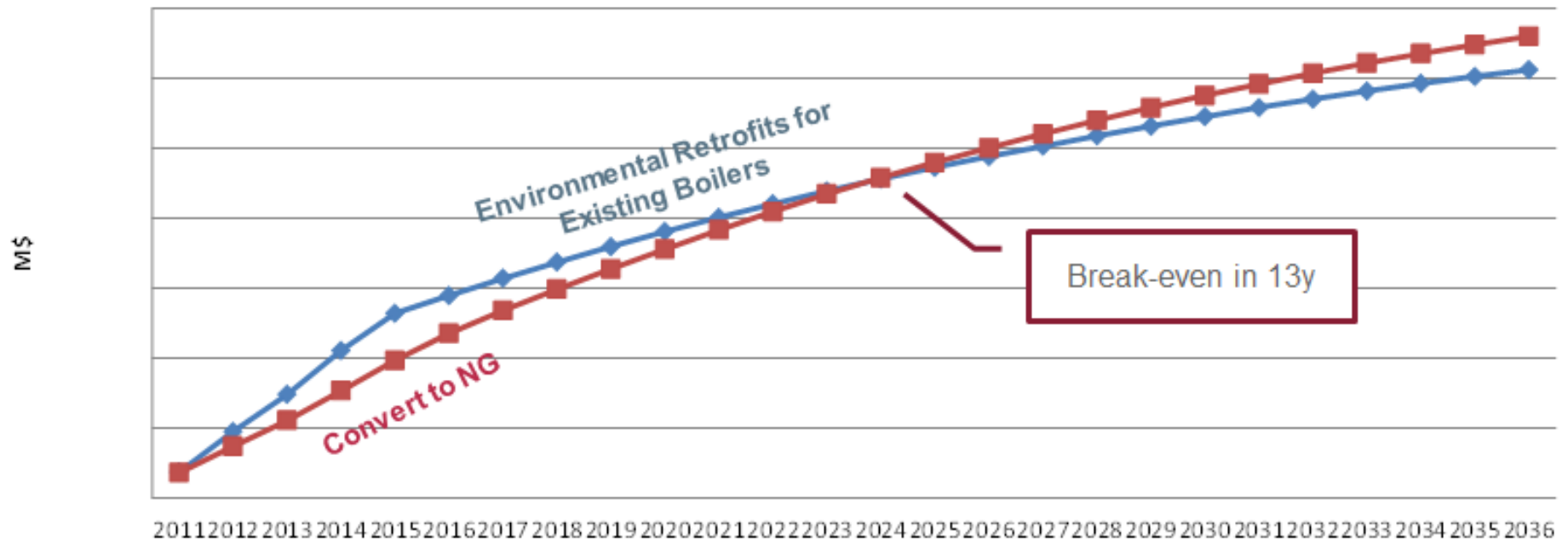
# Regulatory Impact

## Compliance CapEx



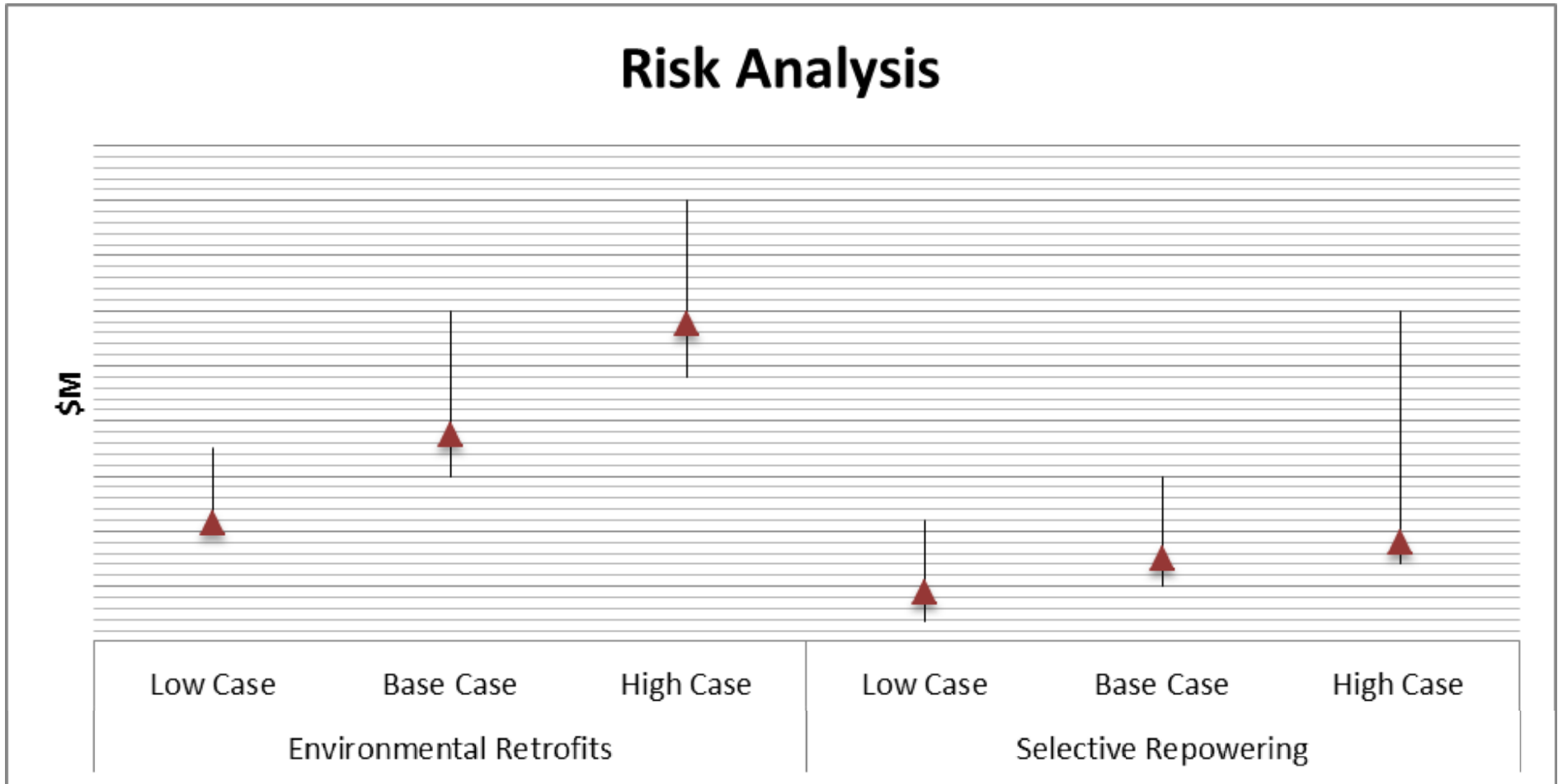
# Financial Analysis: Base Case Assumptions

## Cumulative Discounted After-tax Total Cash Cost

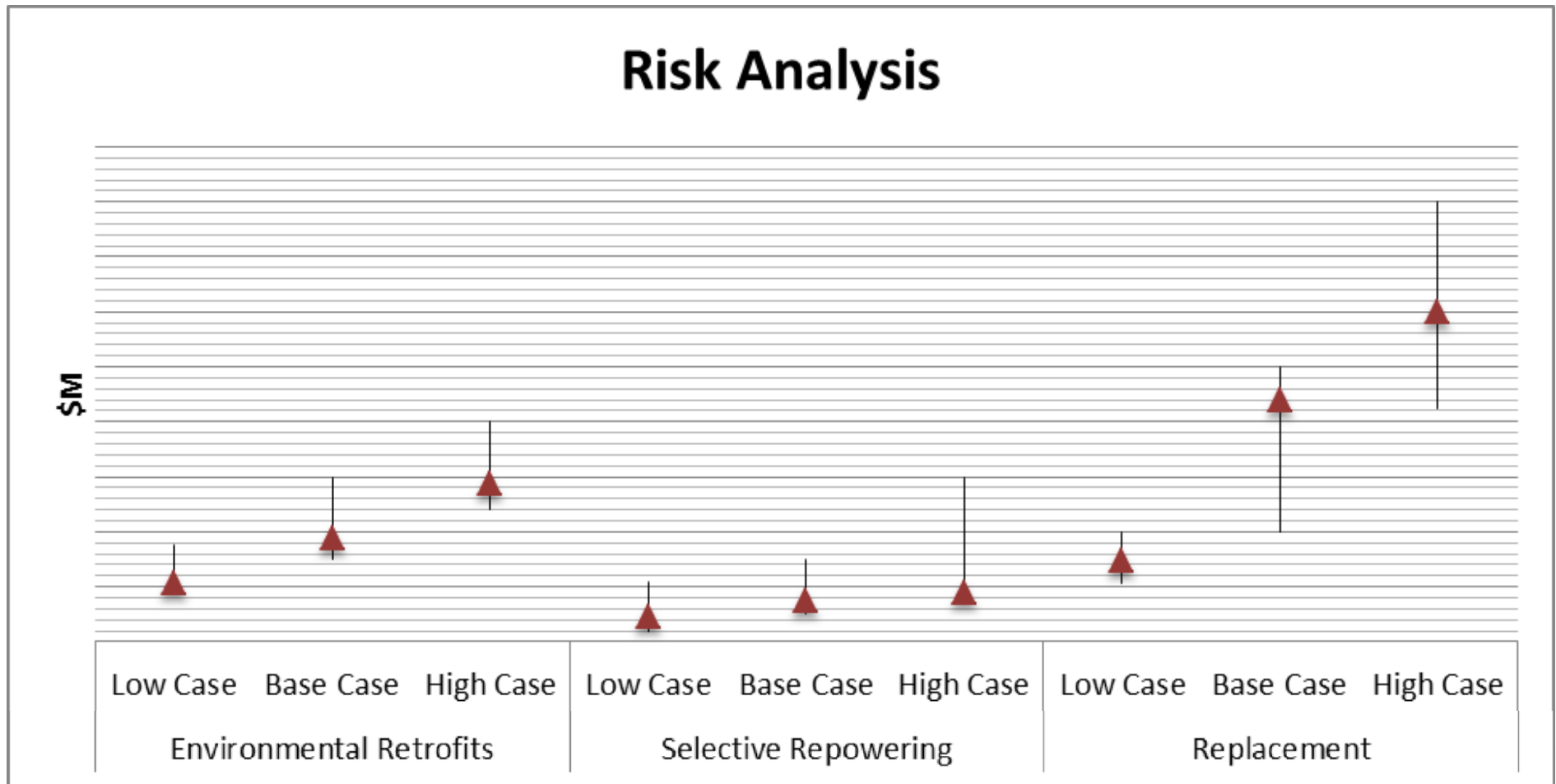


*Plus Sensitivity Analysis around Capital, Commodities, Black Swan Events, etc.*

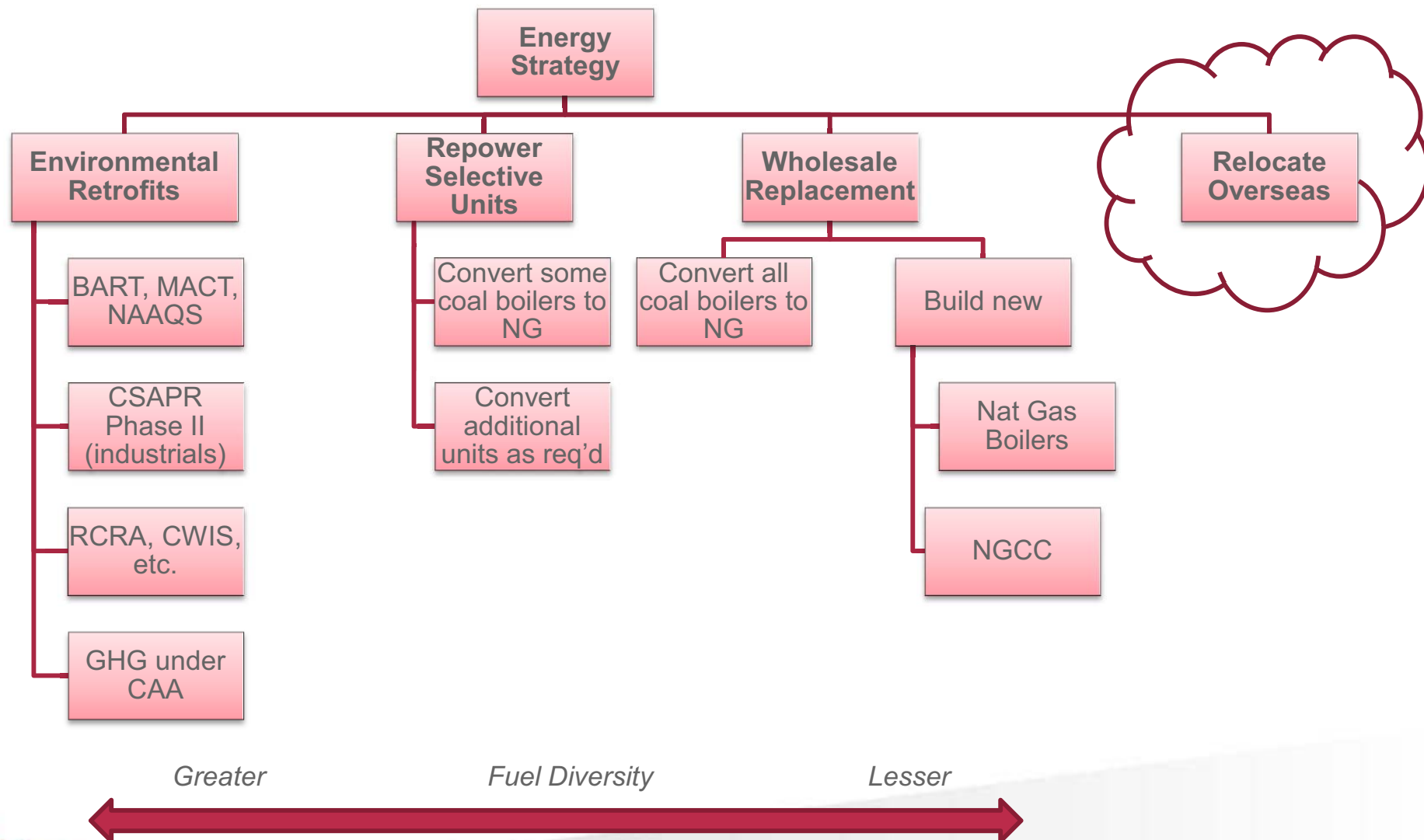
# Risk Analysis (First Pass)



# Risk Analysis (Second Pass)



# Decision Pathways: Second Pass



# Thank you

J. A. (Fred) Cleveland  
[jac@eastman.com](mailto:jac@eastman.com)  
423.202.5295