Exxon's Disclosure to Shareholders on the Costs of a Low-Carbon Energy Transition

Carbon Tracker

NRDC

Overview

1. Exxon tells investors a low-carbon transition is unlikely *because it is too costly*. Exxon cites several third-party reports.
2. Exxon's use of those reports is misleading because it (a) exaggerates their conclusions or (b) omits information that alters the reports' implications.
3. A complete and accurate disclosure would have altered the cost calculus made by Exxon.

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Misleading Numbers

- Using MIT study in USCCSP Report, Exxon claims that a low carbon pathway would, by 2090, result in:
  - **$1,000** tonne CO2 costs, imposing **$22,400** in additional energy costs upon the median households of roughly **44%** of their median household income.
- Each number is flawed.

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Why are the numbers misleading?

- **$1000 tonne CO2**: This number far exceeds 2090 estimates from other models used in USCCSP report. Exxon fails to reference those numbers.
- **$22,400 added costs**: This number assumes flat household emissions, but the IGSM model assumes drastic emissions reductions.
- **44% median household income:** This number assumes flat median household income, but the IGSM model assumes roughly a quadrupling of per capita GDP.

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How would an accurate citation of the models differ?

- Economic impact on average annual household income in 2090 far less if proper analysis done:
- Under IGSM model, impact is **below 5%**.
- In other models (MERGE and MiniCAM) impact is **below 1%**.

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"Managing the Risks"
Spring 2014

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Timeline Leading to Exxon Report

Date	Event
Fall 2013	Shareholders file resolution asking Exxon to address "the risk of stranded assets presented by global climate change."
Winter 2014	Exxon agrees to respond to shareholder request in return for a withdrawal of the resolution.
March 2014	Exxon publishes two reports for shareholders, one called "Managing the Risks."

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Exxon's Conclusion: No Energy Transition, Too Expensive

"Our Outlook for Energy does not envision the 'low carbon scenario' advocated by some because the costs and the damaging impact to accessible, reliable and affordable energy resulting from the policy changes such a scenario would produce are beyond those that societies, especially the world's poorest and most vulnerable, would be willing to bear, in our estimation. "

"Based on this analysis, we are confident that none of our hydrocarbon reserves are now or will become 'stranded'."

– Exxon March 2014 "Managing the Risks," p. 22, 1.

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Why Too Expensive? According to Exxon, experts agree

- **Exxon's (Misleading) Claims About Third Party Studies:**
- **2006 MIT study**: 450 ppm CO2 pathway requires taxes of over $1000 tonne/CO2 by 2090 resulting in *44%* of U.S. median household income spent on *additional* energy costs alone.

- **2008 IEA WEO**: *$45 trillion* needed for new infrastructure.

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MIT--IGSM model grounds Exxon's claim

- U.S. Climate Change Science Program Report 2006-2007
  - 3 Integrated Assessment Models (IAMs): MERGE (EPRI), MiniCAM (PNNL) and IGSM (MIT).
  - Framework: (1) Develop reference case, (2) Solve for carbon price needed to stabilize CO2 concentrations at 450, 550, 650, 750 ppm.
  - Other parameters left to modelers.
- Exxon only discusses IGSM

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IGSM outlier: Estimated GDP losses larger than other models.

Table 4.8. Percentage Reduction in Gross World Product in the Stabilization Scenarios.

Level 1

	2020	2040	2060	2080	2100
IGSM	2.1%	4.1%	6.7%	10.1%	16.1%
MERGE	0.6%	1.4%	2.2%	1.8%	1.4%
MiniCAM	0.2%	1.2%	1.9%	1.9%	1.4%

Source: USCCSP Assessment 2.1a (2007)

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IGSM carbon costs higher than other models

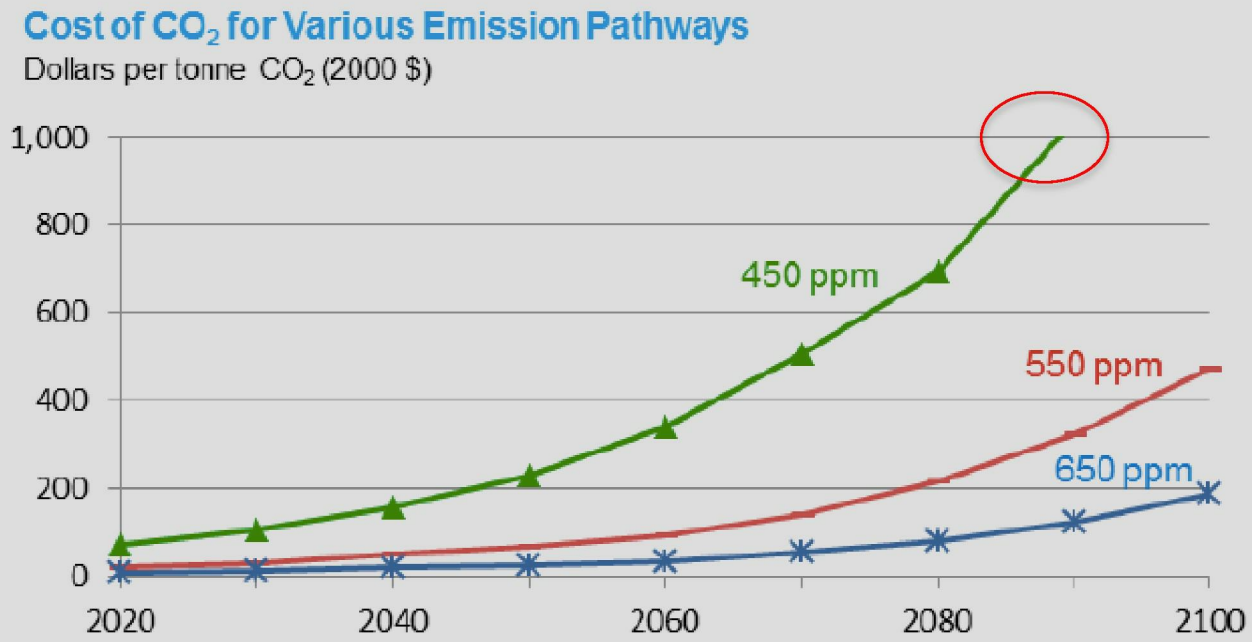
	2020 ($/tonne C)			2030 ($/tonne C)		
Stabilization Level	IGSM	MERGE	MiniCAM	IGSM	MERGE	MiniCAM
Level 4	$18	$1	$1	$26	$2	$2
Level 3	$30	$2	$4	$44	$4	$7
Level 2	$75	$8	$15	$112	$13	$26
Level 1	$259	$110	$93	$384	$191	$170

	2050 ($/tonne C)			2100 ($/tonne C)		
Stabilization Level	IGSM	MERGE	MiniCAM	IGSM	MERGE	MiniCAM
Level 4	$58	$6	$5	$415	$67	$54
Level 3	$97	$11	$19	$686	$127	$221
Level 2	$245	$36	$69	$1,743	$466	$420
Level 1	$842	$574	$466	$6,053	$609	$635

IGSM carbon costs converted to CO2

Stabilization Level	2020 $/tonne CO_2 (IGSM)	2030 $/tonne CO_2 (IGSM)	2050 $/tonne CO_2 (IGSM)	2100 $/tonne CO_2 (IGSM)
Level 4: 750 ppm	$4.90	$7.08	$15.80	$113.08
Level 3: 650 ppm	$8.17	$11.99	$26.43	$186.92
Level 2: 550 ppm	$20.44	$30.52	$66.76	$474.93
Level 1: 450 ppm	$70.57	$104.63	$229.42	$1649.32

Exxon: Costs surpass $1000 per tonne CO2 before end of century



Additional CO_2 Cost for Average American Households
(2013$)

Increased Energy Cost / Year	% of Median Pre-Tax Income
$22,400	44%
$17,900	35%
$13,400	26%
$8,900	18%
$4,500	9%

Source: Exxon, "Managing the Risks," at 9.

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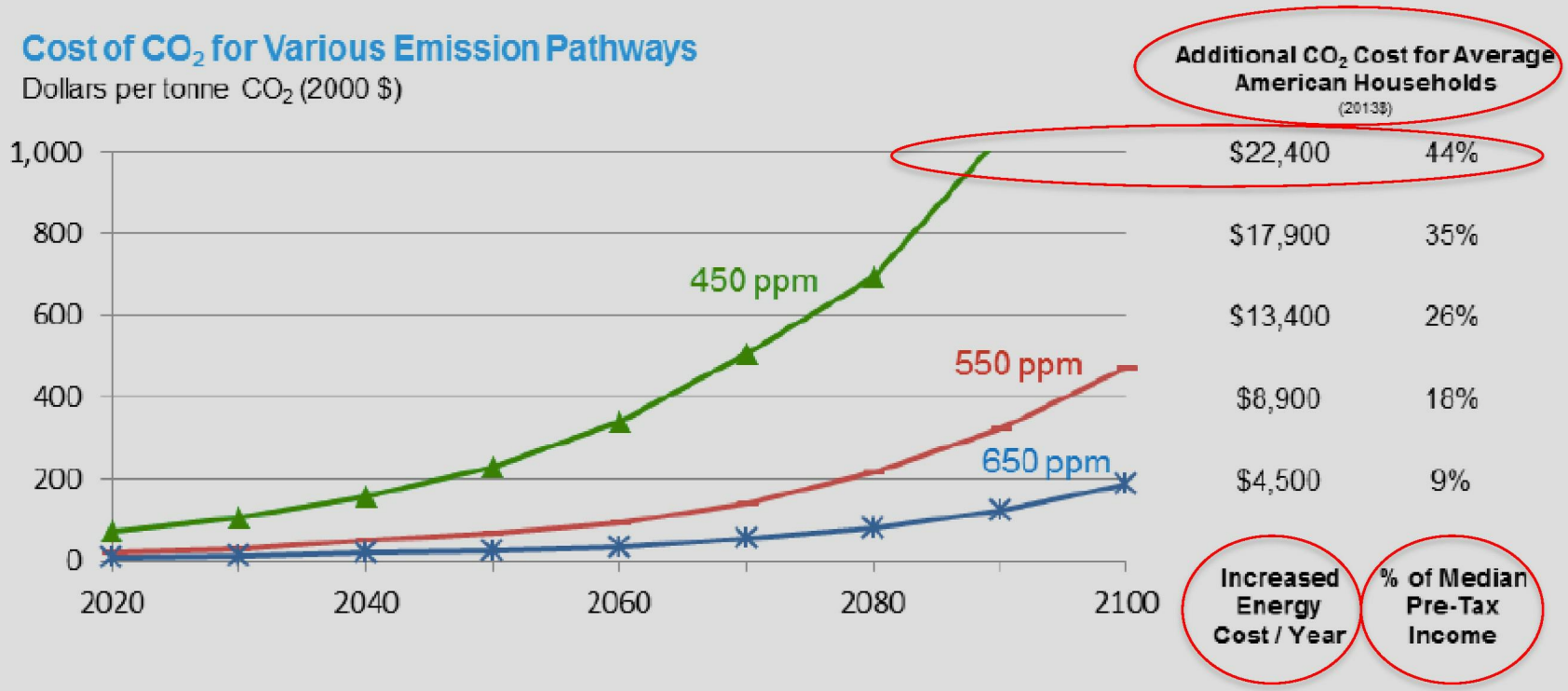
Exxon's claim: 44% of median household income in added energy costs (2090)



Source: Exxon, "Managing the Risks," at 9.

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Problem: Exxon exaggerates/misleads on modeling by:

1) Comparing *future* carbon prices to *current* income, energy use, and emissions levels to overstate IGSM conclusions.

2) Assuming flat *median* income, which IGSM does not model, despite anticipated per capita GDP growth.

3) Ignoring other models in USCCSP report that imply far lower costs.

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Akin to saying $3/gallon gas too expensive for average 1930 income of $1,970.*

*Source: http://www.thepeoplehistory.com/1930s.html

Problem 1: Exxon uses IGSM's high future carbon prices, but assumes income is flat over the century, contrary to IGSM model.

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This is misleading since Exxon is presenting *future* costs as a fraction of *current* income—it should be comparing *future* costs to *future* income.

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Exxon's Formula– Costs as % of Income

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Example year: 2090

If $22,400 in annual costs is 44% of median household income, then:

$$\$22,400 = (.44)x$$

$$x = \$50,909$$

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Flat median income implied by Exxon…

Year (approximated from chart)	Increased Energy Cost/Yr.	% Median Pre-Tax Income	Implied Median Income (2013$)*
2045	$4,500	9%	$50,000
2063	$8,900	18%	$49,444
2073	$13,400	26%	$51,538
2082	$17,900	35%	$51,142
2090	$22,400	44%	$50,909

*Difference in numbers potentially due to rounding.

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…and close to U.S. 2013 median of $51,939…

Table H-6. Regions--All Races by Median and Mean Income: 1975 to 2013

(Households as of March of the following year. Income in current and 2013 CPI-U-RS adjusted dollars (28))

UNITED STATES

Region and year	Number (thousands)	Median income		Mean income	
		Current dollars	2013 dollars	Current dollars	2013 dollars
2013 (38)	122,952	51,939	51,939	72,641	72,641
2012	122,459	51,017	51,758	71,274	72,310
2011	121,084	50,054	51,842	69,677	72,166
2010 (37)	119,927	49,276	52,646	67,392	72,001
2009 (36)	117,538	49,777	54,059	67,976	73,824
2008	117,181	50,303	54,423	68,424	74,029
2007	116,783	50,233	56,436	67,609	75,957
2006	116,011	48,201	55,689	66,570	76,912

Source: U.S. Census Bureau (cited by Exxon in report)

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…but, there's no *median* income forecast in IGSM model.

- IGSM does not forecast median income; it only describes population and GDP growth.
  - This allows per capita GDP to be calculated.
- Cannot derive median income growth without other assumptions, since it is dependent on how growth is allocated across society.
  - IGSM model makes no such assumptions regarding the allocation of wealth.
- **IGSM model predicts per capita GDP will nearly quadruple by 2090.**

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How might Exxon's results differ if they had used IGSM per capita GDP growth?

We can use the $51,939 median income number (2013) as a starting point and use the IGSM model's CAGR to see how that number grows through 2090.

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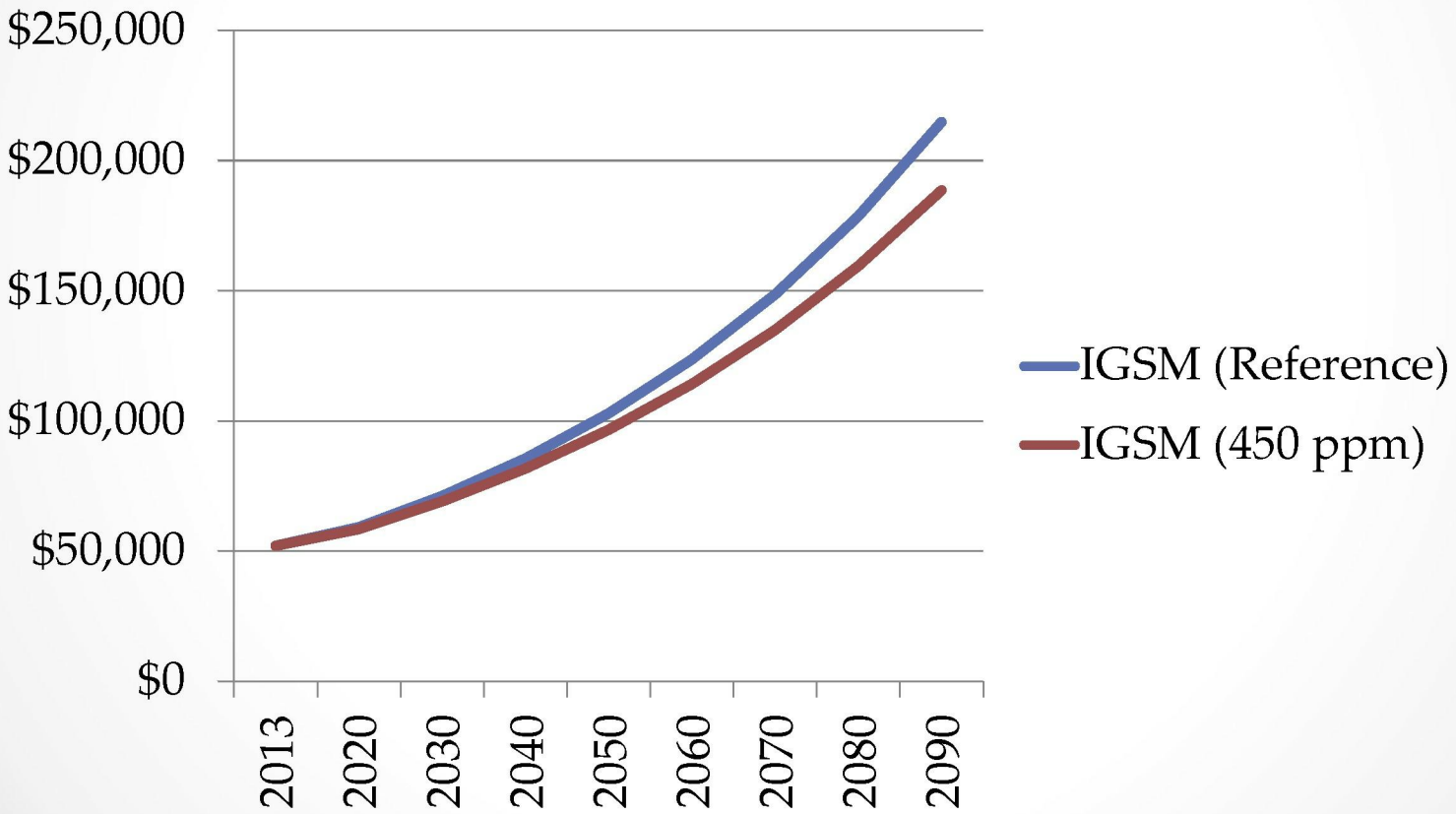
IGSM per capita GDP growth increases household income



Using $51,939 2013 median income (2013$) as base.

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Problem 2: Exxon fails to account for emissions reductions in the IGSM model

Assumes flat household CO2 emissions throughout century, but IGSM predicts declines between 2010-2090 due to lower demand and less carbon intensity of energy.

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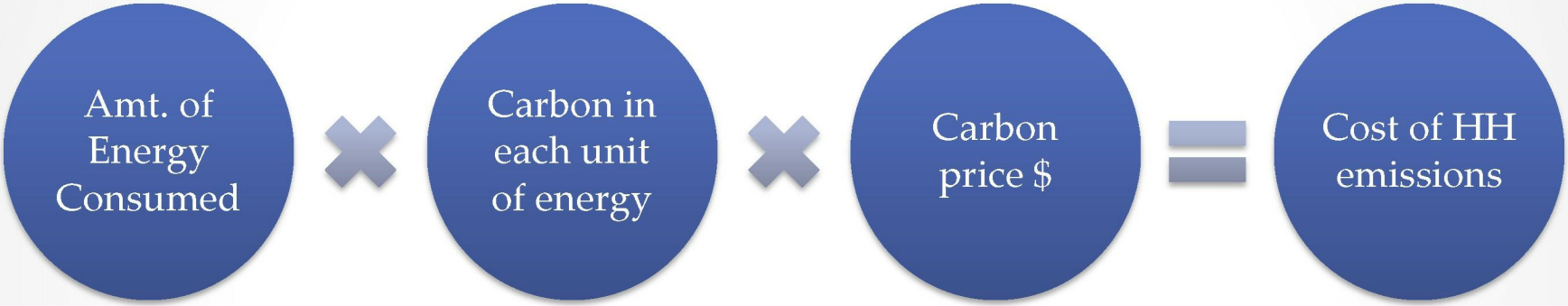
Formula: added cost of emissions to households



- Exxon includes rising carbon prices, but ignores reductions in energy consumed and carbon intensity.

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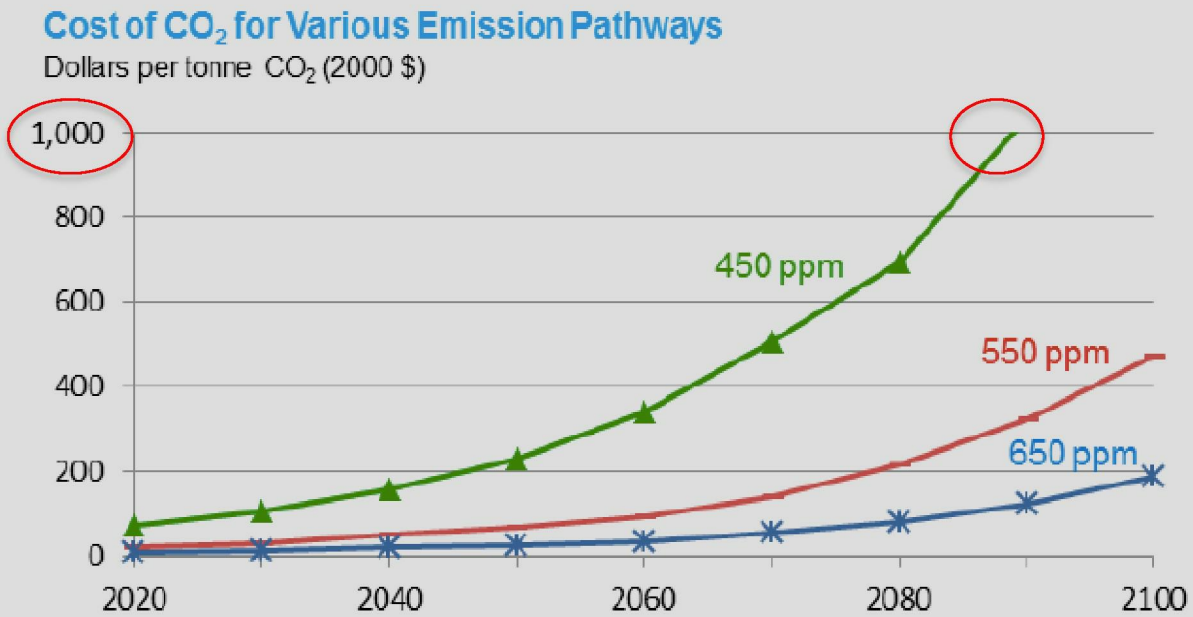
Exxon: at $1000 tonne, average household spends $22,400 more



Additional CO_2 Cost for Average American Households

(2013$)

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$4,500	9%

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How much CO2 emitted according to chart?

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Exxon implies CO2 emissions flat (≈22.4 tonnes/CO2)

Year (approximated from chart)	IGSM Marginal CO2 Price ($/tonne CO2)	Exxon calculated increased annual energy cost ($)	Implied CO2 emitted (tonnes/C02)
2045	200	4500	22.5
2063	400	8900	22.25
2073	600	13400	22.33
2082	800	17900	22.38
2090	1000	22400	22.4

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But, IGSM models reductions in energy consumption and emissions in 2010-2090 period…

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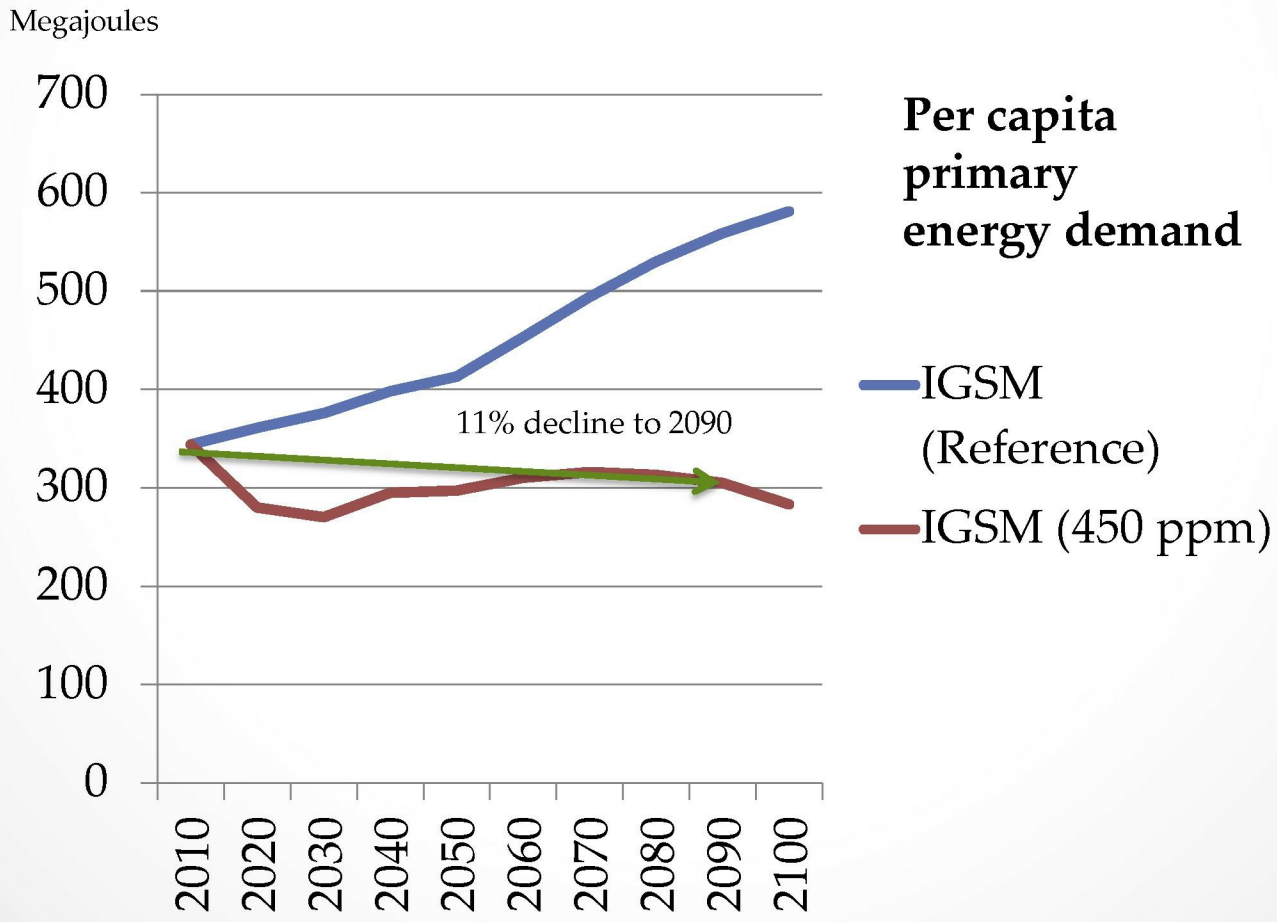
…per capita energy demand drops 11%…



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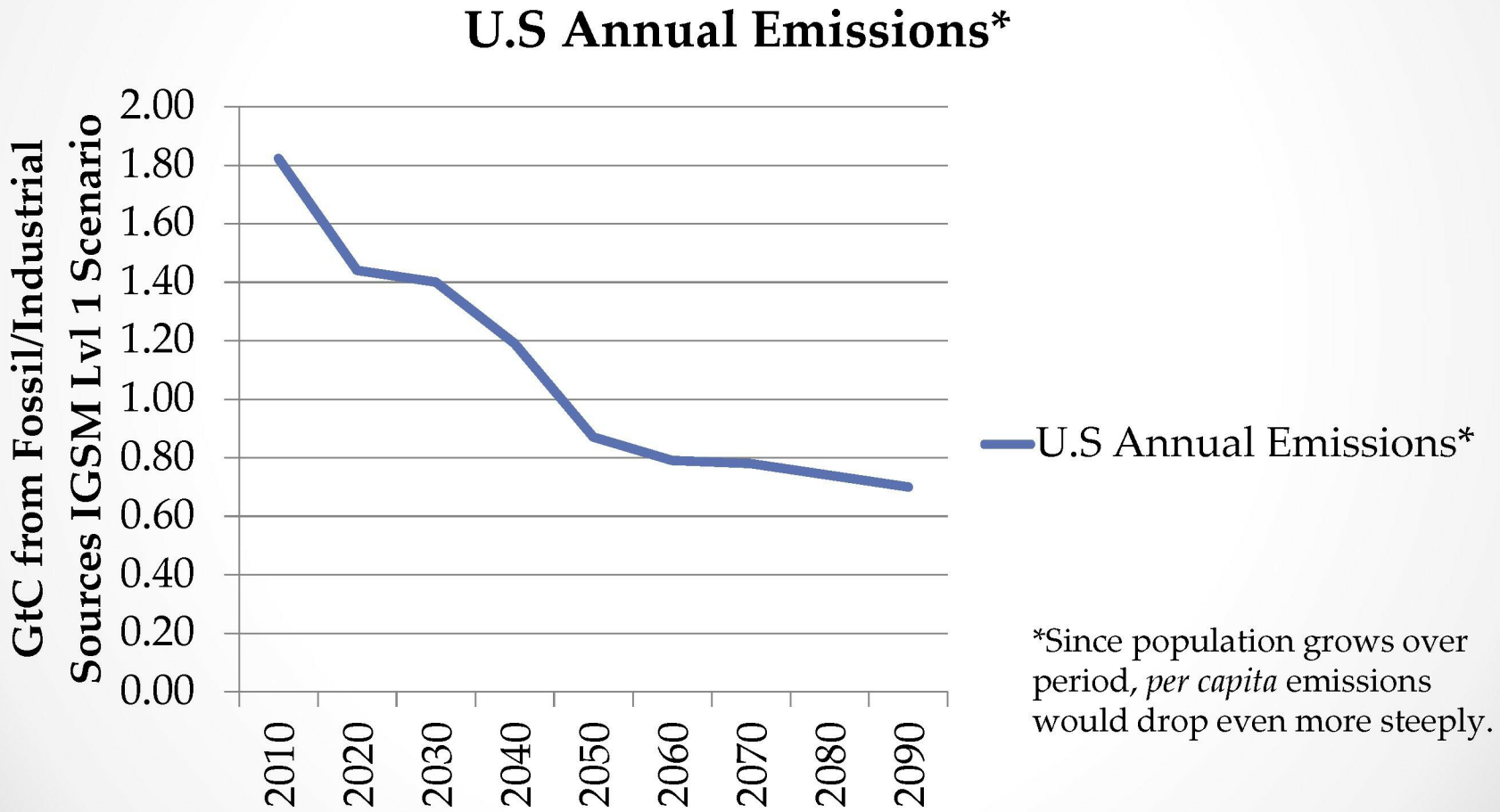
IGSM U.S. data: 62% emissions decline, 2010-2090



*Since population grows over period, *per capita* emissions would drop even more steeply.

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Adding Up The Errors

Summary of Problems, Exxon:

- Compares 2090 carbon price to 2013 median household income.
- Ignores economic growth for income but uses growing carbon price.
- Assumes flat household emissions, despite declines in per capita energy demand and overall emissions reductions.
- Ignores lower prices in other models.

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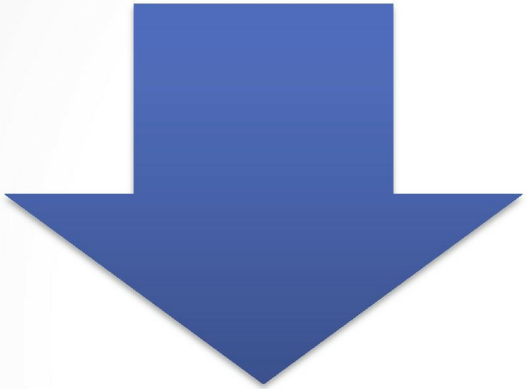
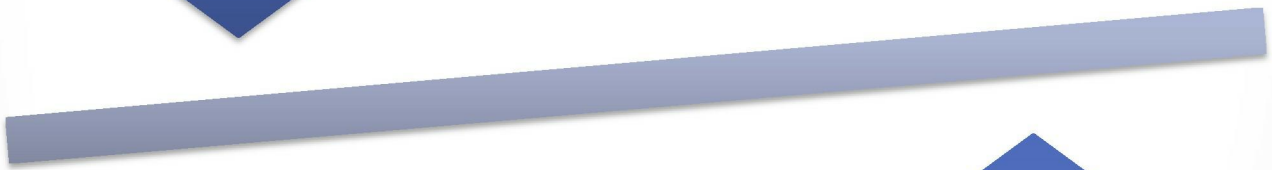
2010-2090 Adjustments to Exxon's view



62% lower emissions



260%-310% greater per capita GDP.

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Calculations for Y≈2090

- Exxon Case
  - Numerator: Aggregate household emissions = 22.4 tonnes CO2* 2090 carbon price.
  - Denominator: Flat median household income in 2013 (2013$).
  - Assumption: No reduction in household emissions, no increase in median household income over 2010-2090 period.

- Per Capita GDP Case
  - Assumption: Includes emissions reductions and 2010-2090 per capita GDP growth in model.

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2010-2090 Changes (IGSM)

Exxon Case

$22,400
$51,939

=

% HH Income 2090

43.1%*
*44% on Exxon chart

Consistent Results Case

$22,400 *(.38)
$51,939*(3.6)

=

4.6%

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What if Exxon analyzed other USCCSP models?

- Other models would show far lower expect impact to households.
- Applying Exxon's (flawed) framework would yield number between 4-8% of household income.
- Using those models' carbon prices, and energy use and income projections through 2090 results in impacts of less than 1% of projected average household income.

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Comparison

- **Taking Exxon's assumptions:**
- 22.4 tonnes CO2/household (implied by Exxon chart)
- 2013 median household income $51,939 (cited by Exxon)

- **We apply:**
- MERGE/MiniCAM carbon prices in 2090
- MERGE/MiniCAM CAGR from 2010-2090 for per capita GDP, emissions, etc.

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2010-2090 (MERGE)

Exxon Case

$4,272

$51,939

=

% HH income 2090

8.2%

Consistent Results Case

$4,272 *(.06)

$51,939*(2.49)

=

0.2%

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2010-2090 (Mini-CAM)

Exxon Case

$3,979

$51,939

=

% HH income 2090

7.7%

Consistent Results Case

$3,979*(.29)

$51,939*(2.58)

=

0.9%

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Misleading IEA Report Reference

- Exxon focuses on IEA's "$45 trillion in costs":

"The International Energy Agency estimated that reducing greenhouse gas emissions to just 50 percent below 2005 levels by 2050 would require $45 trillion in added energy supply and infrastructure investments." - Exxon, "Managing the Risks," at 9.

- But IEA notes those costs not significant in light of averting fuel and climate change costs:

"To halve today's emission levels would require additional investments of the order of USD 45 trillion. Although this is a large number in absolute terms, it is small relative to the expected growth in global economic activity over the next forty years - and small relative to the cost of not taking action." –IEA, WEO 2008 at 3.

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Additional questions raised by the report

- Exxon's Involvement in the creation of the model: Exxon was instrumental in developing the Joint Program at MIT (which works on the IGSM model). To what extent did they influence its key assumptions?
- Why would Exxon's 2014 report focus on eight year-old modeling runs?
- Exxon's Internal Outlook: Exxon models carbon prices in its Outlook and implies certain reductions in demand based on those prices. How consistent it Exxon's Outlook with the IGSM modeling?

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