Can USG SCCs guide climate policy?

And other topics

Steven Rose (EPRI)

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Relevant considerations

- Potential applications

- Appropriate application
  - Conceptually
  - Given the state of the art

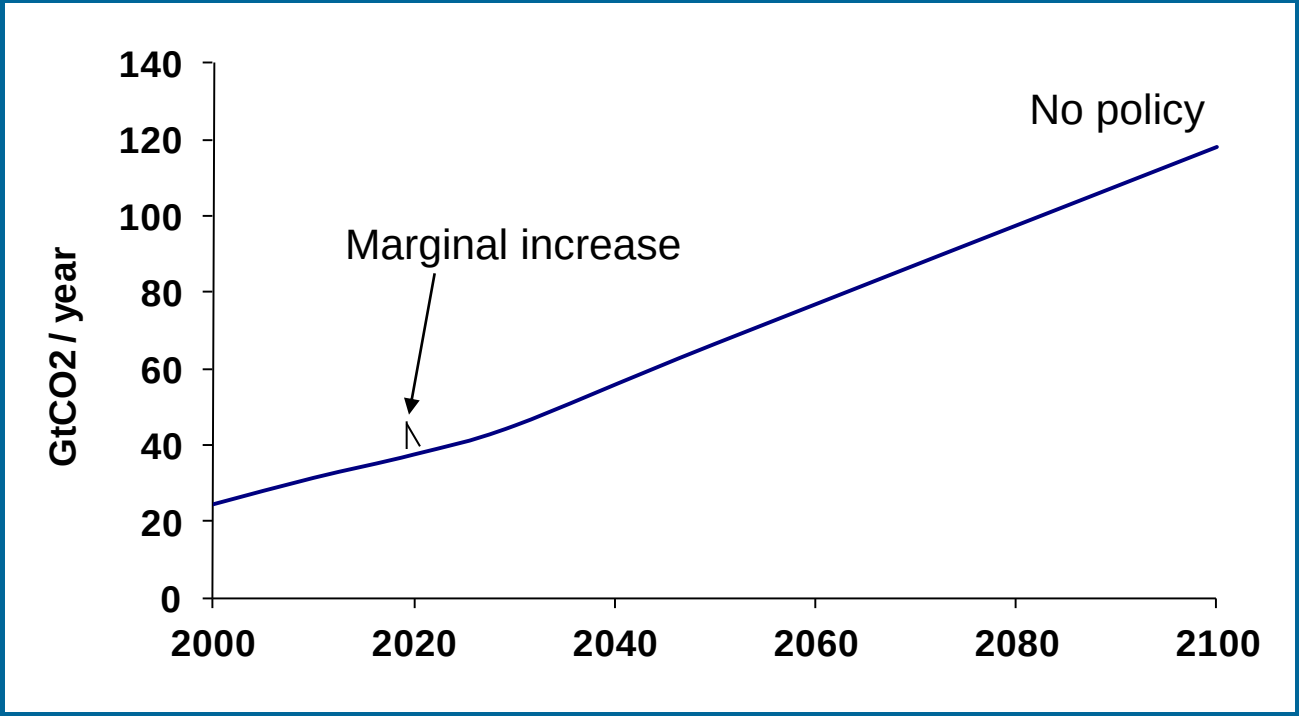
Potential applications

- SCC not appropriate for all decisions
  - E.g., Supreme Court endangerment ruling, CA GHG waiver request, threatened species listing of polar bear
- Where appropriate, there are incremental and non-incremental decisions
  - i.e., decisions with incremental v non-incremental global emissions implications

Appropriate application – conceptually

SCC = the marginal cost of an incremental global net emissions increase in year t off of a reference scenario

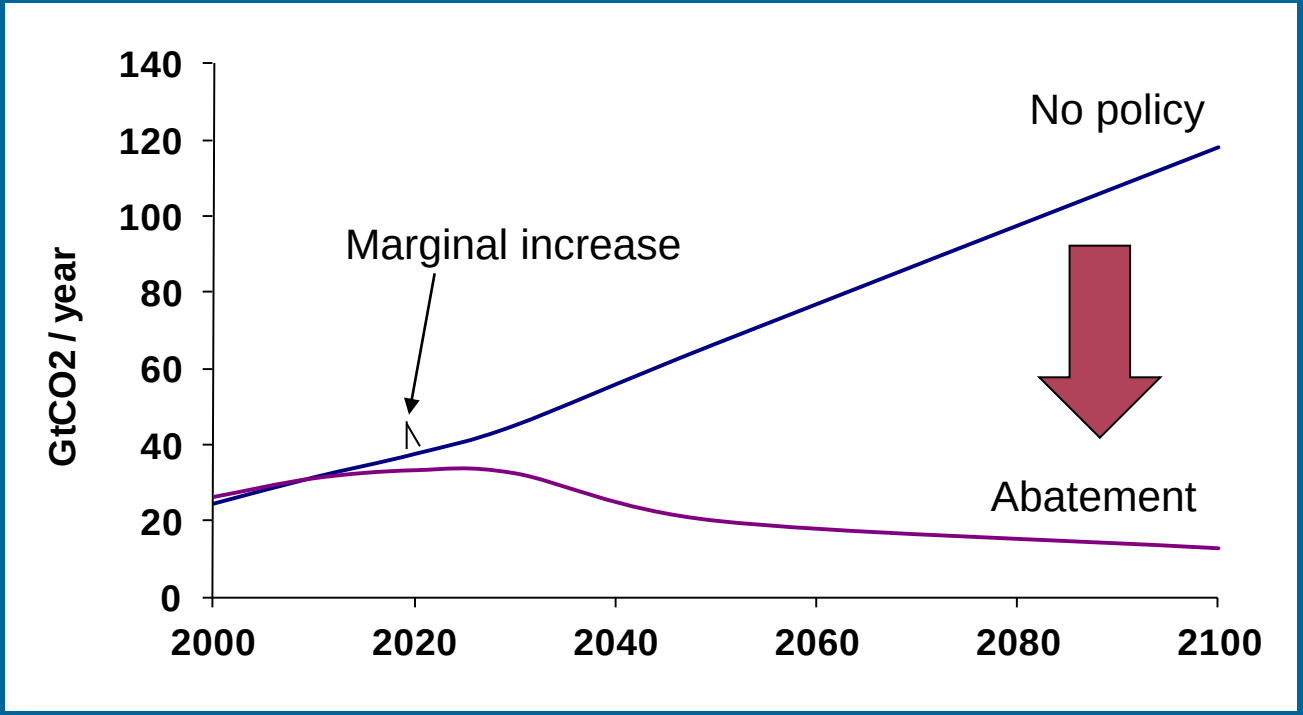
- Current USG SCC estimates conceptually appropriate for valuing incremental reductions in global GHGs



Appropriate application – conceptually

SCC = the marginal cost of an incremental global net emissions increase in year t off of a reference scenario

- However, not so for non-incremental reductions ➔ marginal benefits are endogenous!



Endogenous marginal benefits!

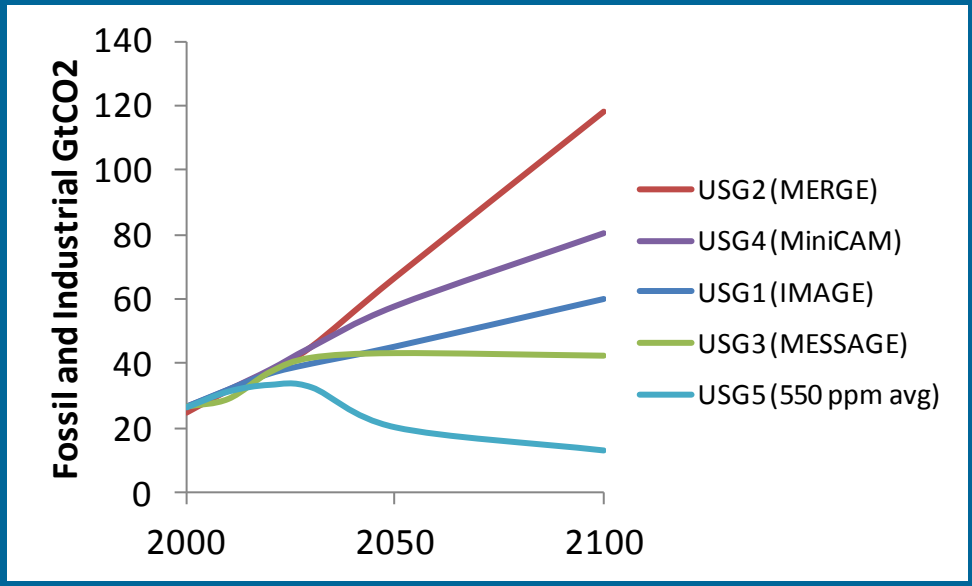
USG (2013) 2.5% DR 2020 mean SCCs

(across scenarios there are differences in emissions and society)

Scenario	PAGE	DICE	FUND	Avg
USG1	129	72	44	82
USG2	78	40	35	51
USG3	108	58	32	66
USG4	107	61	45	71
USG5	85	52	24	54
				65

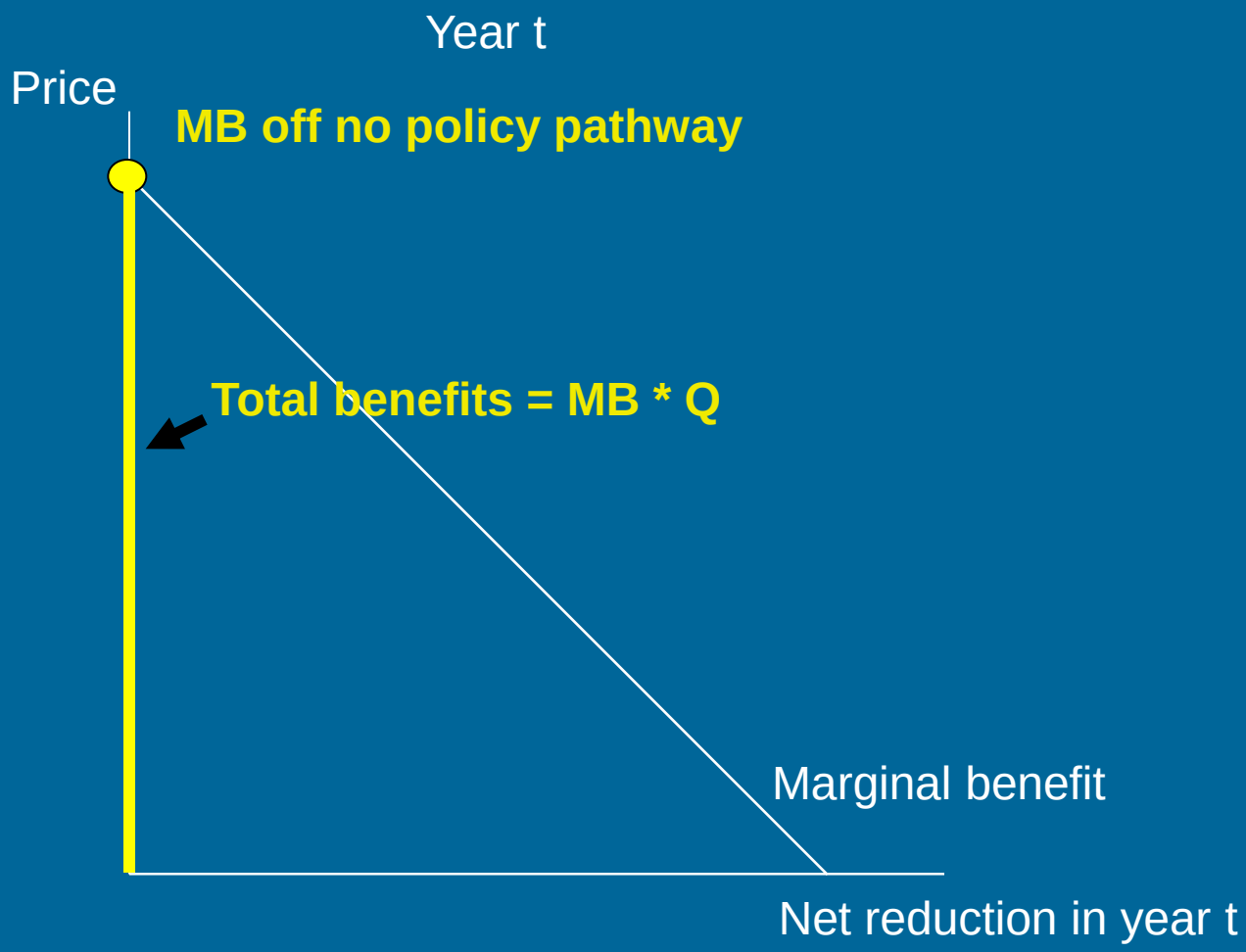
When managing climate, emissions, climate, and society are endogenous.

Simply can't use SCCs based on exogenous futures.



Danger of miscalculating benefits

Total benefits for incremental reductions



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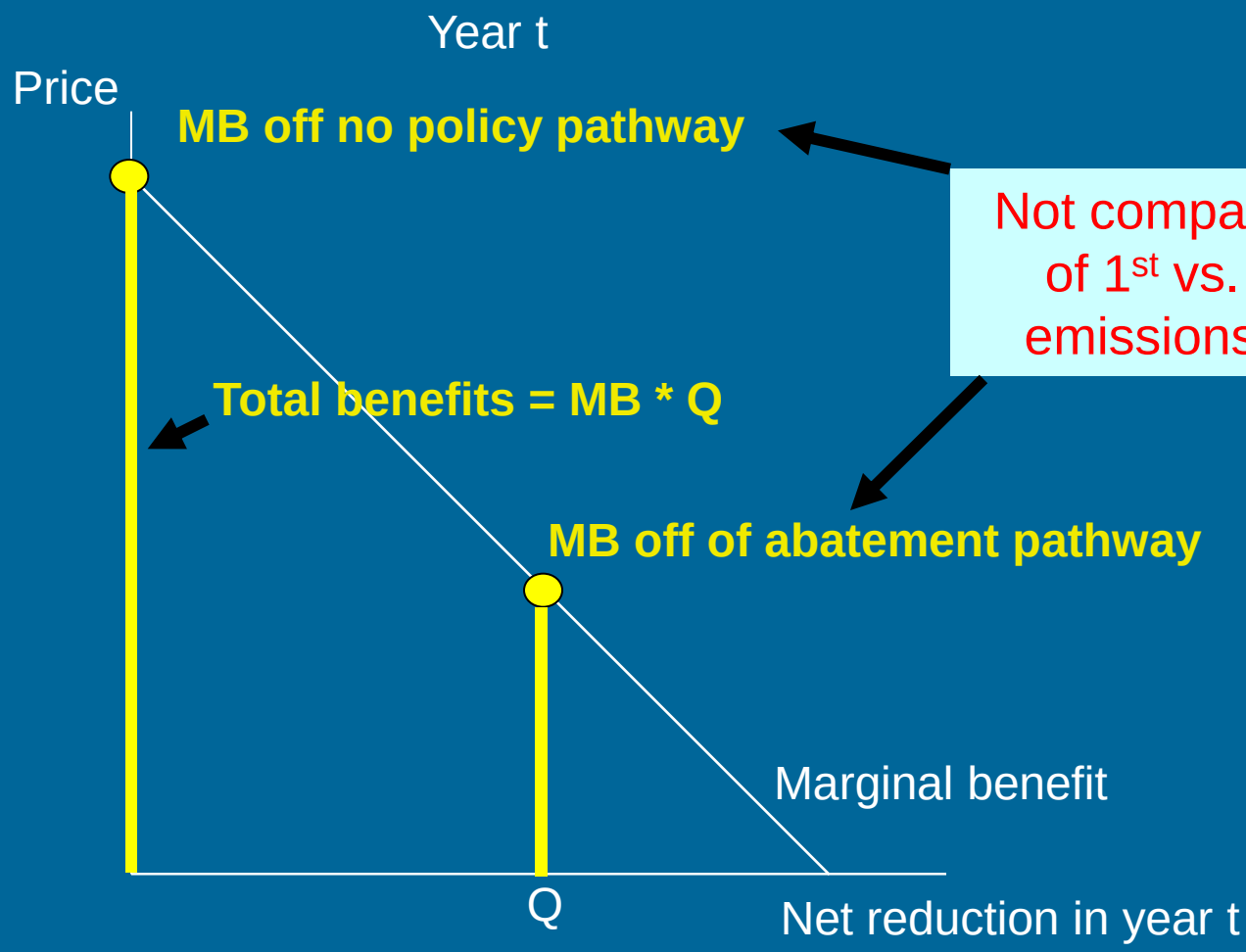
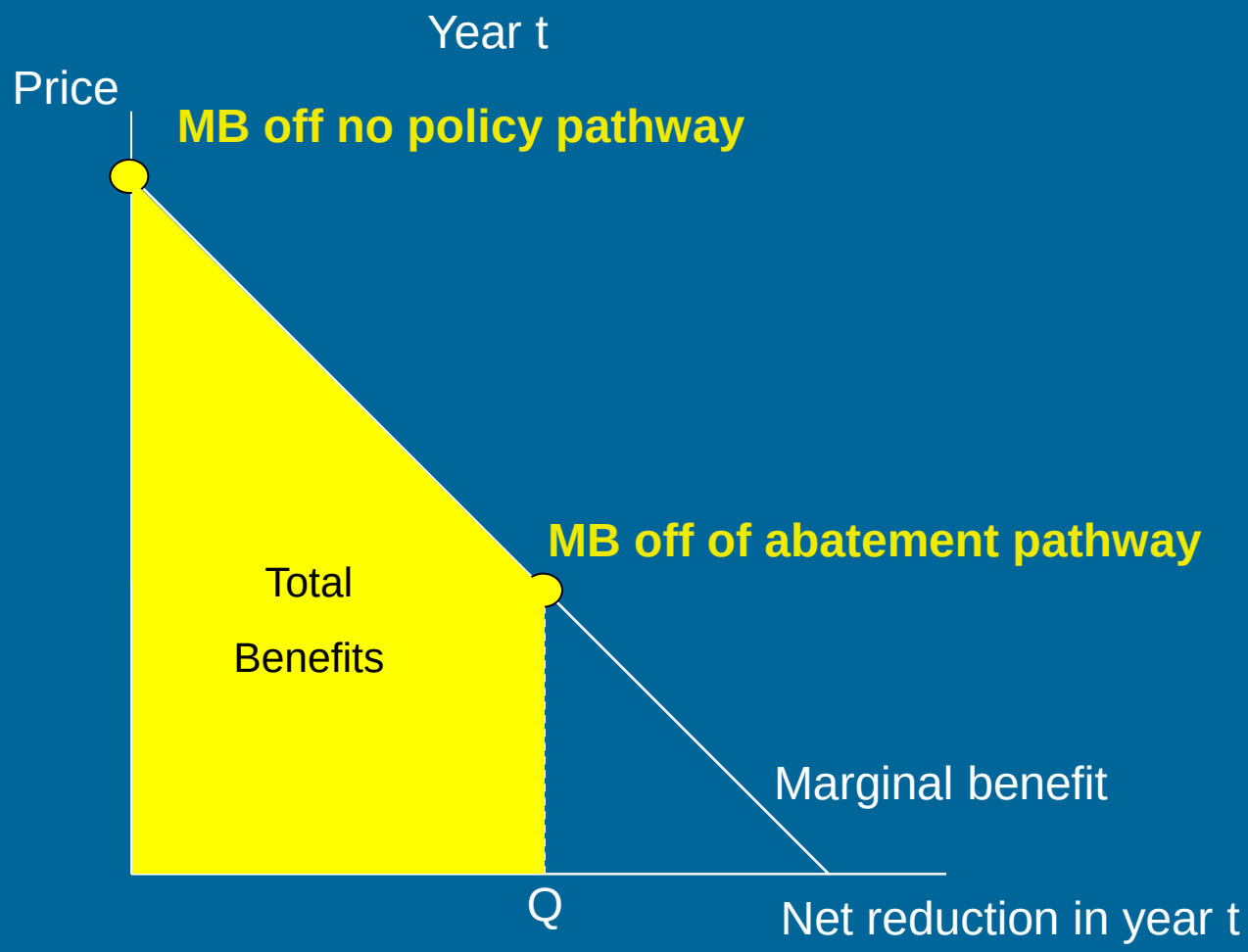
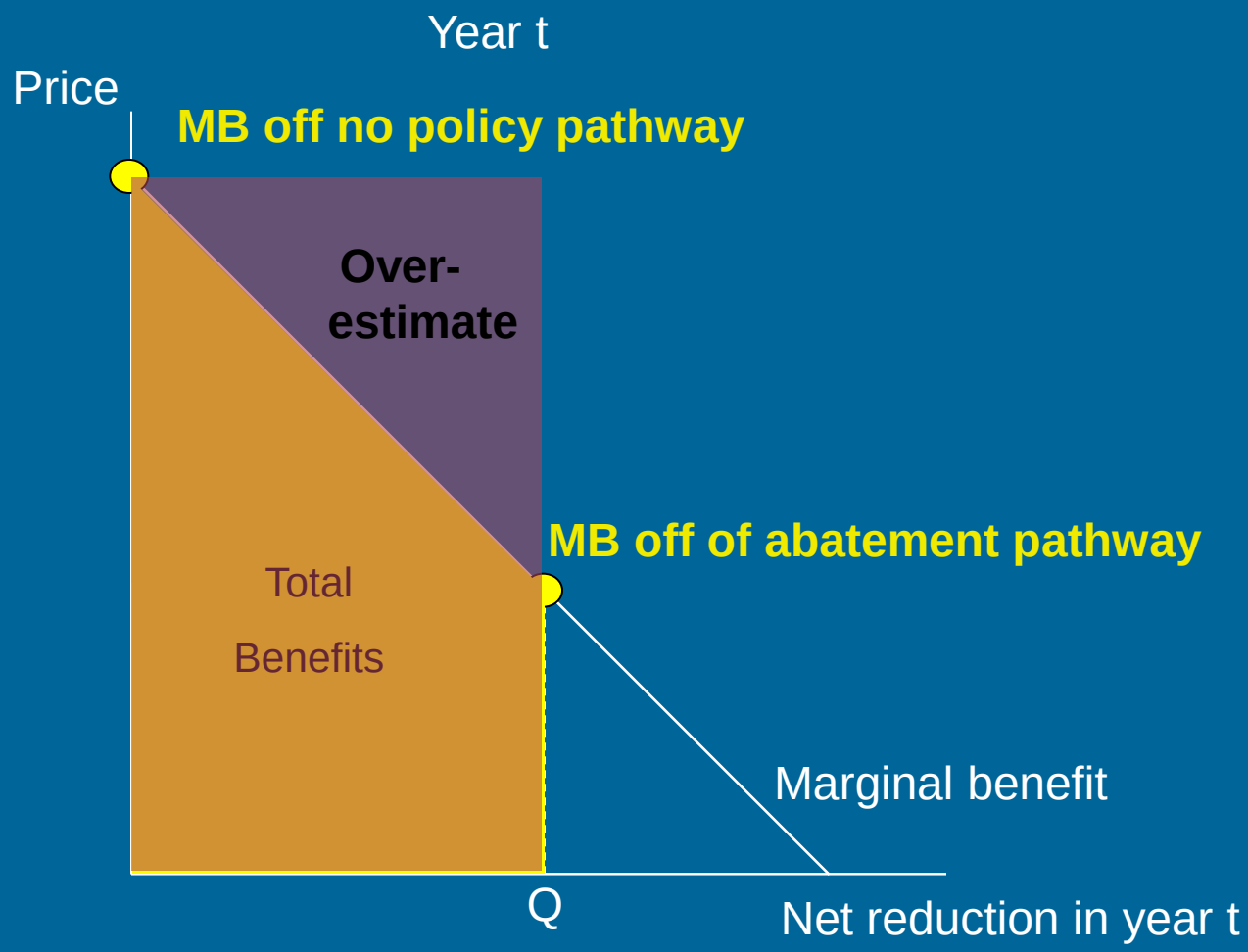


e.g., USG $72 vs $52/tCO2 for DICE IMAGE and 550 ppm scenarios (2007$ in 2020)

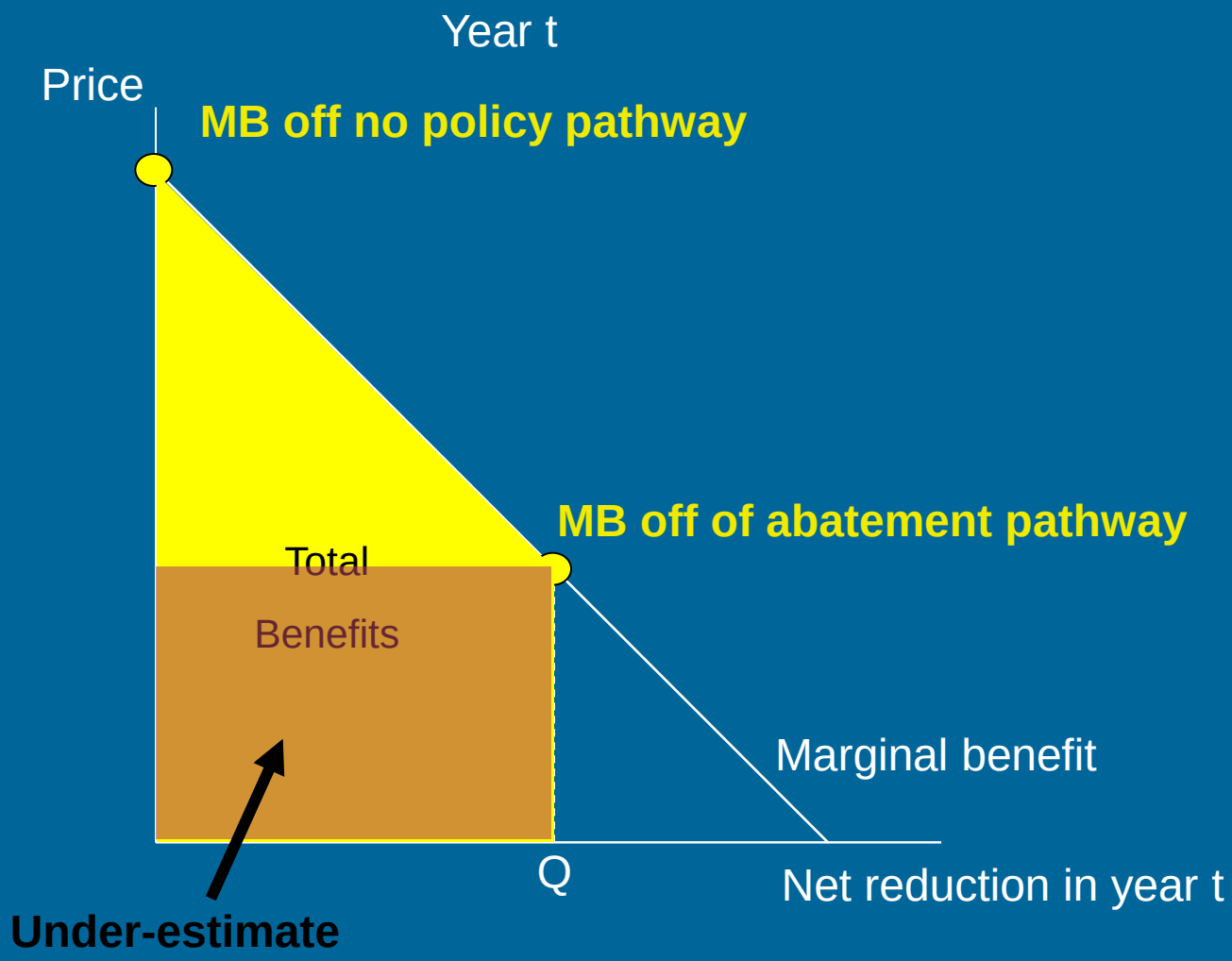
Total benefits for non-incremental reductions



Total benefits for non-incremental reductions



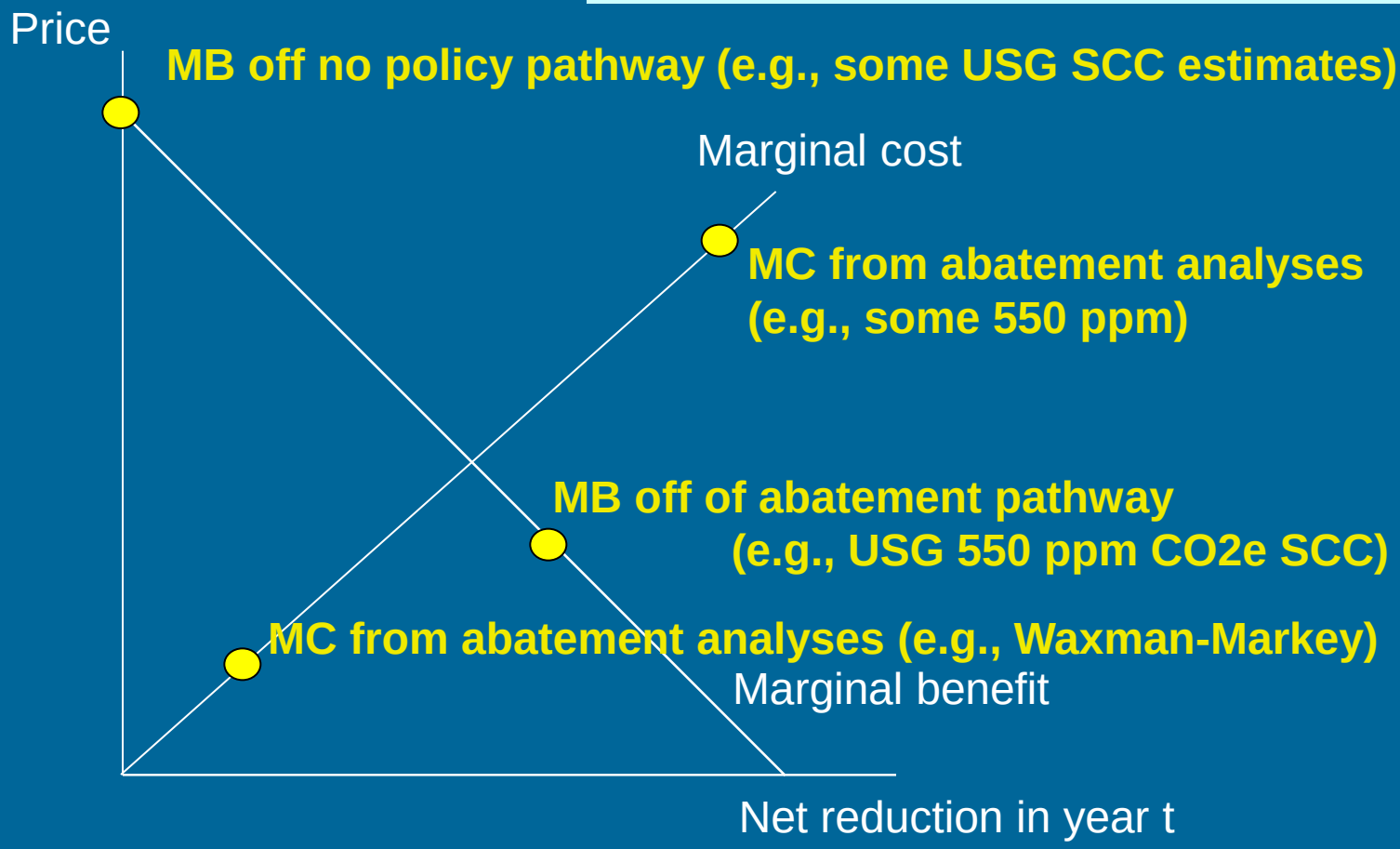
Total benefits for non-incremental reductions



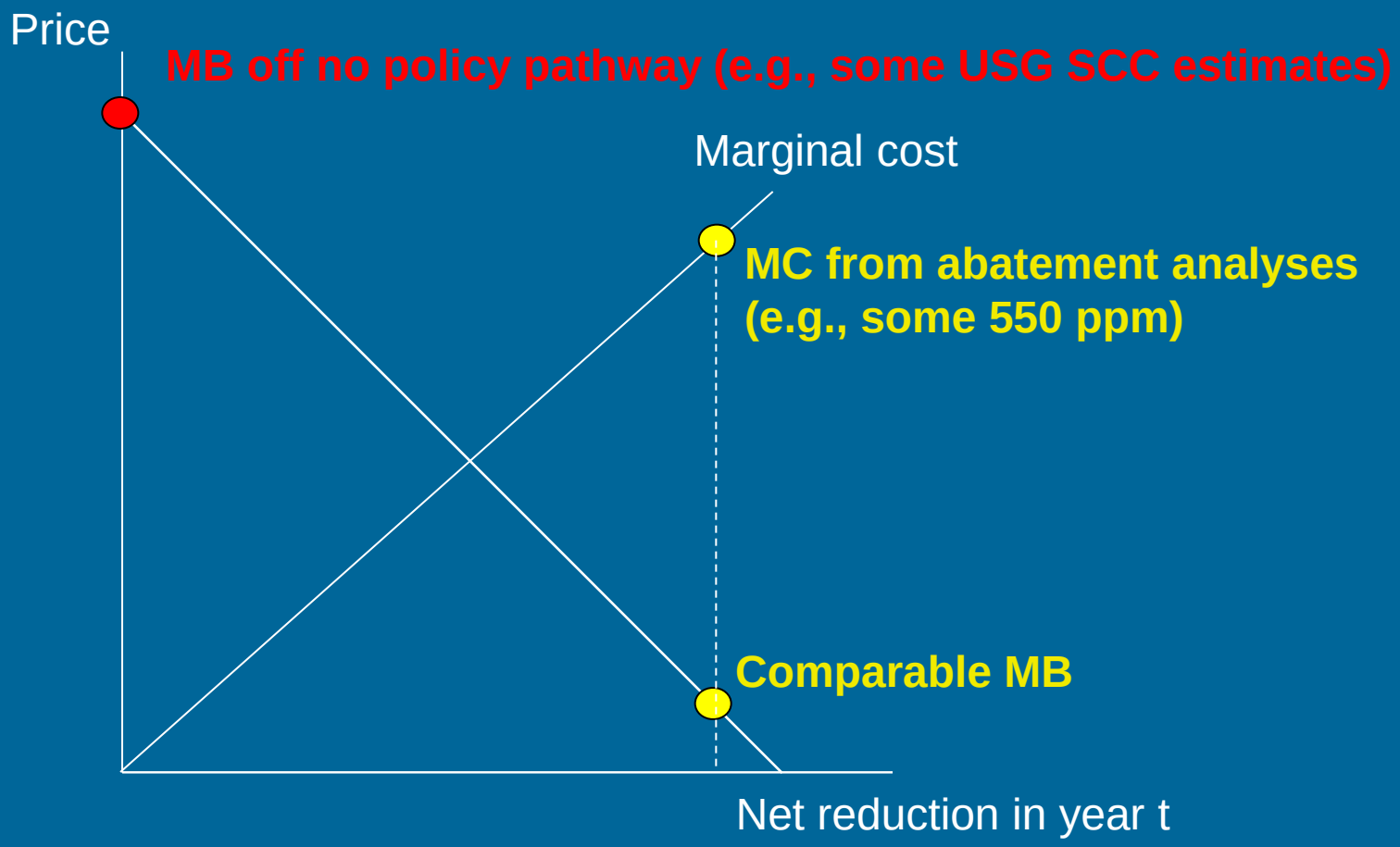
Comparing apples and oranges

Conceptually not comparable!

(And, assumption inconsistencies exacerbate)



Comparing apples and oranges

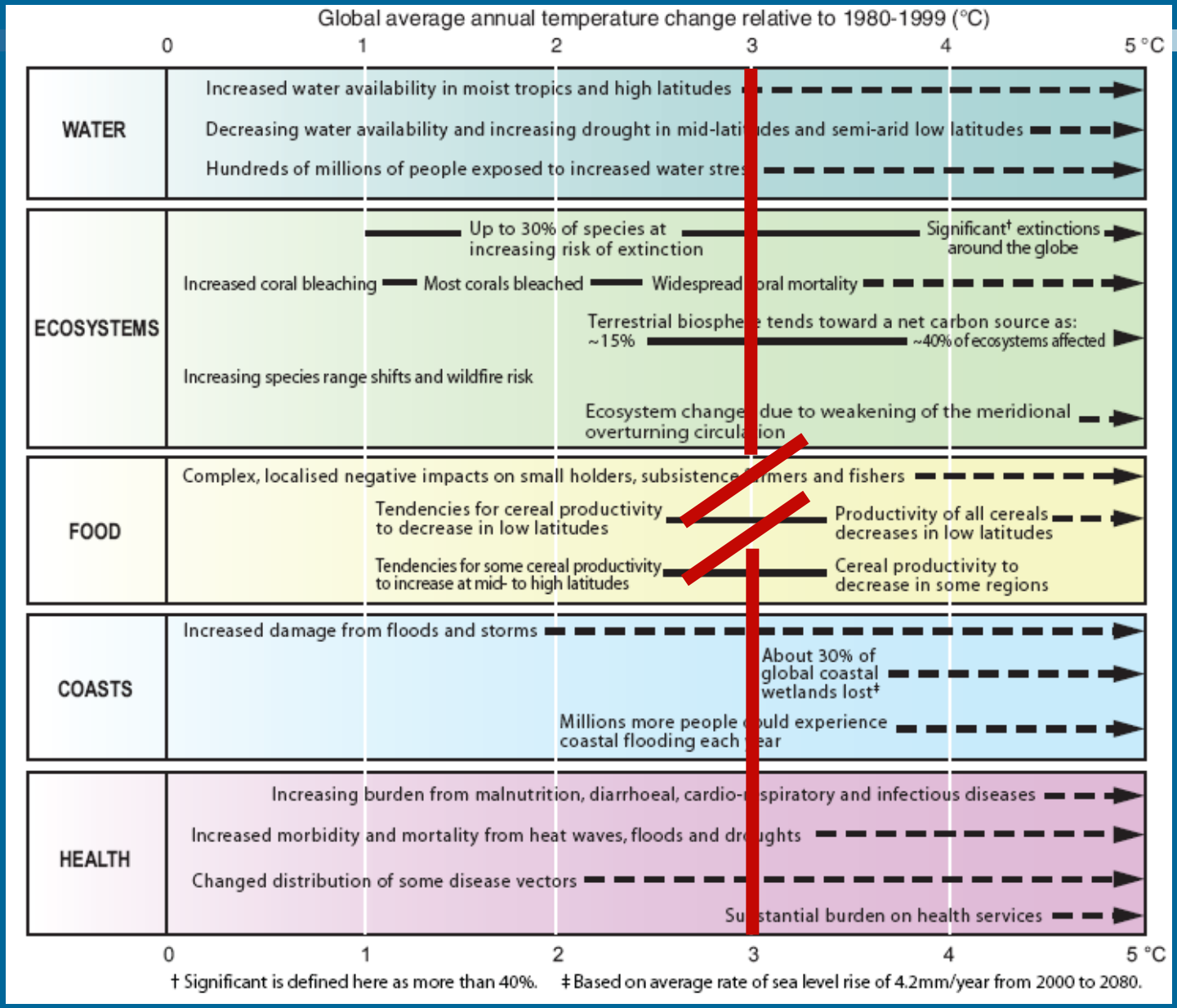


Appropriate application – practically

- **Need to consider the state of the art**
  - Aggregate stylized modeling of causal chain: socioeconomics-emissions-climate change-impacts
  - Only as strong as the literature – climate science, impacts, economics
    - Deficiencies significant – observational data, coverage, scaling, inconsistencies, behavior, poorly understood impact categories

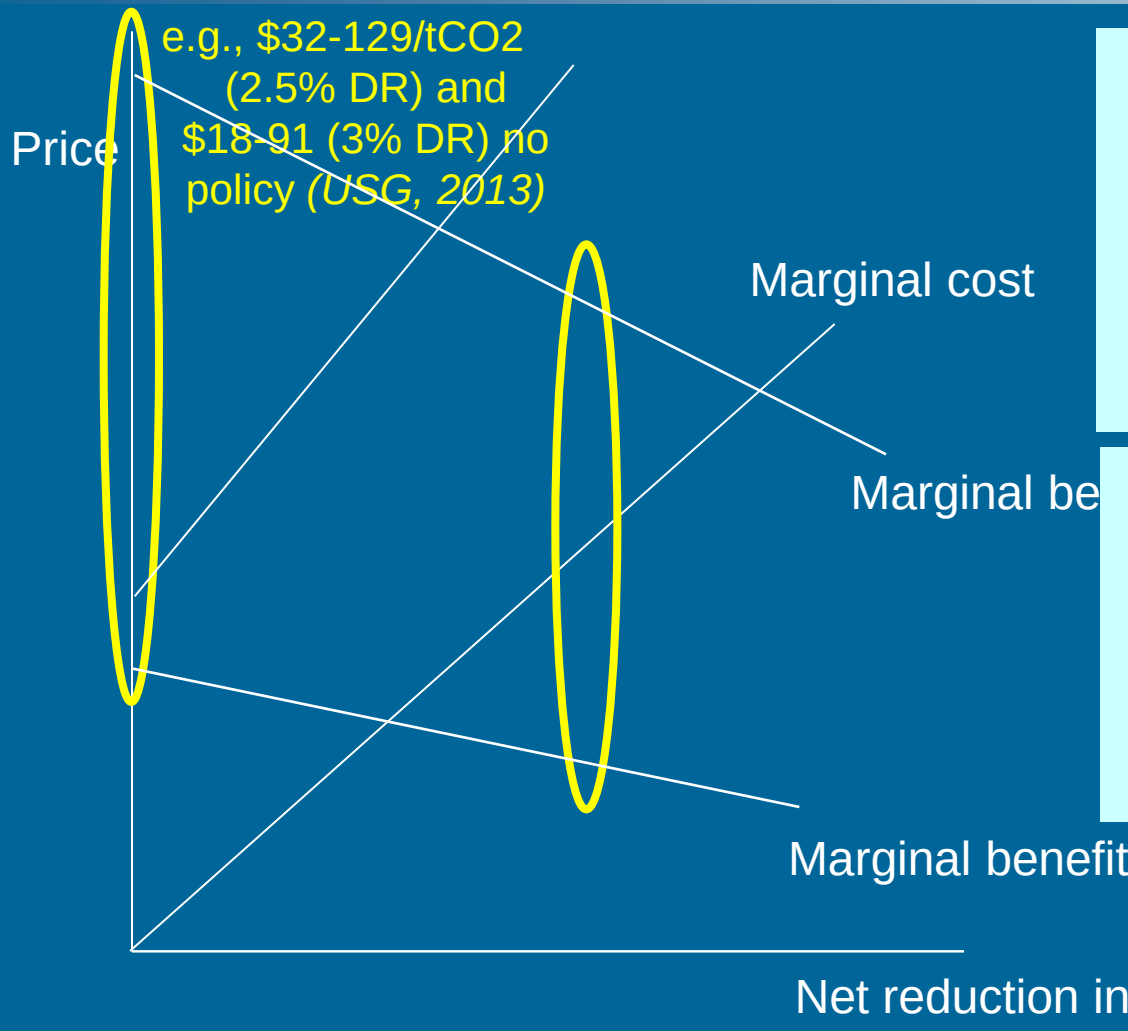
- **Uncertainty abounds but unknown**
  - From what is included – projections and parameters
    - And, distributions not well characterized
  - From what is not included – prominent reasons for concern (catastrophes, thresholds, irreversibilities, extreme weather, variability, biodiversity)

Impacts and avoided impacts literature – independent, inconsistent, not a sliding scale



IPCC WGII (2007)

Consequences of uncertain SCC

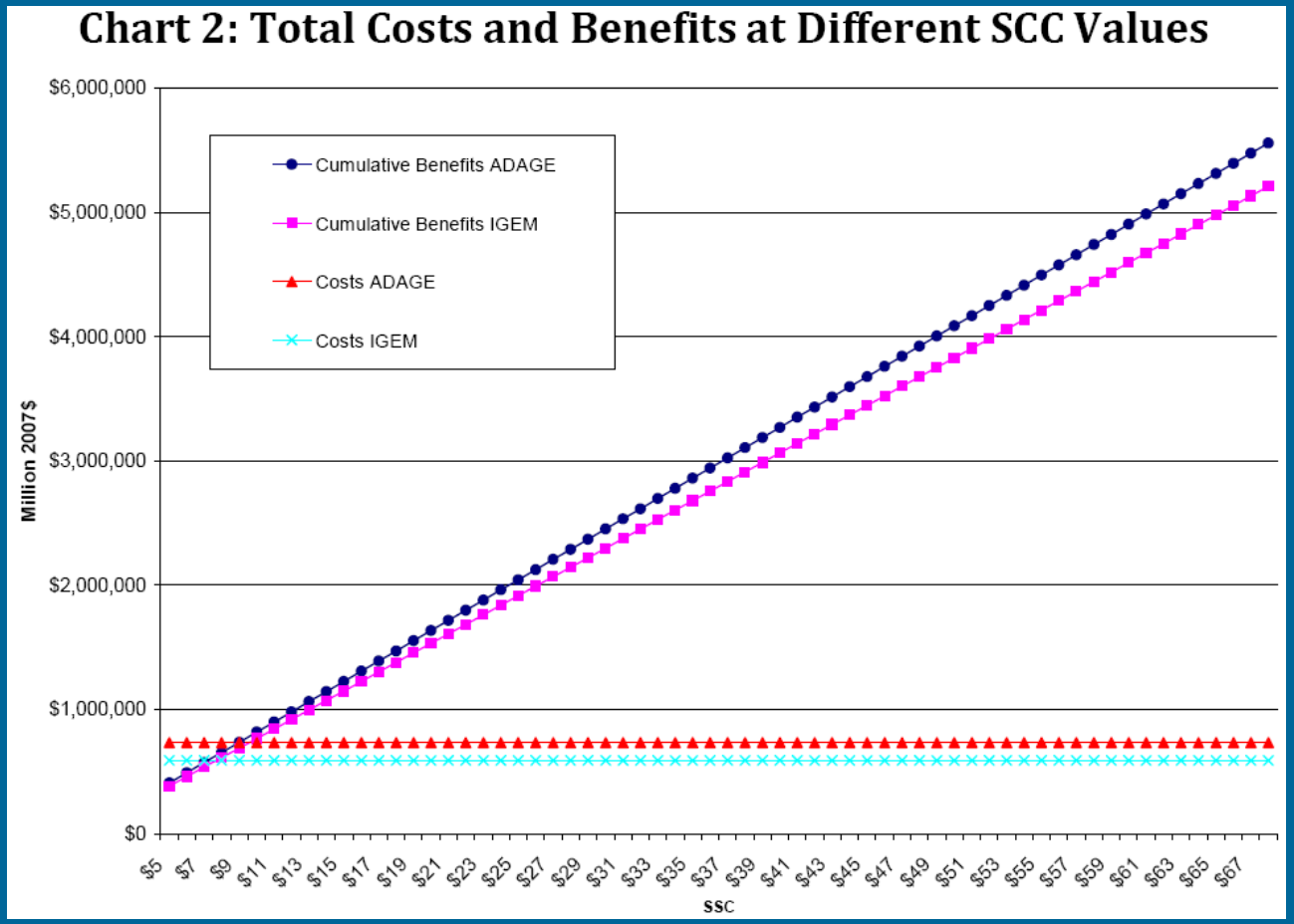


For incremental reductions, ranges appropriate. Expected values useful, but can be misleading. Question: how to consider deficiencies?

For non-incremental reductions, robustness an issue.

(cost uncertainty exacerbates)

Caution about SCC based benefit-cost comparisons for non-incremental changes – e.g., domestic climate policy



Cumulative Benefits

Cumulative Costs

Holladay & Schwartz (2009)

- Numerous inconsistencies, not using net global emissions changes, omitted impacts, no consideration of risk
- Cost uncertainty ignored – policy implementation, technology availability, international assumptions?

Caution about SCC based benefit-cost comparisons for non-incremental changes – e.g., intl climate policy

	NPV Cost		NPV Benefit	Benefit-cost ratio
Initial carbon tax \ Period	2010-2020	2010-2100	2010-2100	2010-2100
World: 2 $/tC (century)	$ 0.2 10^9	$ 0.1 10^{12}	$ 0.1 10^{12}	1.51
World: 12 $/tC (century)	$ 5.6 10^9	$ 2.0 10^{12}	$ 0.5 10^{12}	0.26
World: 250 $/tC (decade)	$ 2.0 10^{12}	$ 17.8 10^{12}	$ 0.2 10^{12}	0.01
World: 250 $/tC (century)	$ 2.0 10^{12}	$ 46.7 10^{12}	$ 1.1 10^{12}	0.02
OECD: 700 $/tC (decade)	$ 2.0 10^{12}	$ 13.3 10^{12}	$ 0.0 10^{12}	0.00

> 800 ppm CO2 in 2100

~ 450 ppm CO2 in 2100

Tol (2009)

But,

- Omitted impacts, no consideration of risk, single scenario, discount rate 5%
- Only abating energy & industrial CO2 with ideal policy assumptions

An issue with current USG SCC incremental applications?

Considering changes in global emissions

- To date, policies applying USG SCCs have not estimated changes in global emissions – is there a benefits bias?
  - 1% leakage ➔ 1% reduction in CO2 benefits
  - 10% leakage ➔ 10% reduction in CO2 benefits
  - 20% leakage ➔ 20% reduction in CO2 benefits

Opportunities for future improvements in USG SCC

Methodological opportunities for improving USG SCCs

- Fuller uncertainty where possible (e.g., socioeconomics)
- Value risk
- Assumptions and estimates should be consistent with incremental changes (e.g., pathways, extensions)
- Economic growth and discounting should be consistent
- Need to value non-CO2 GHG changes
- Guidance needed for computing global emissions changes

Summary remarks

- SCCs have a place, but not appropriate for all decisions.
- SCCs relevant and appropriate for valuing incremental global GHG changes (and needed legally and economically)
  - Baseline global SCCs most appropriate (with room to improve)
  - Ranges and expectations appropriate
  - Need to estimate changes in global emissions
- SCCs not appropriate for valuing non-incremental GHG changes
- SCCs not robust for setting climate targets (even if applied properly)
  - Robustness an issue given the state of the art, in particular SCC sensitivity and deficiencies.

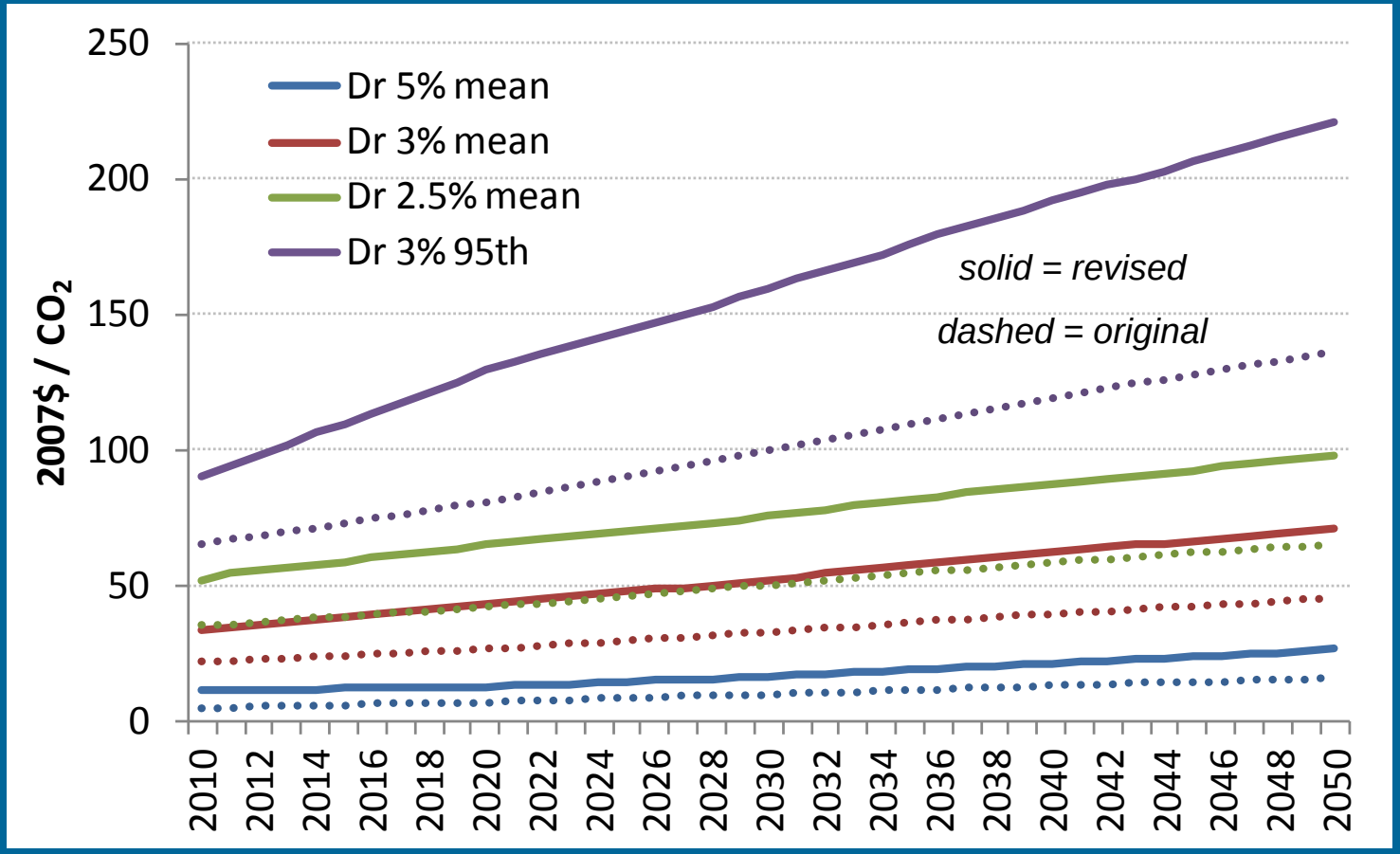
Need for non-incremental impacts analyses, as well as basic science and consistent impacts analyses

Thank you!

Steven Rose
srose@epri.com

EXTRAS

US Government SCC Values
(2007$/tCO$_2$)



Developed from USG (2013)

Analytical guidance for choosing and applying SCC values

Issue	Guidance	U.S. Interagency WG[4]	U.S. EPA[9,10]	Defra[17]
Global vs domestic	Global	Global	Global and domestic	Global
Non-CO_2 GHG changes	Should be valued	Not valued	Via CO_2 equivalent emissions	Via CO_2 equivalent emissions
Global net GHG changes	Should be estimated	Not noted	Noted	Not noted
Time horizon	Over 100 years	Yes	Yes	Yes
Discounting	Discount rates of 3% and lower	2.5%, 3%, 5%	1%, 3%, 7%	1.4%
	Dynamic discount rates	No (Constant)	Yes	No (Constant)
	Regional discount rates	No (Global)	Yes	No (Global)
Uncertainty	Ranges and expected values	Ranges and expected values by discount rate for averages across models	Ranges by discount rate	Range
Risk	Include risk premium	No	No	No
	Risk consideration in value selection	No	No	No
Values over time	Change over time	Yes	Yes	Yes
Omitted impacts	Could be considered	No	No	No
Reference conditions	Derive estimates off nonclimate policy reference scenarios (i.e., baselines)	No (baseline and climate stabilization reference scenarios)	Yes (baseline reference scenarios)	No (climate stabilization reference scenario)
Equity weighting	Should not be used	Not used	Not used	Not used
Literature or new modeling	Guidance for each (see text)	New modeling with three models	New modeling	New modeling
Application of SCCs	Suitable for incremental net global emissions changes	Incremental, but nonincremental left open	Incremental	Incremental and nonincremental

Rose (2012)