

THE GAS STRATEGY

Will the gas boom solve climate change?

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Will the gas boom solve climate change?

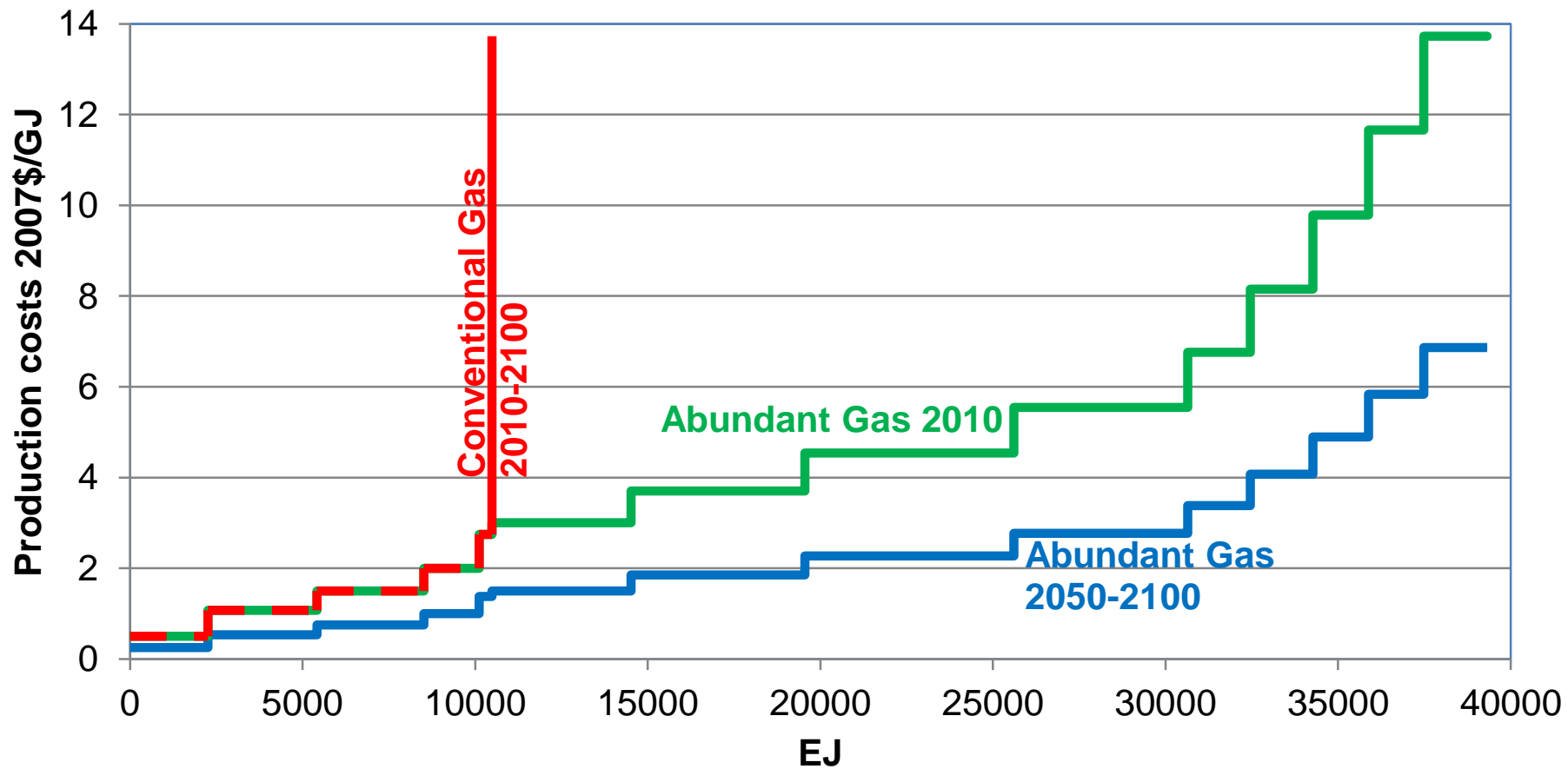
The question we're addressing this year

- ▶ Can abundant natural gas on its own substantially mitigate climate change in the absence of climate policies?

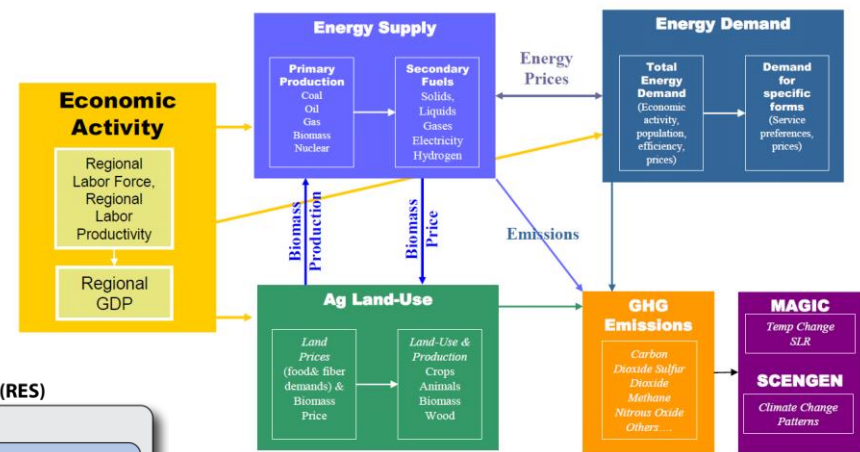
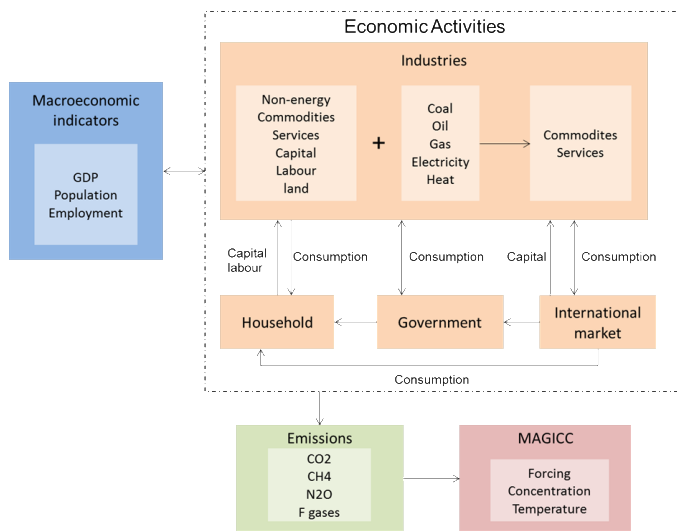
The question we will be address next year

- ▶ Can abundant natural gas play a major role in mitigating climate change in the presence of dedicated climate policy?

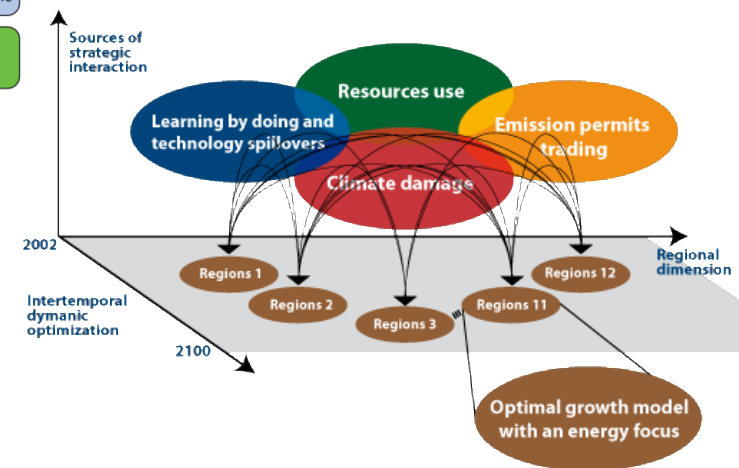
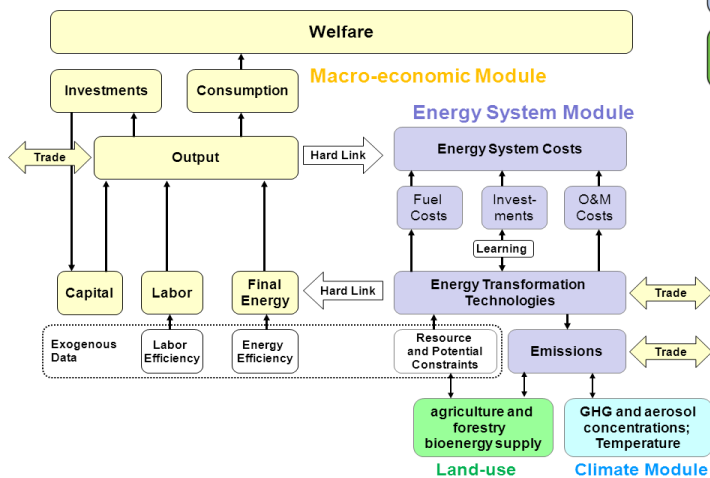
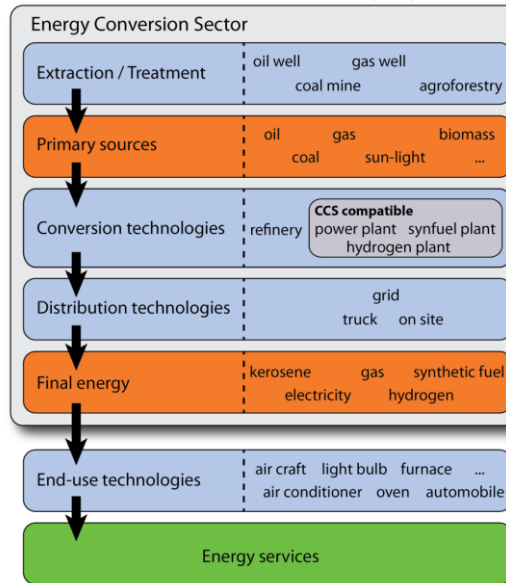
Natural Gas Supply Curves



Integrated Assessment Models

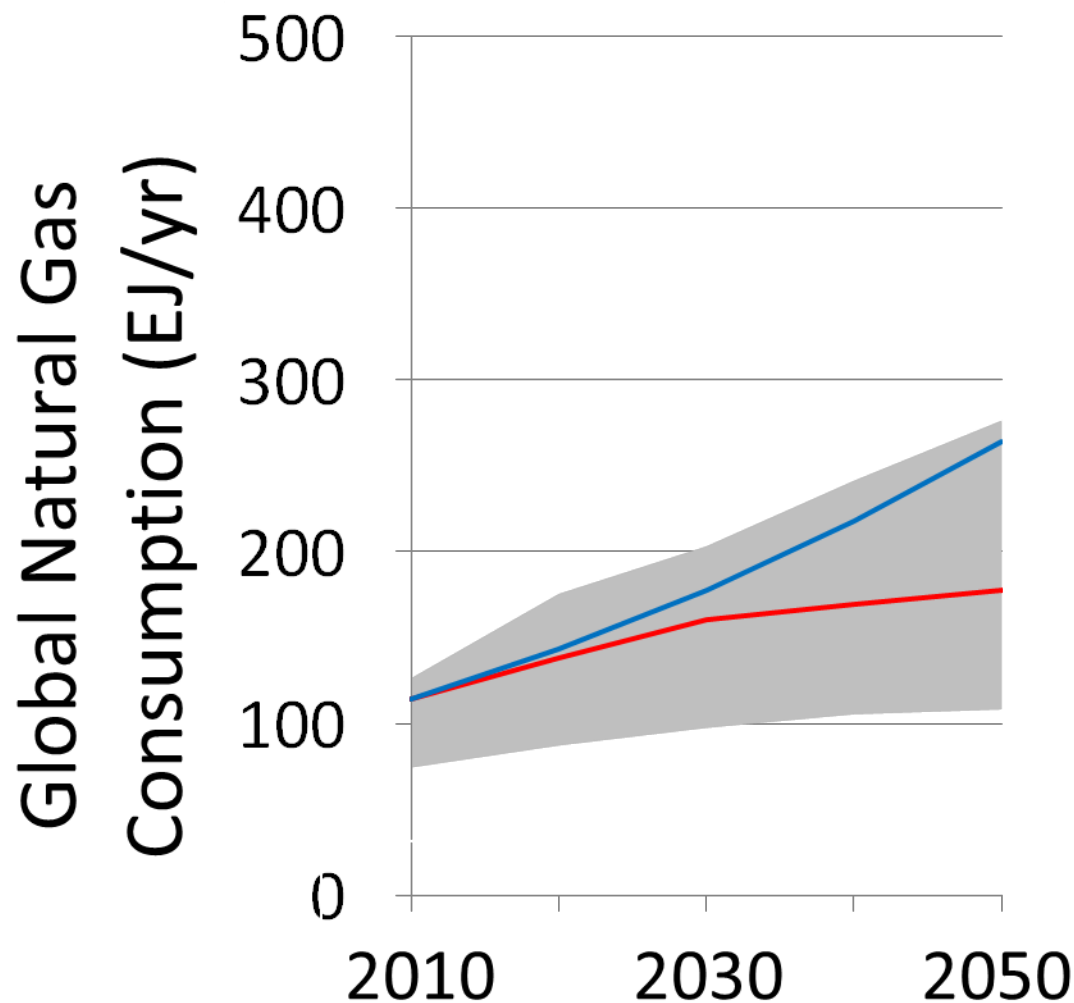


MESSAGE REFERENCE ENERGY SYSTEM (RES)

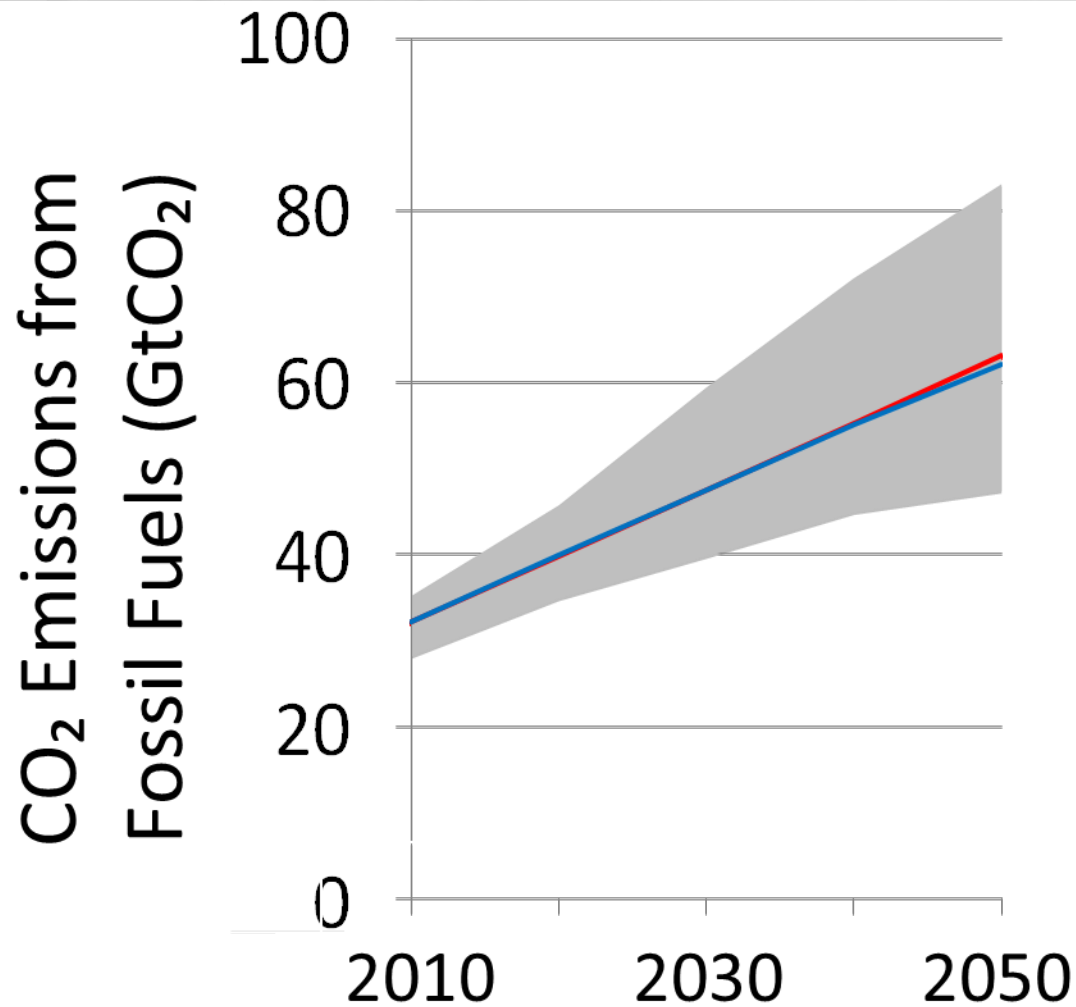


Model results

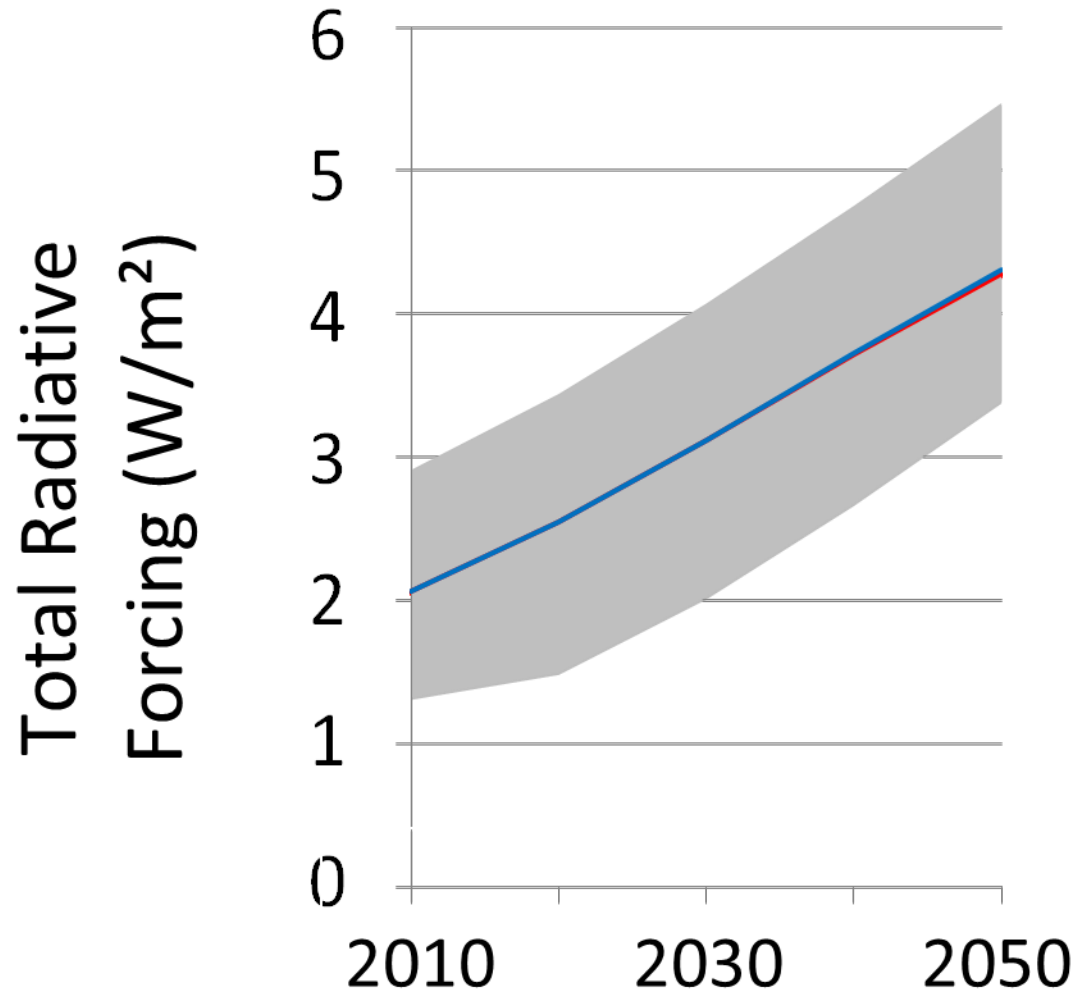
Natural Gas Consumption



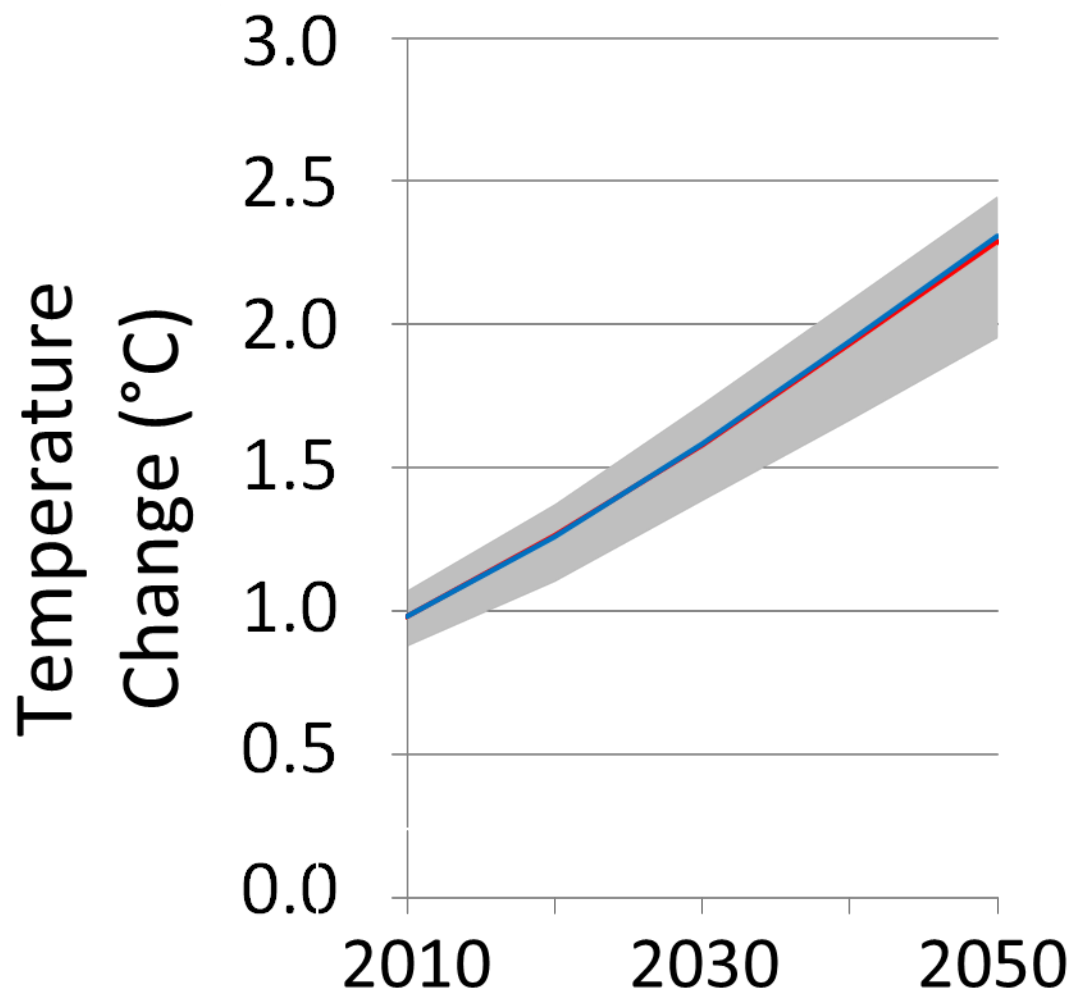
CO₂ Emissions

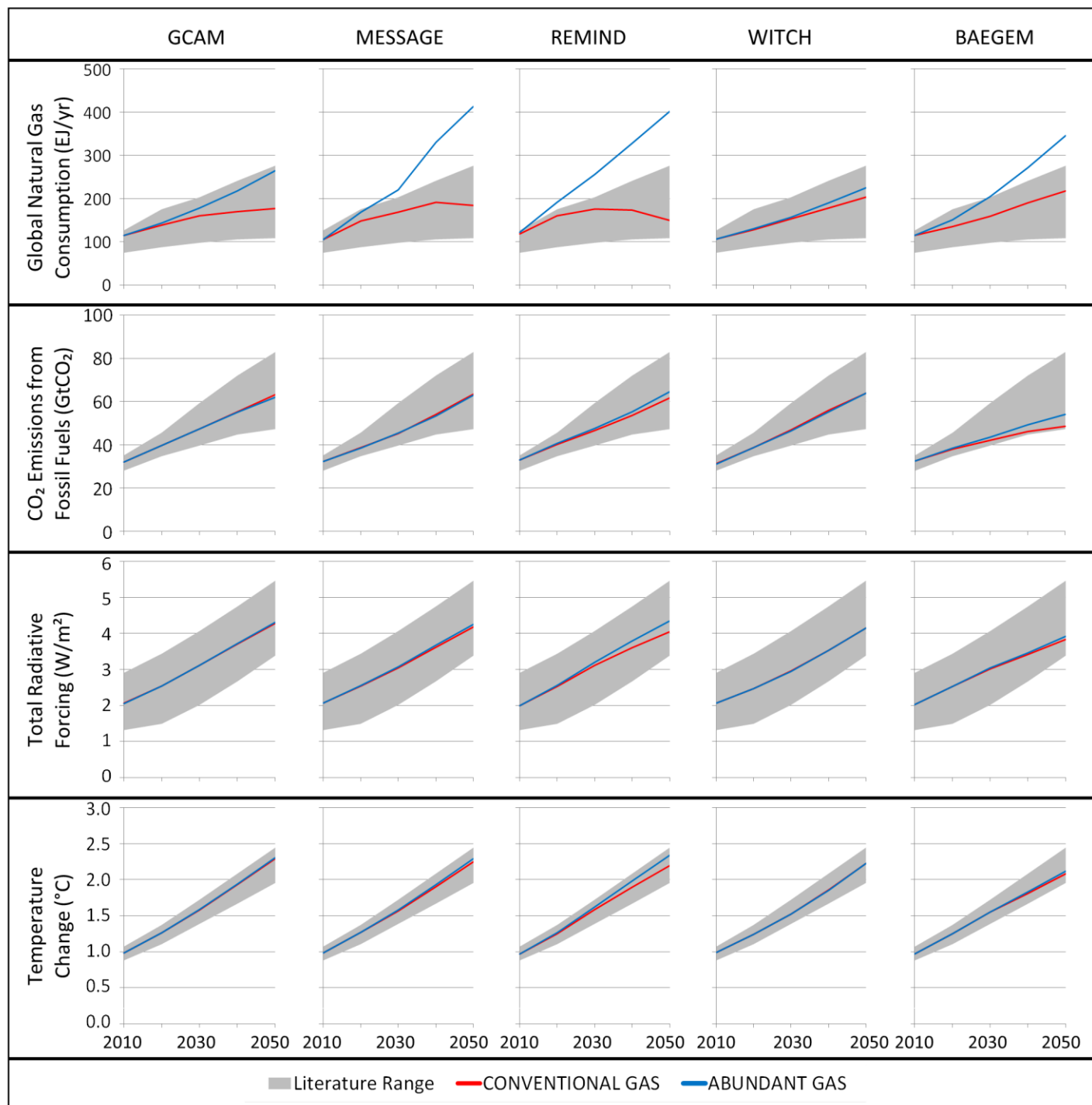


Radiative Forcing



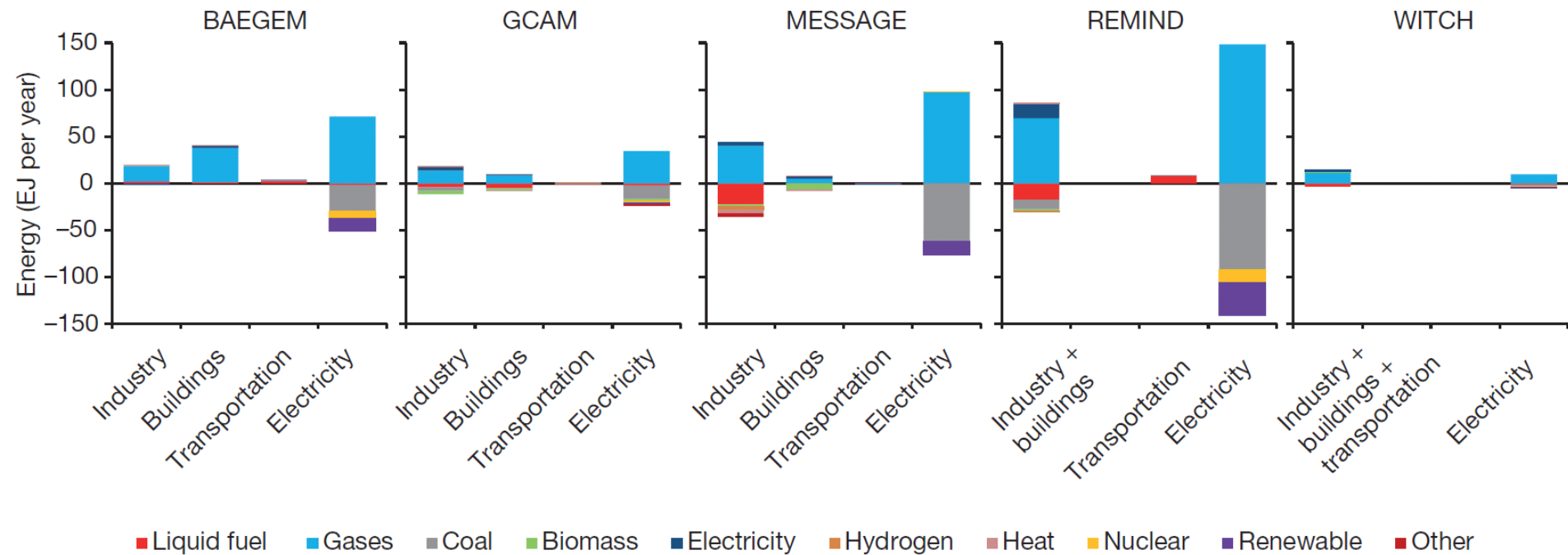
Temperature Change



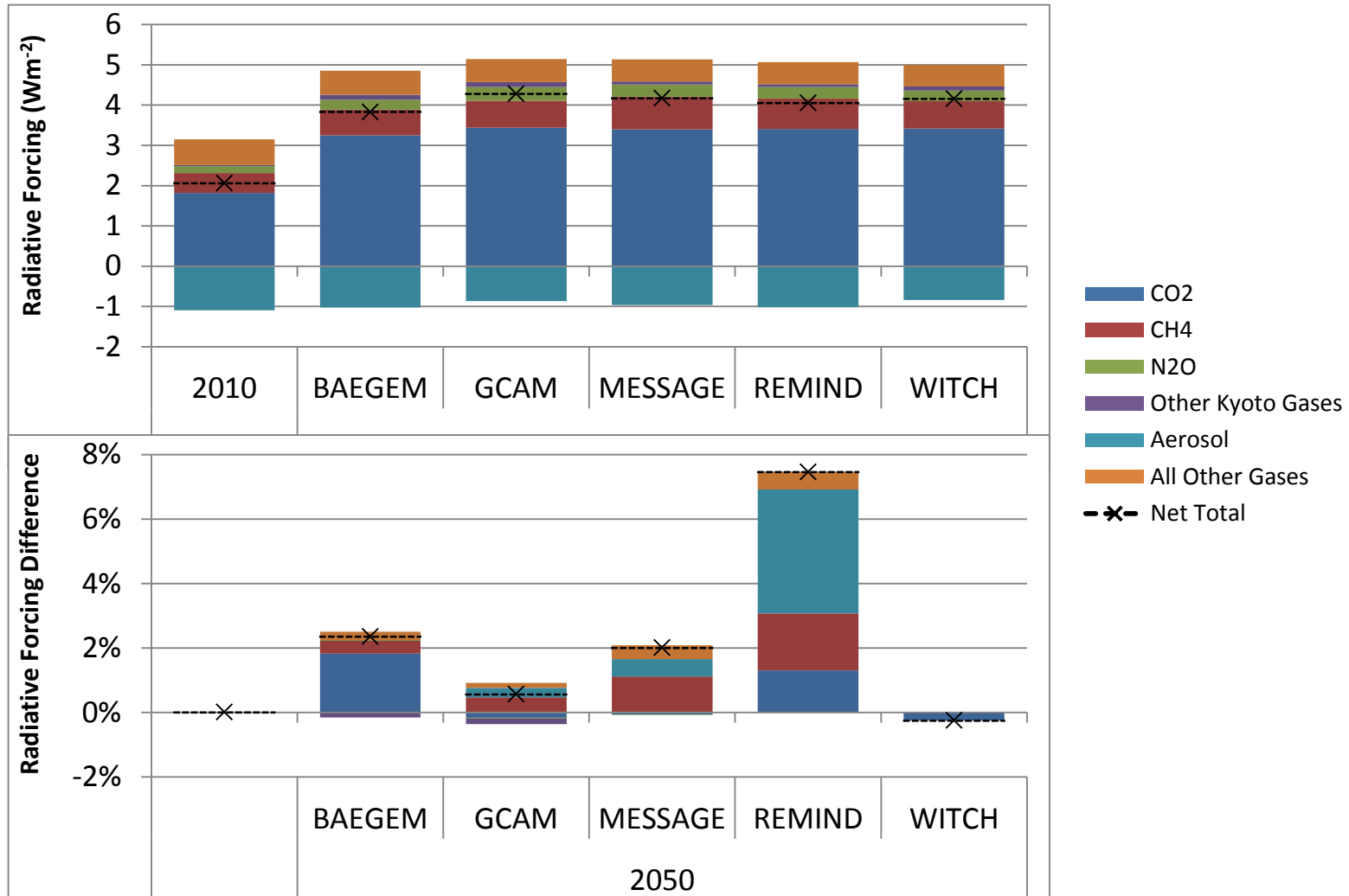


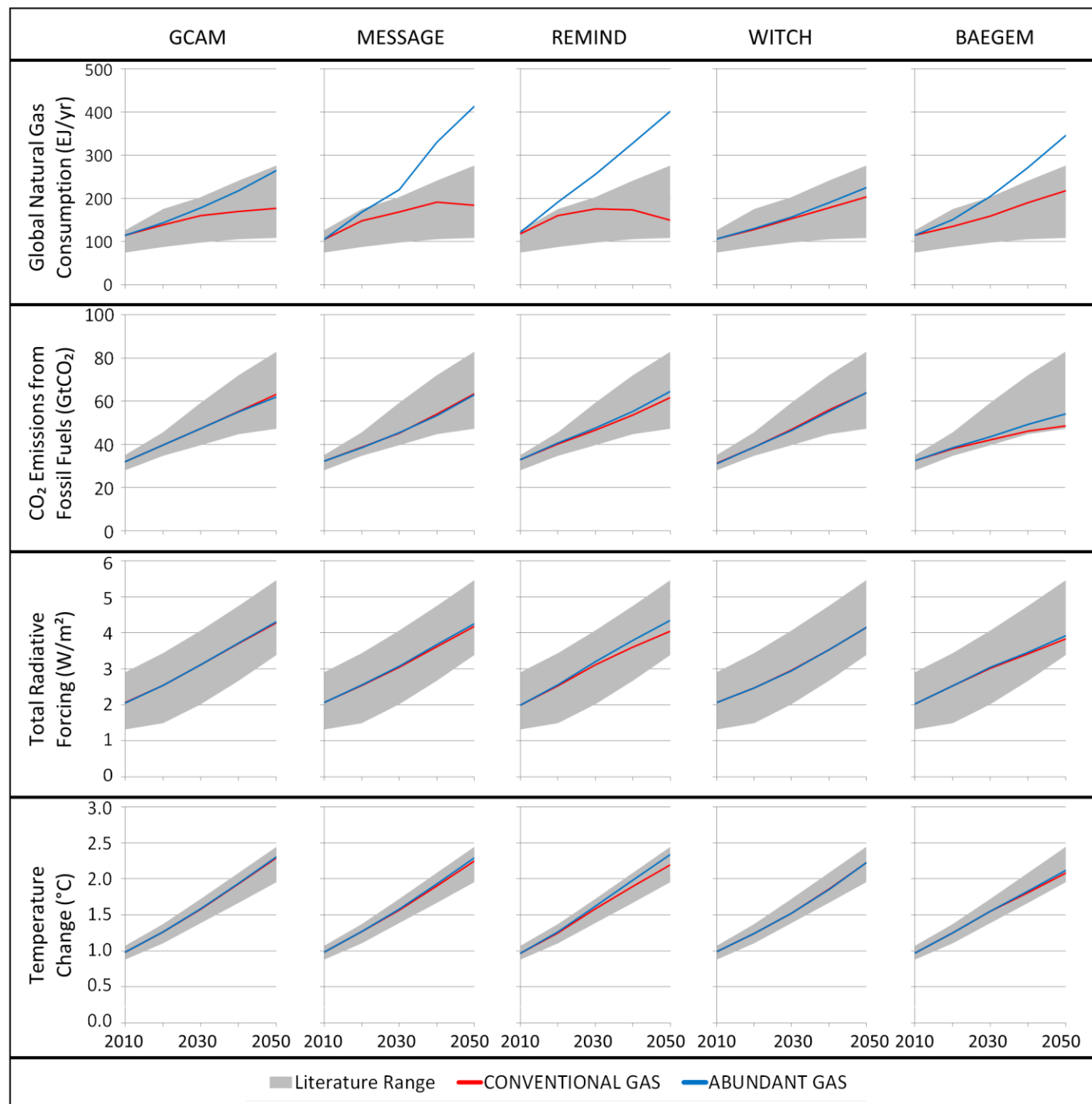
But why?

Energy Consumption Difference 2050



Radiative Forcing in 2050



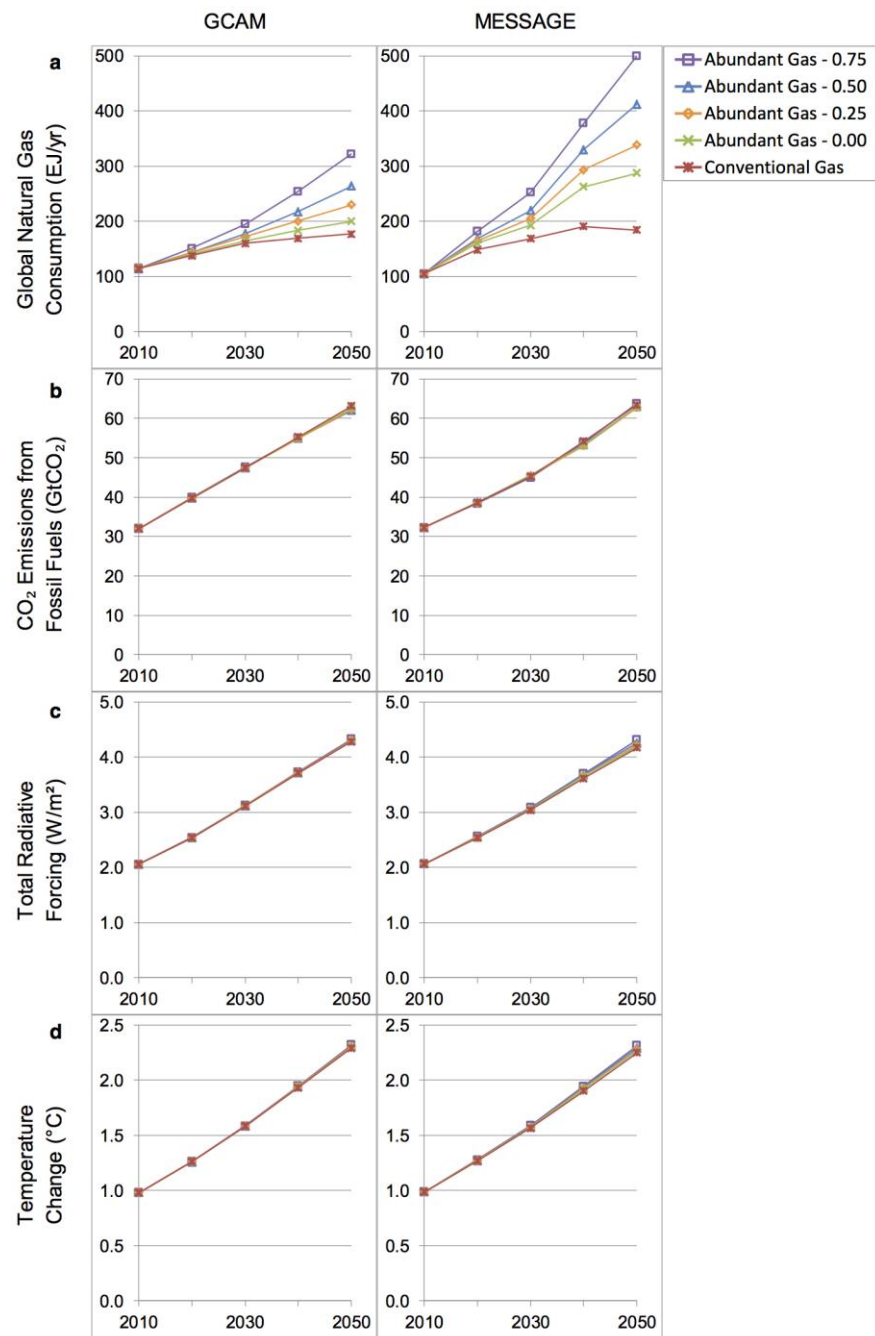




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Sensitivity analysis



Energy market dynamics sensitivity

Extended Data Table 2 | CO₂ emissions in 2050 from fossil fuels and industry with standard energy market assumptions and with the coal-substitution-only assumption

		BAEGEM	GCAM	MESSAGE	REMIND	WITCH	units
Standard	Conventional Gas	48.5	63.1	63.4	61.7	63.8	GtCO ₂
	Abundant Gas	54.0	62.1	62.9	64.6	63.9	GtCO ₂
	Difference	5.5	-1.1	-0.5	2.9	0.0	GtCO ₂
Coal Substitution Only	Conventional Gas	48.5	63.1	63.4	61.7	63.8	GtCO ₂
	Abundant Gas	51.9	60.4	59.7	60.4	63.8	GtCO ₂
	Difference	3.3	-2.8	-3.8	-1.3	-0.0	GtCO ₂

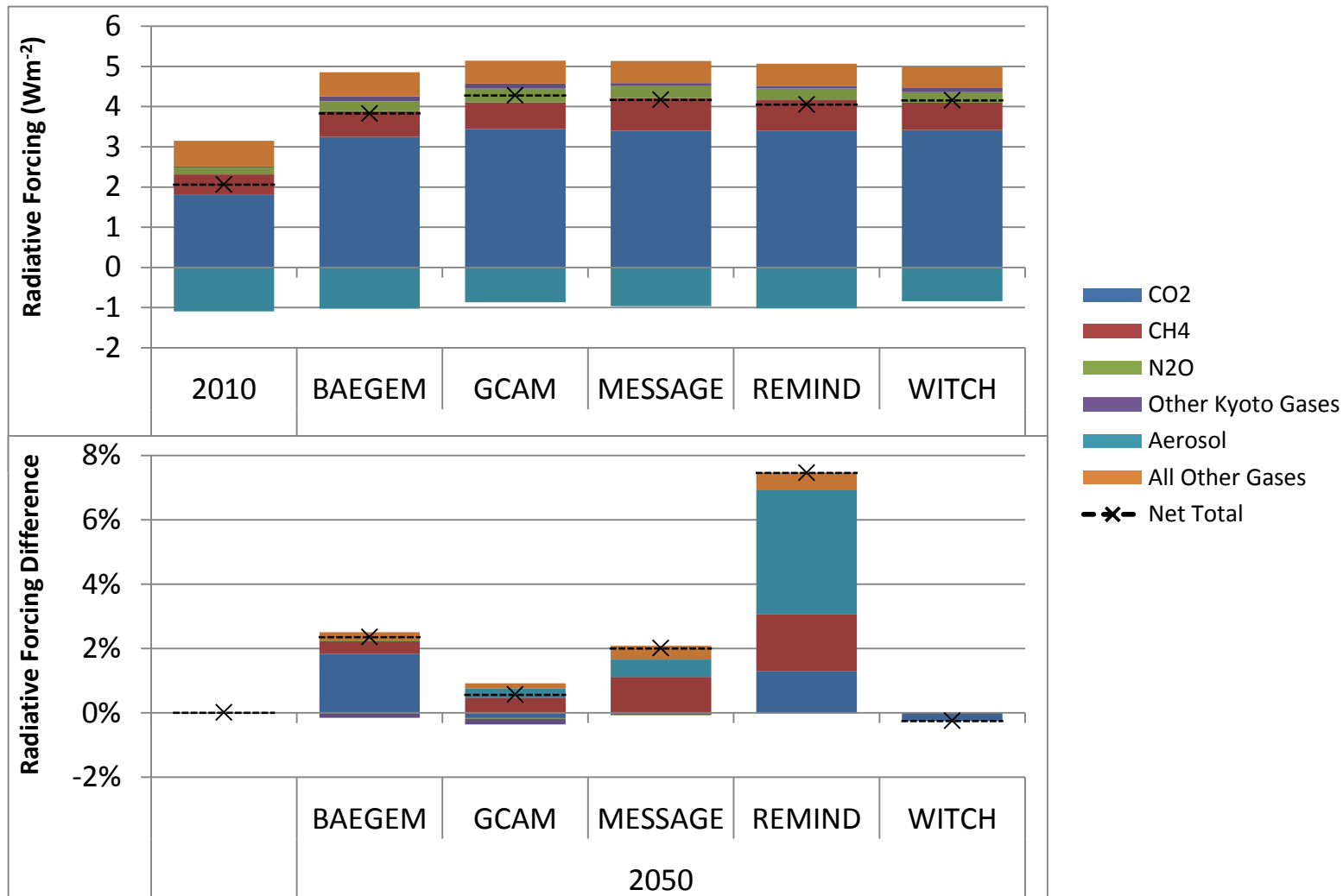
Fugitive methane emission sensitivity

Extended Data Table 3 | 2050 emission factors for fossil fuels in each model

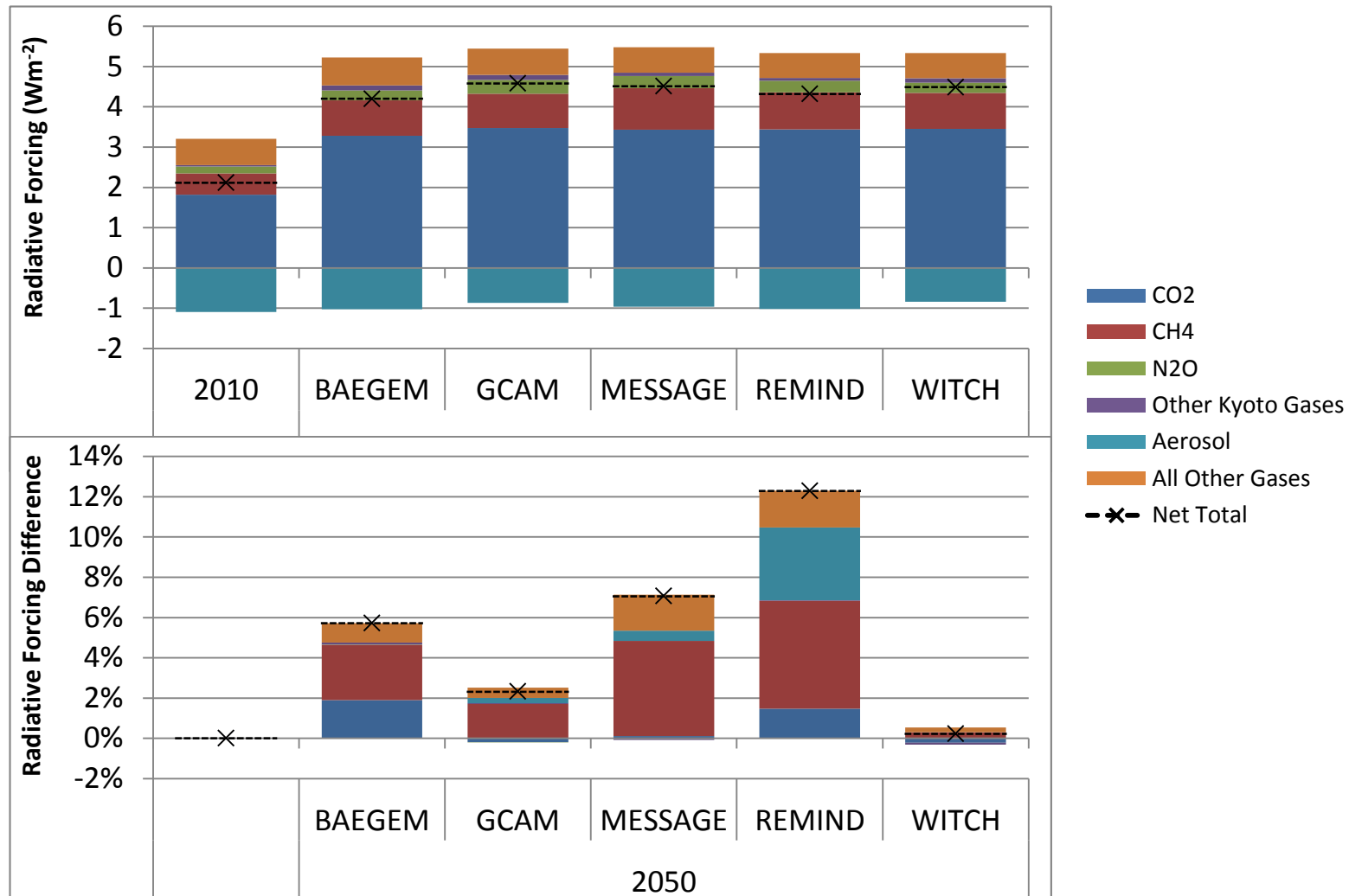
		BAEGEM	GCAM	MESSAGE	REMIND	WITCH	units
CO ₂	Coal	101	100	95-101	96	90	kgCO ₂ /GJ
	Oil	79	72	73	68	70	kgCO ₂ /GJ
	Gas	59	52	56	56	55	kgCO ₂ /GJ
CH ₄	Coal	0.21	0.14	0.39	0.12	N/A	kgCH ₄ /GJ
	Oil	0.11	0.06	0.06	0.06	N/A	kgCH ₄ /GJ
	Gas	0.32	0.35	0.31	0.52	N/A	kgCH ₄ /GJ

CO₂ emission factors specify the average carbon content of the fuel. CH₄ emission factors specify average fugitive methane emissions associated with production and transportation of each fossil fuel reported for the Abundant Gas scenario.

Radiative Forcing in 2050 with Standard Fugitive Methane Emissions



Radiative Forcing in 2050 with High Fugitive Methane Emissions



Fugitive methane emission sensitivity

Extended Data Table 4 | 2050 anthropogenic radiative forcing with standard fugitive methane emission assumptions and with high fugitive methane emission assumptions

		BAEGEM	GCAM	MESSAGE	REMIND	WITCH	units
Standard	Conventional Gas	3.97	4.46	4.25	4.16	4.38	W m ⁻²
	Abundant Gas	4.07	4.49	4.37	4.46	4.37	W m ⁻²
	Difference	0.10	0.02	0.12	0.31	-0.01	W m ⁻²
High Fugitive Methane	Conventional Gas	4.20	4.58	4.51	4.32	4.49	W m ⁻²
	Abundant Gas	4.44	4.69	4.83	4.85	4.50	W m ⁻²
	Difference	0.24	0.11	0.32	0.53	0.01	W m ⁻²

- ▶ It has been hoped that abundant natural gas displacing coal could be a strategy to mitigate climate change.
- ▶ Five IAMs independently reached the same conclusion:
- ▶ Abundant gas can not solve climate change on its own in the absence of climate change mitigation policies.
- ▶ Our findings show little sensitivity to individual assumptions:
 - Our findings are not sensitive to the assumption of “abundance”.
 - Our findings show small but appreciable change with RPS or CES to protect low-carbon energy.
 - Our findings show small but appreciable change with high fugitive methane emissions.

- ▶ The role of abundant natural gas under climate change mitigation scenario
- ▶ The air quality implications of abundant natural gas
- ▶ The water quality implications of abundant natural gas
- ▶ The changes in resource trade pattern associated with abundant natural gas future

Acknowledgements

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- ▶ The views and opinions expressed in this paper are those of the authors alone.

A tall oil derrick stands silhouetted against a vibrant sunset sky, transitioning from deep red at the horizon to a pale orange at the top. The derrick's structure is detailed with various beams and cables, and several small lights are visible along its height. A small flag is attached to the lower part of the derrick. The foreground is dark, showing the silhouettes of some trees and the base of the derrick. The text "THE END" is superimposed in a large, white, sans-serif font on the right side of the image.

THE END