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NATIONAL LABORATORY

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EMF30 Short-Lived Climate Forcers Overview

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EMF30 Introduction

- Context
- Study Objectives
- Scenario protocol – Pilot Runs

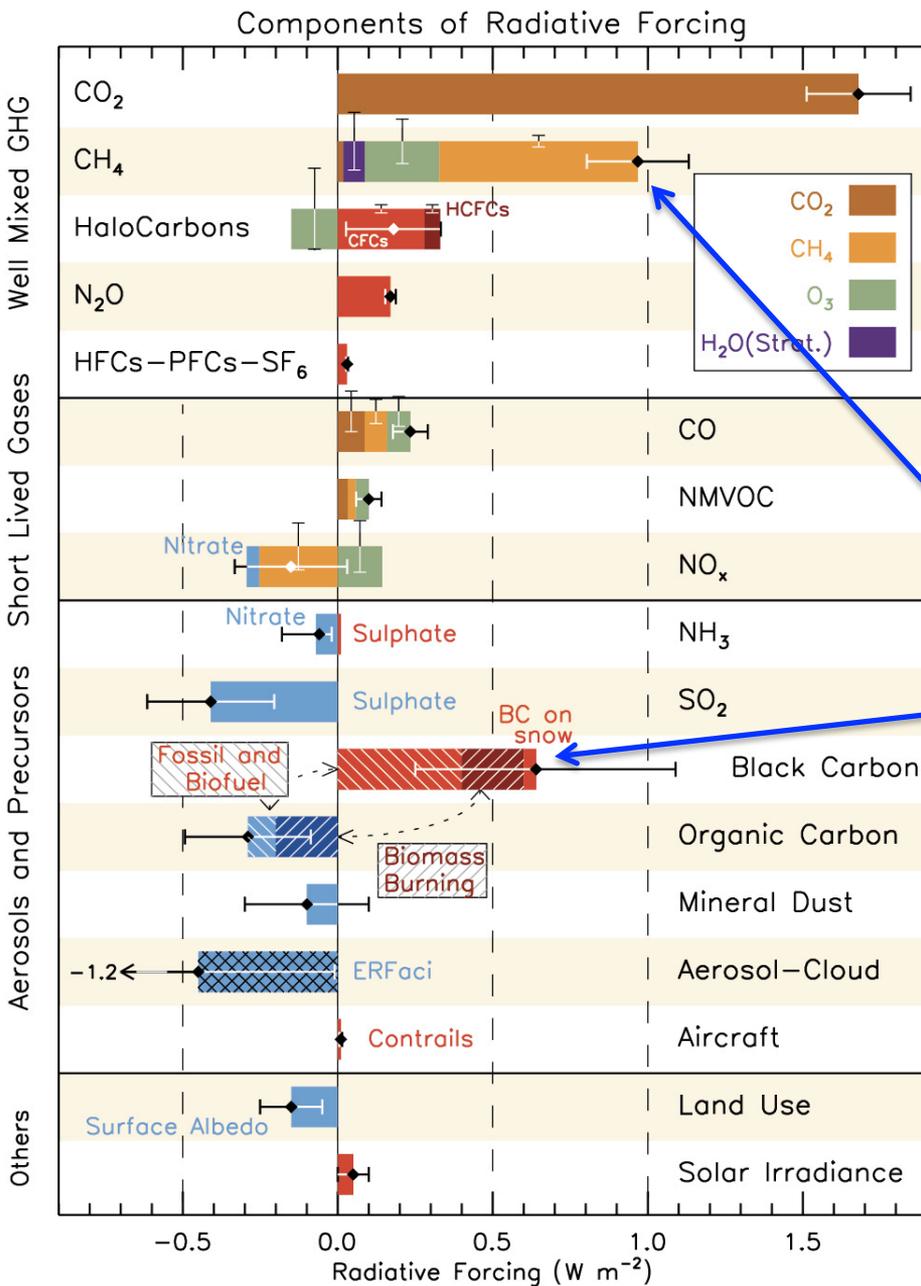
Methane Results

BCOC/End-Use Results

Forcing and Temperature Results

Next Steps

Why do BC and CH₄ matter?



Methane and Black Carbon are the 2nd and 3^d most important (positive) anthropogenic forcing agents after CO₂.

Overall aim of the study is to provide insight into:

- The potential impact of methane and BC reductions on near-term climate change.
- The importance of a modeling choices/model structure issues that may impact study design (e.g., economically-driven reductions in methane emission factors, the sectoral resolution of end-use sectors, ...)
- Compare the climate impact of an idealized SLCF polices and climate policies
- Examine the interaction between SLCF policy and climate policy

Participating models have run a set of “pilot runs”: the goal of which is to

- 1) Identify and, ultimately, rectify reporting/definitional issues
- 2) Identify potential model structure and scenario set-up issues that may be influencing results, and begin collection of relevant model details so results can be understood.
- 3) Identify results or issues that are relevant for study design.
- 4) Perhaps spur model development where needed (*ad hoc* basis)

A number of reporting/model issues are being addressed in current results

Two more submission rounds are scheduled

EMF30 Pilot Runs - Summary

Scenario	Description
Reference	No climate policy, default model improvements in methane emission factors, default long-term pollutant emission controls.
<i>Frozen Methane Emission Factors</i>	
Fzn-CH4	Methane scenario with no autonomous improvement in methane emissions factors. <i>Diagnostic scenario.</i>
<i>Methane Abatement Policy</i>	
CH4-Only	CH4 price of \$4,250/tCH4 by 2030, constant thereafter. (Is equal to \$50/tCO2 and methane index of 85 (= 20-year AR5 GWP))
<i>Black-Carbon-Focused Abatement Policy</i>	
BCOC-EndU	Phase out end-use coal and biomass consumption in buildings and implement advanced emission controls in transportation for all regions, both by 2030.
<i>Greenhouse Gas Abatement Scenario</i>	
EmPrice25	“Standard” IAM abatement scenario. Global CO2 price path as: \$25/tCO2 (\$2005) in 2020 increasing at 5% per year, with global participation and non-CO2 greenhouse gases included using each model’s default methodology.
<i>Greenhouse Gas Abatement + SLCF abatement</i>	
EmPrice25 + SLCF	GHG price paths (for all but CH4) from EmPrice25, plus CH4-Only CH4 price path for methane, and end-use policy BC-OCEndU.

Participating Modeling Groups

The following groups have submitted modeling results.

Institution

Model

NIES (Japan)

AIM/CGE

RITE (Japan)

DNE21

Env Canada

EC-IAM

OECD

ENV-Linkages

PNNL (USA)

GCAM

PBL (Netherlands)

IMAGE

IIASA

MESSAGE-GLOBIOM

PIK (Germany)

REMIND

FEEM (Italy)

WITCH-GLOBIOM



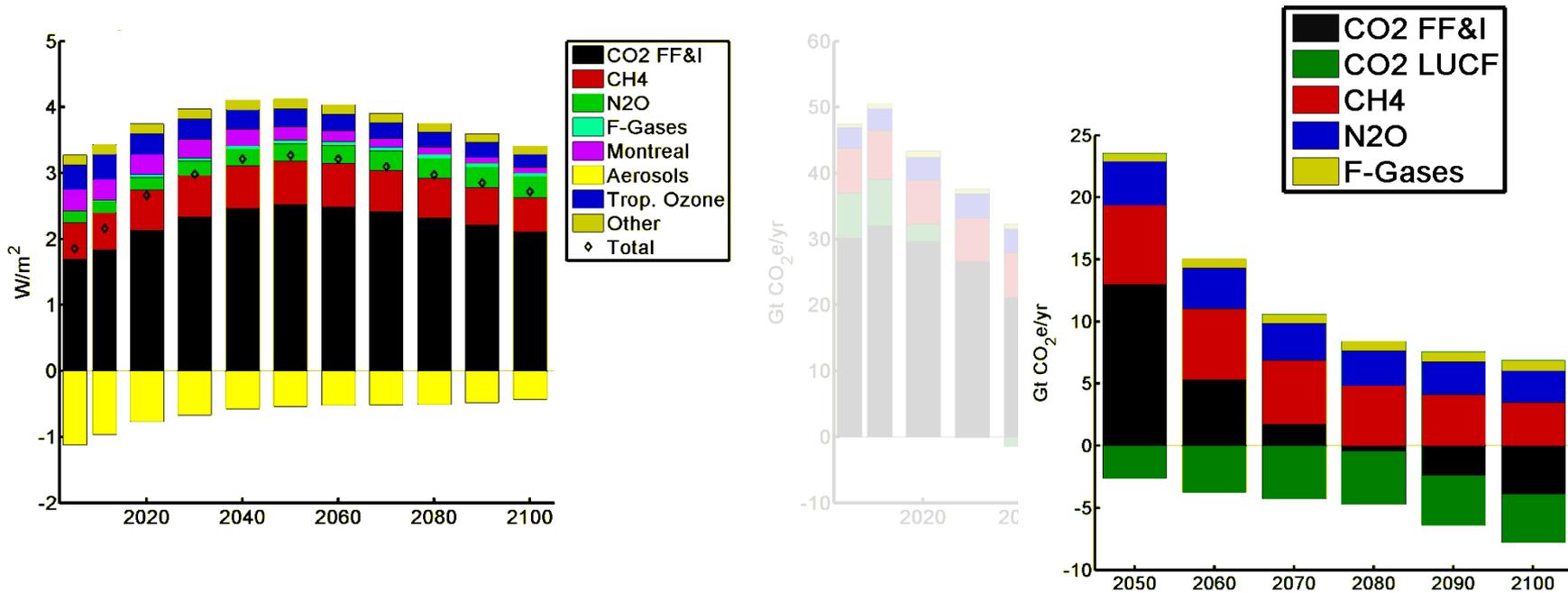
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Pilot Run Results

Analysis of CH₄ dimension based
on the updated pilot runs, Snapshot
as of 2015-07-15

Why does CH₄ matter for low stabilization?

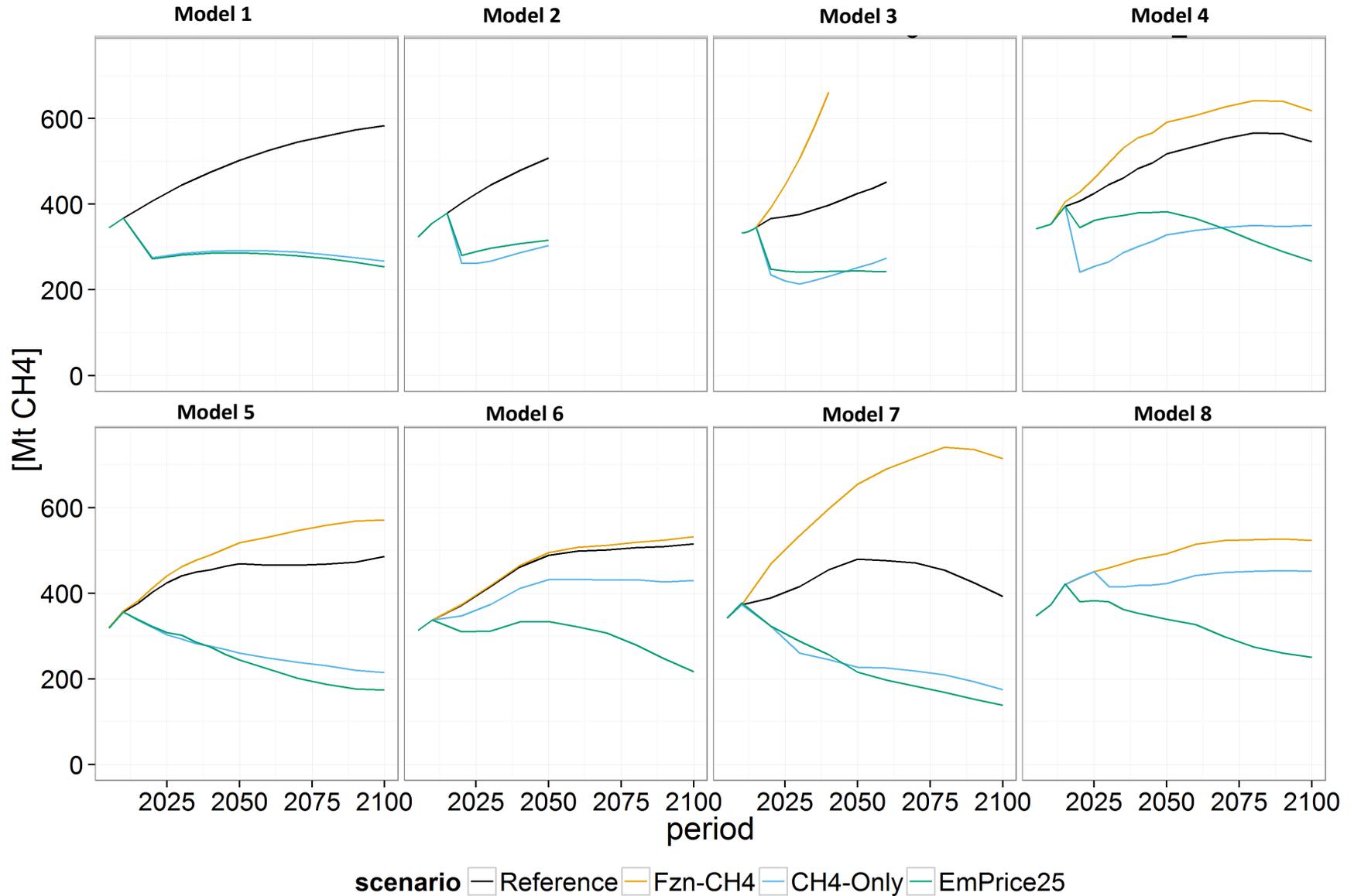


Example: EmPrice25 scenario
(2°C stabilization)

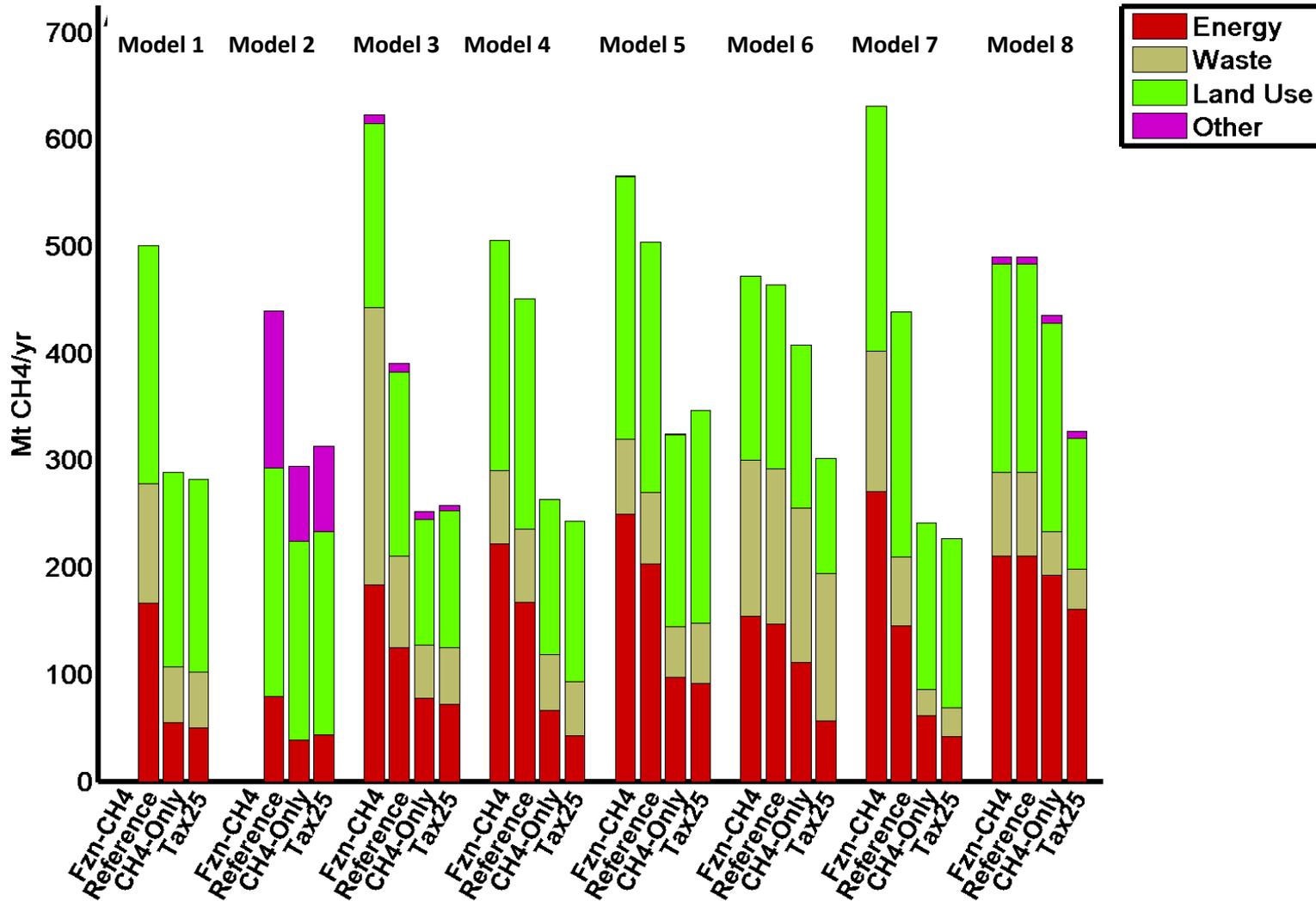
Focus scenarios CH4 dimension

- **Reference** (no pricing of CO₂ nor CH₄)
- **Fzn-CH₄** (no autonomous improvement)
- **CH₄-only** (4250 \$/tCH₄, increasing at 5%p.a.)
- **EmPrice25** (25\$/tCO₂, 700 \$/tCH₄ ,
increasing at 5%p.a.)

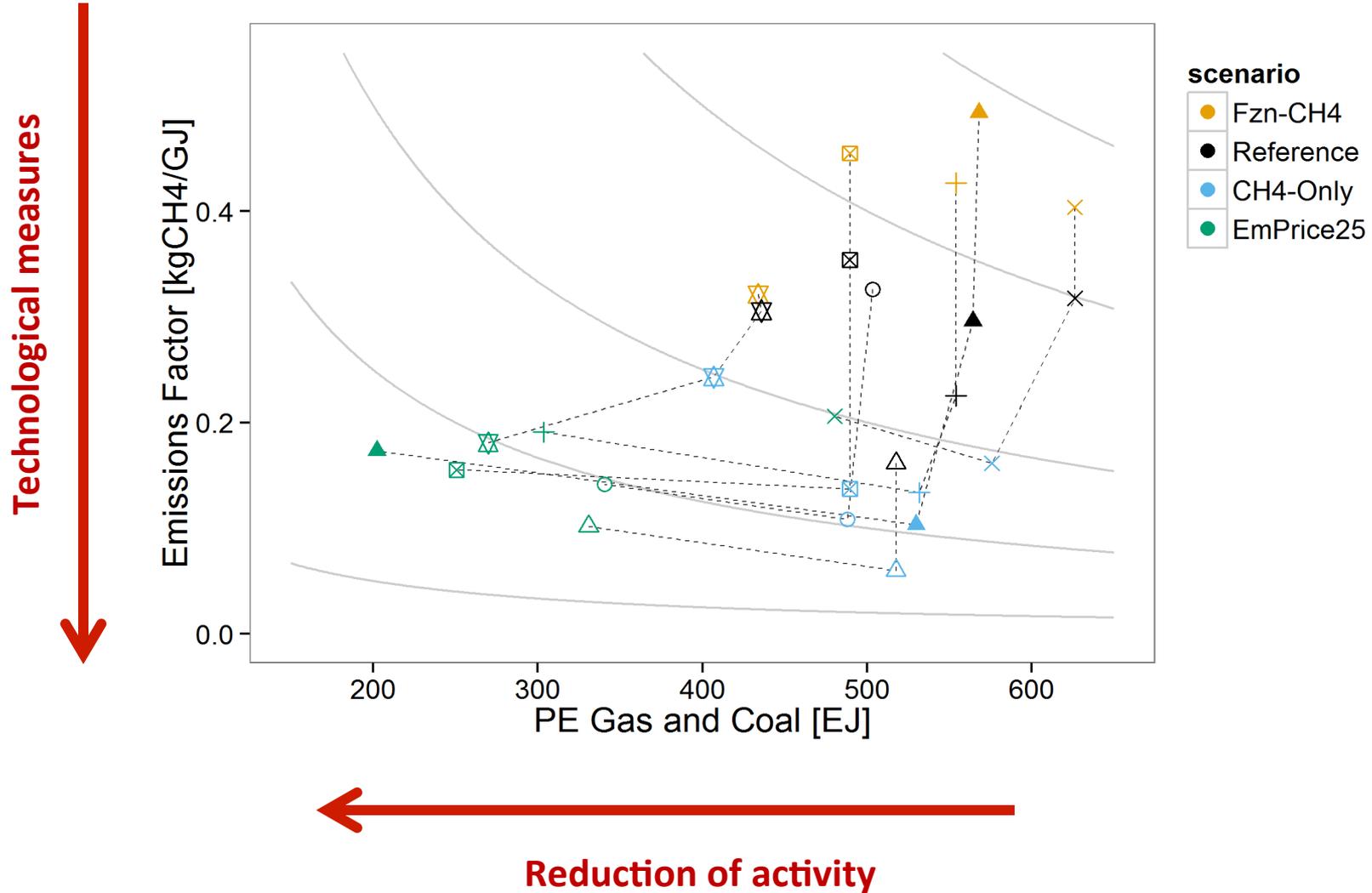
Elasticity of CH4 emissions to pricing



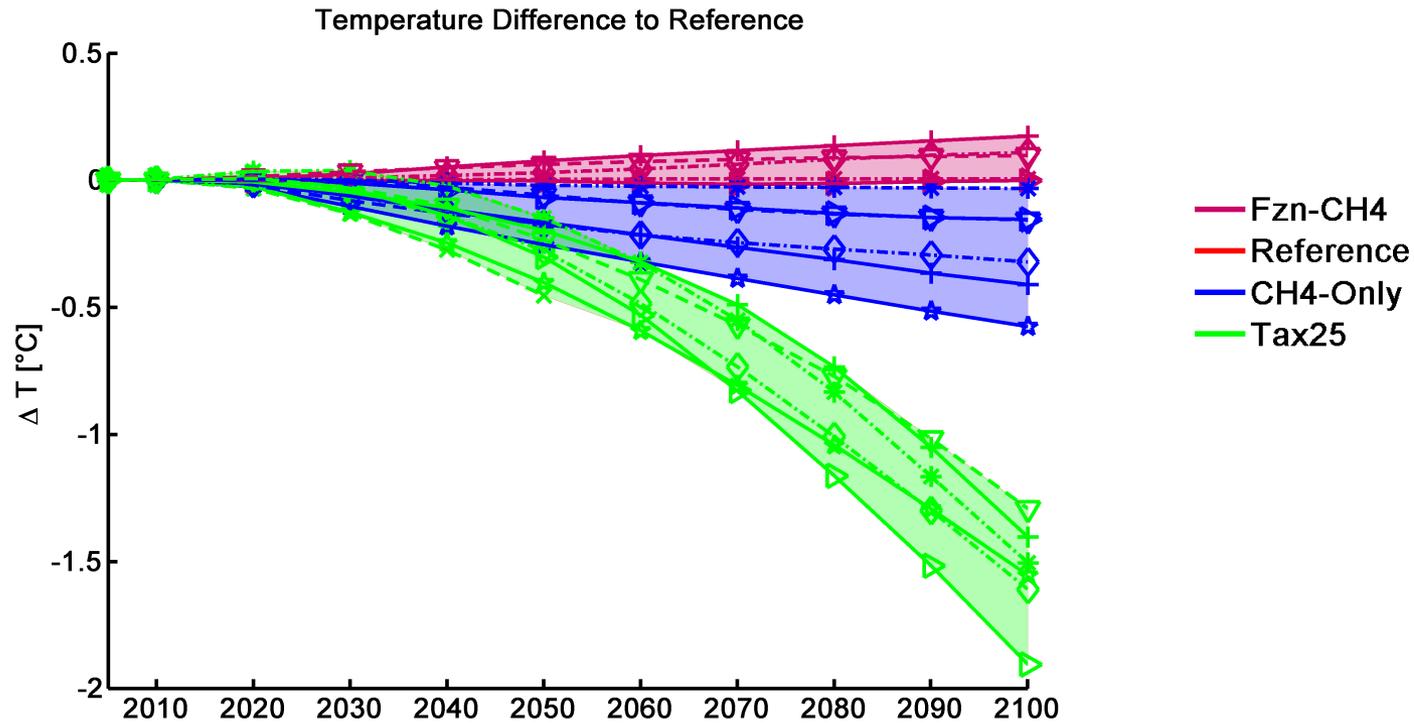
Future CH₄ emissions (2010-2100 average)



Sectoral CH4 Emissions: Energy



Effect of CH4 measures on temperature



Important CH₄ modeling challenges

- How to project drivers of CH₄ emissions into the future, e.g. municipal waste disposal, effect of unconventional gas,...
- How big are negative-cost CH₄ abatement options? What are reasonable assumptions on share of captured emission that can be used energetically?
- What are reasonable assumptions on long-term economic mitigation potentials?

Pilot Run Results

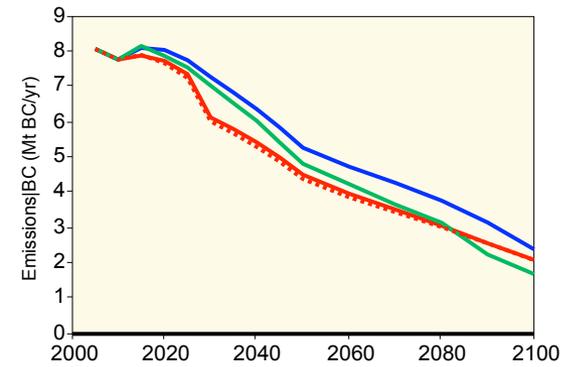
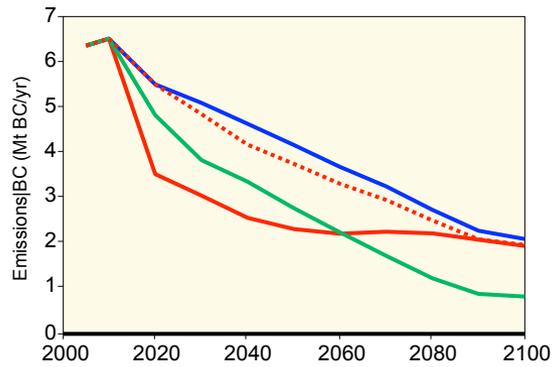
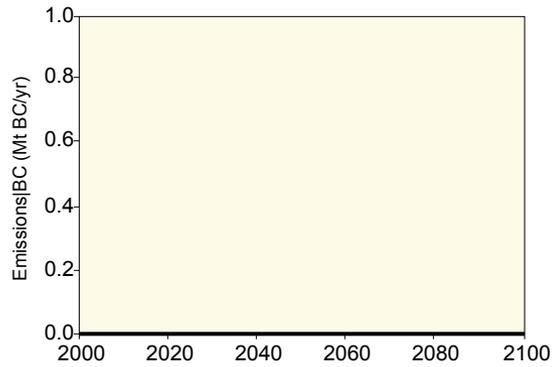
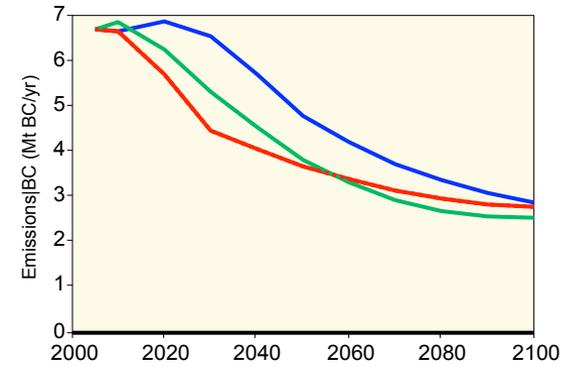
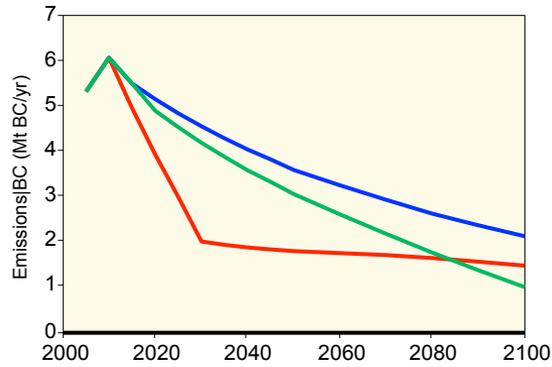
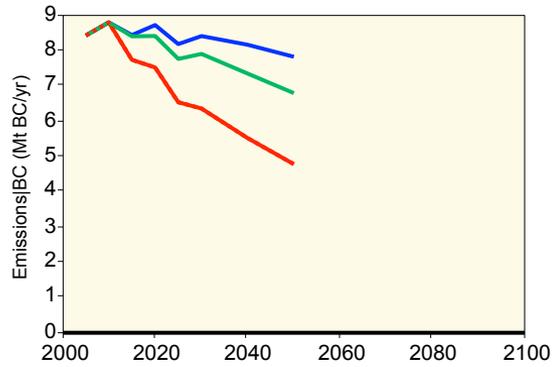
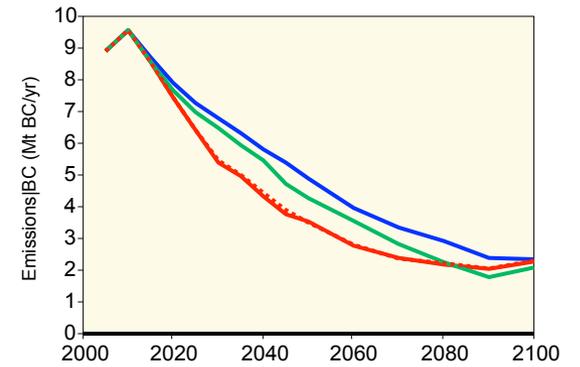
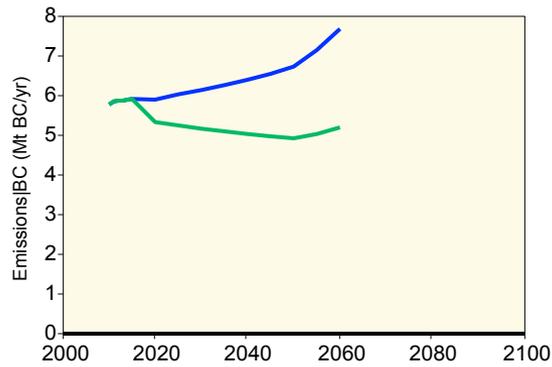
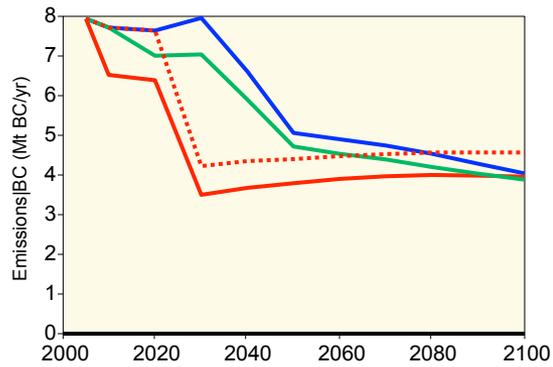
BC-OC Emissions

Reference

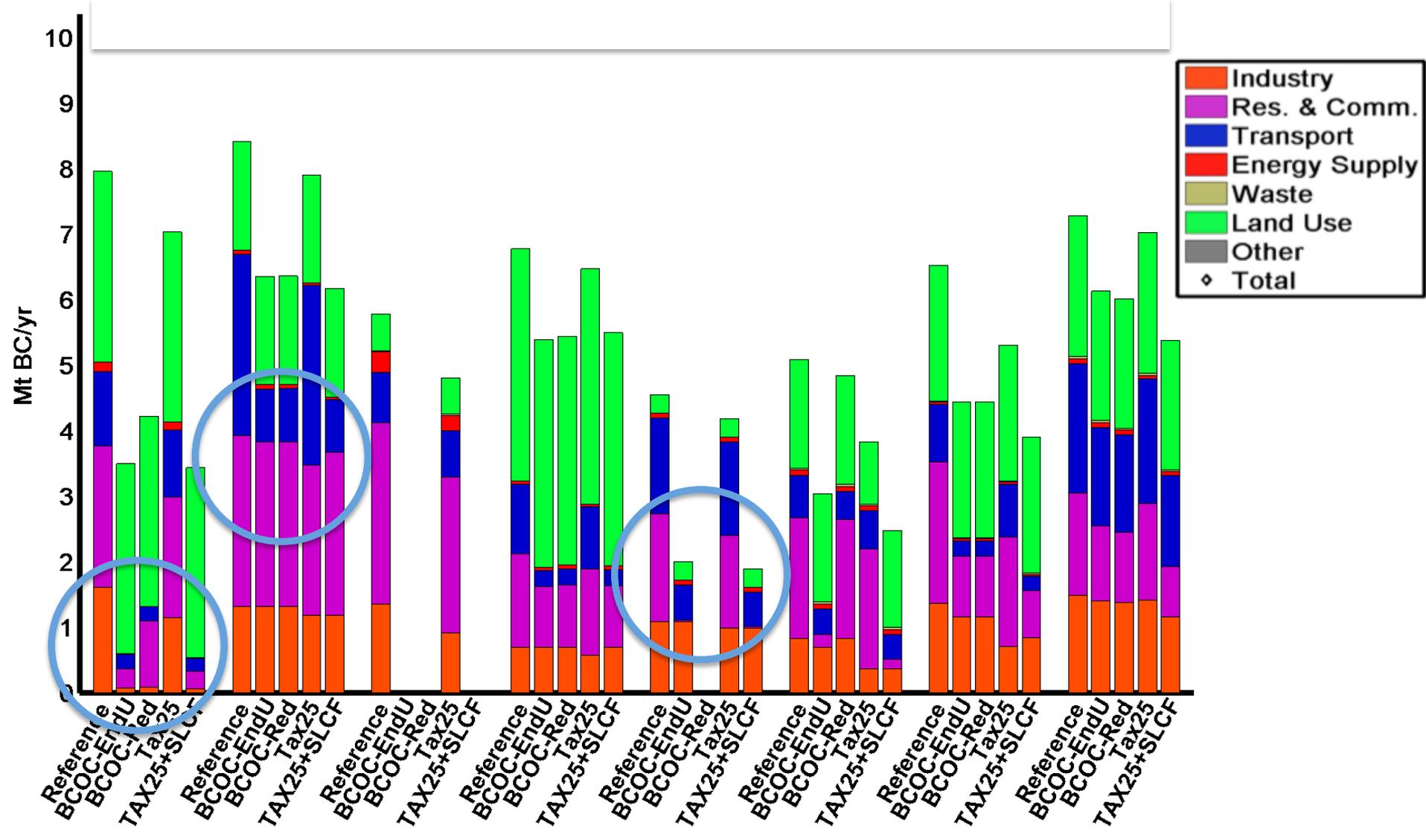
BC/OC EndU & Red

EmPrice25

World – Emissions BC



BC emissions 2030

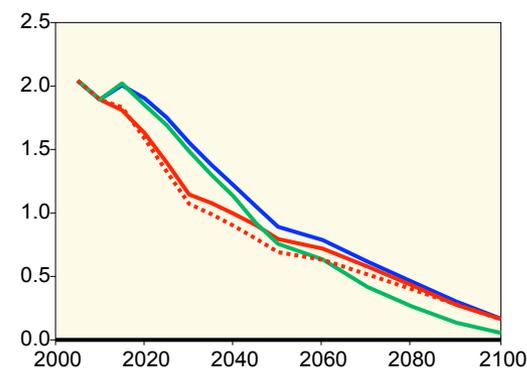
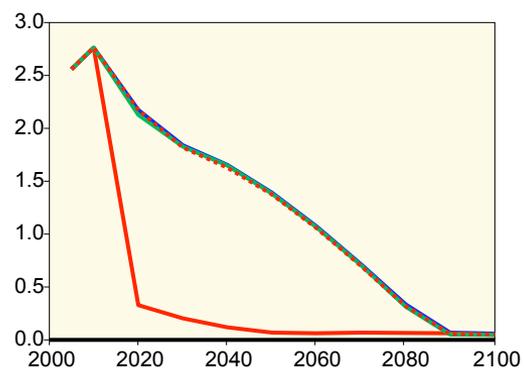
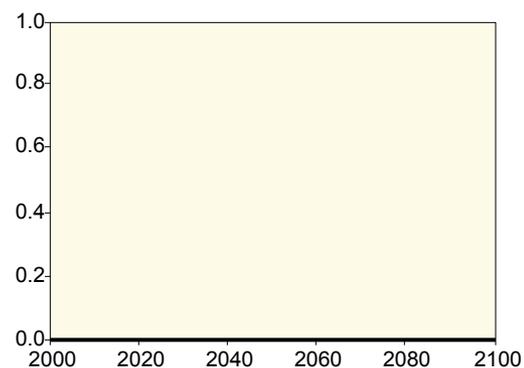
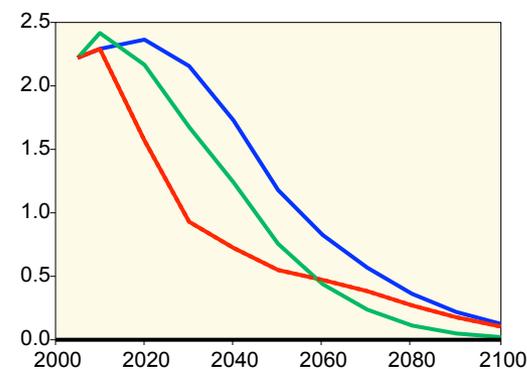
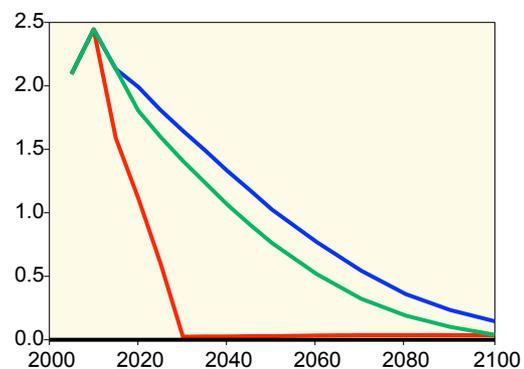
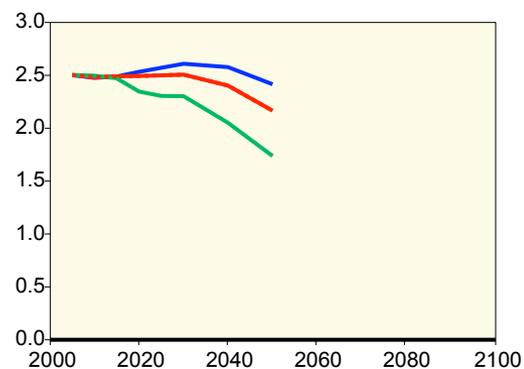
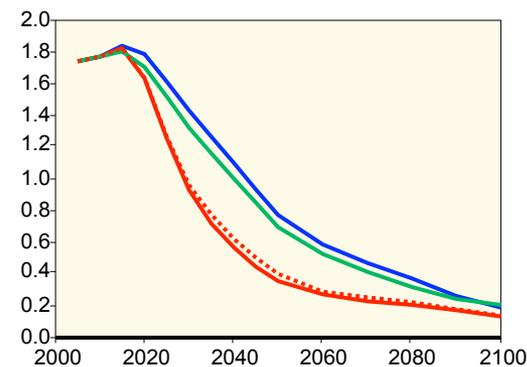
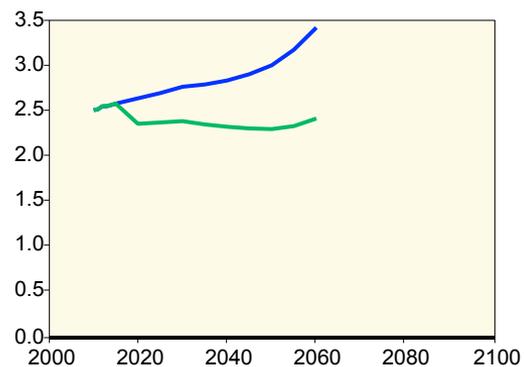
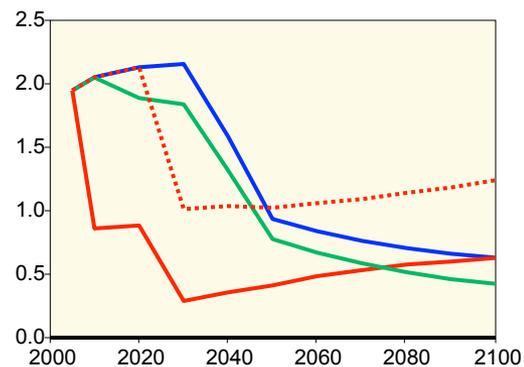


Reference

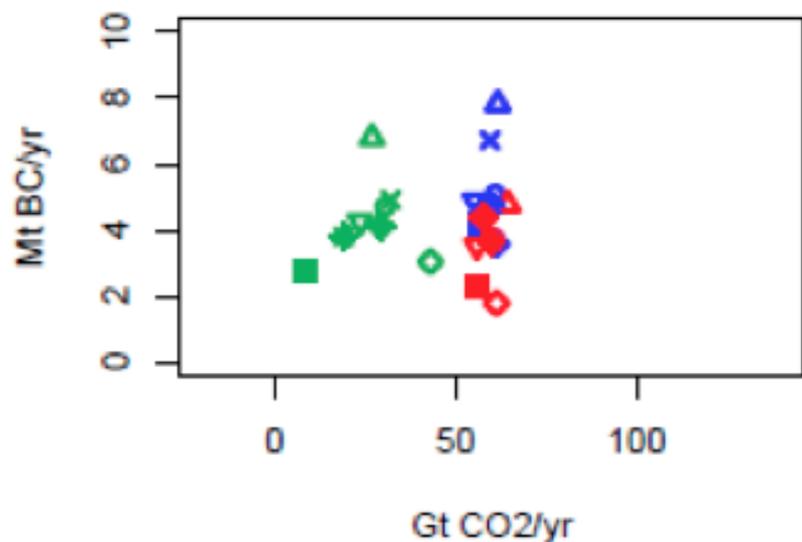
BC/OC EndU & Red

World – Emissions BC – Residential/Commercial

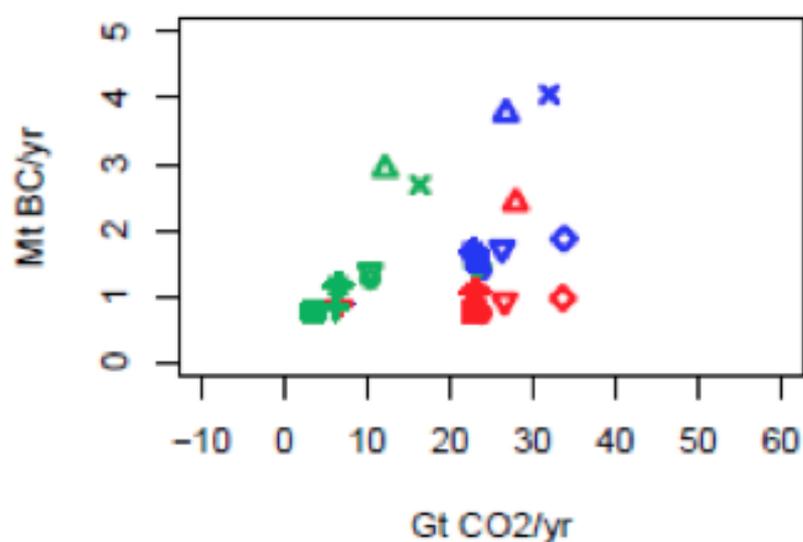
EmPrice25



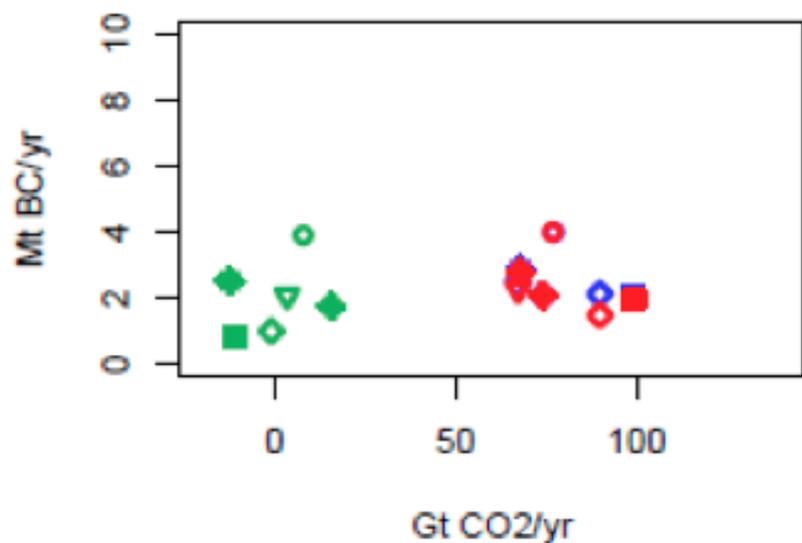
BC over CO2 World 2050



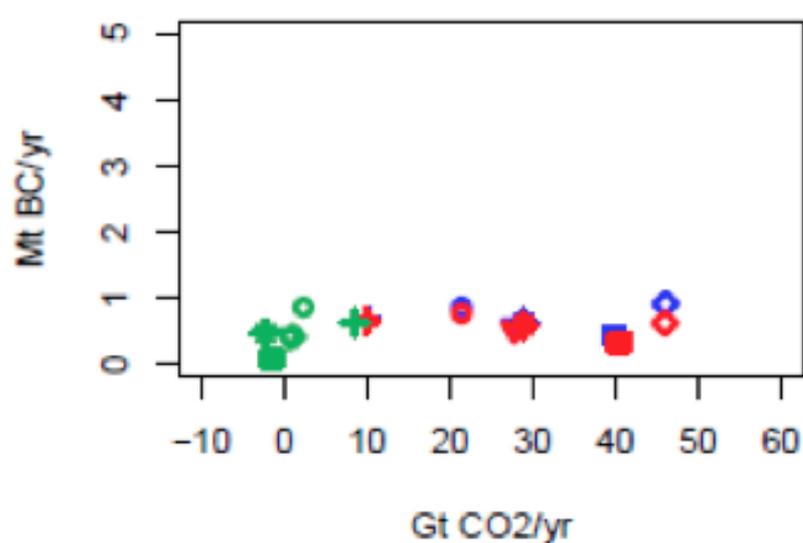
BC over CO2 ASIA 2050



BC over CO2 World 2100



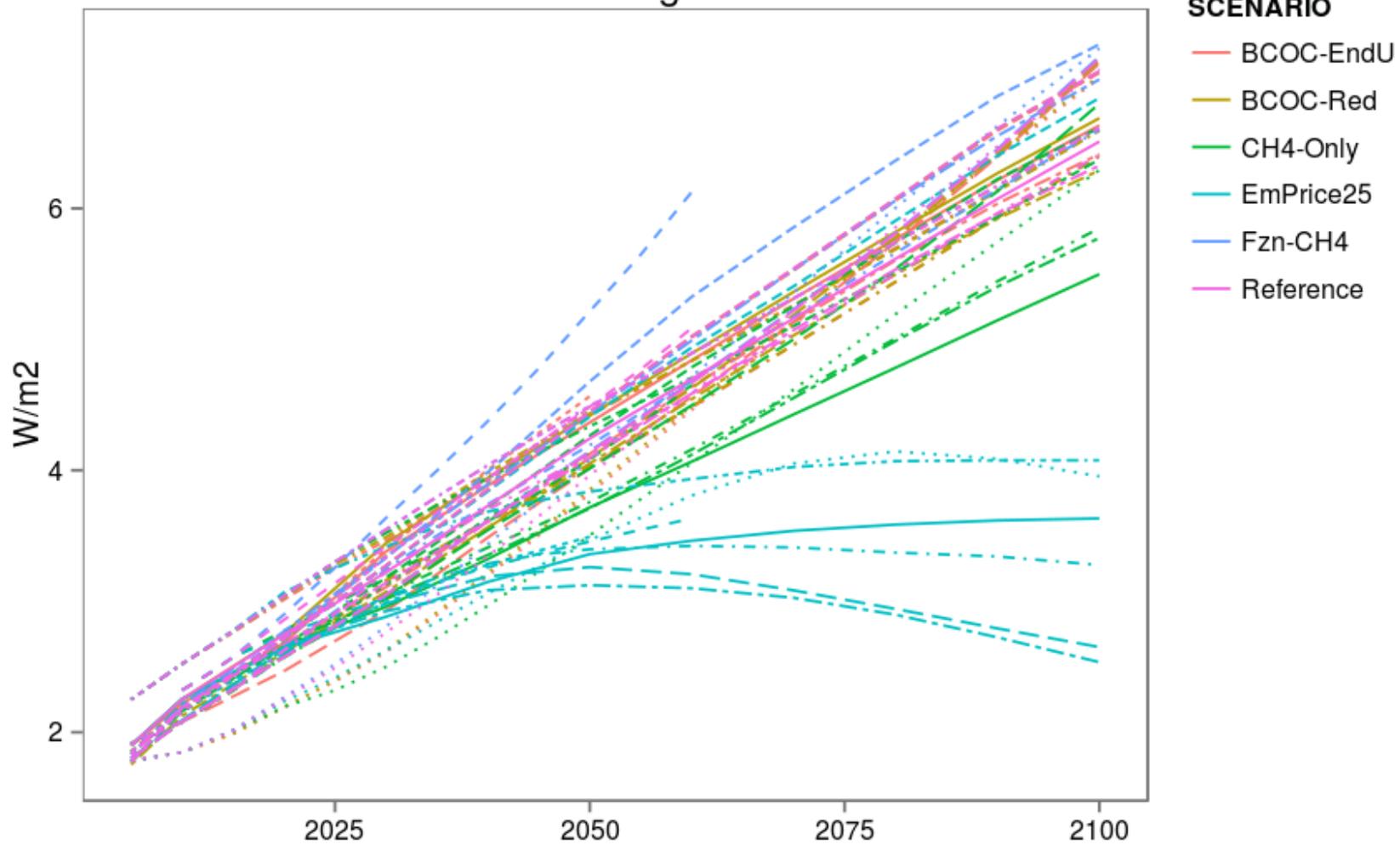
BC over CO2 ASIA 2100



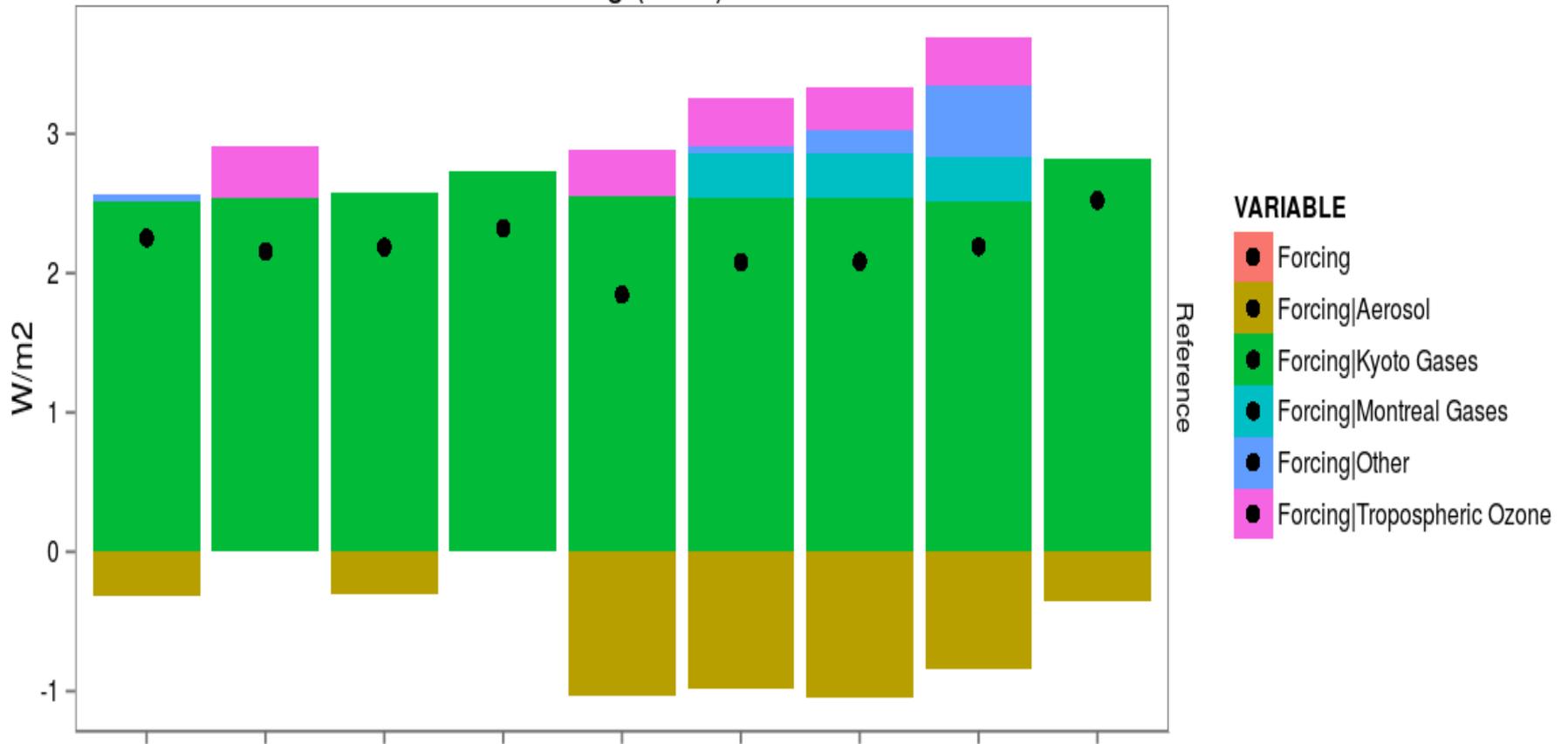
Pilot Run Results

Forcing and Temperature

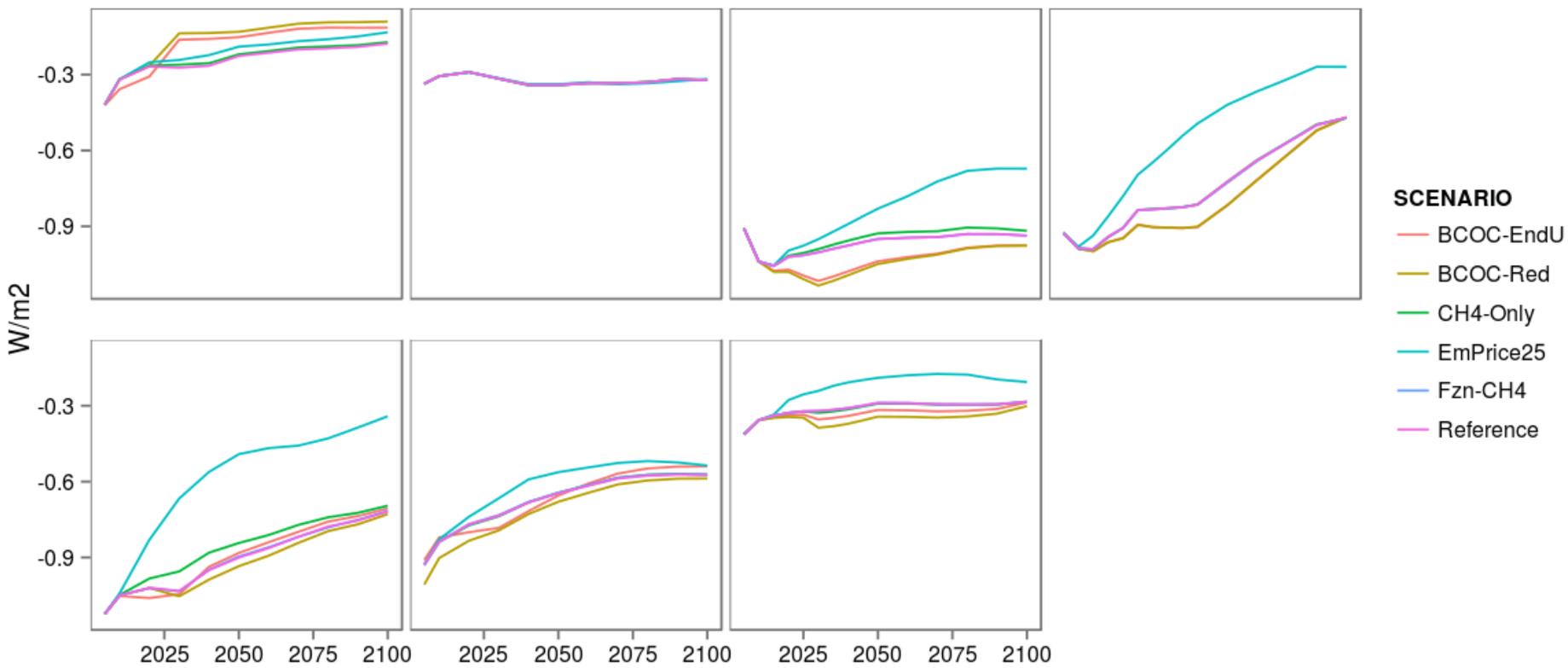
Forcing



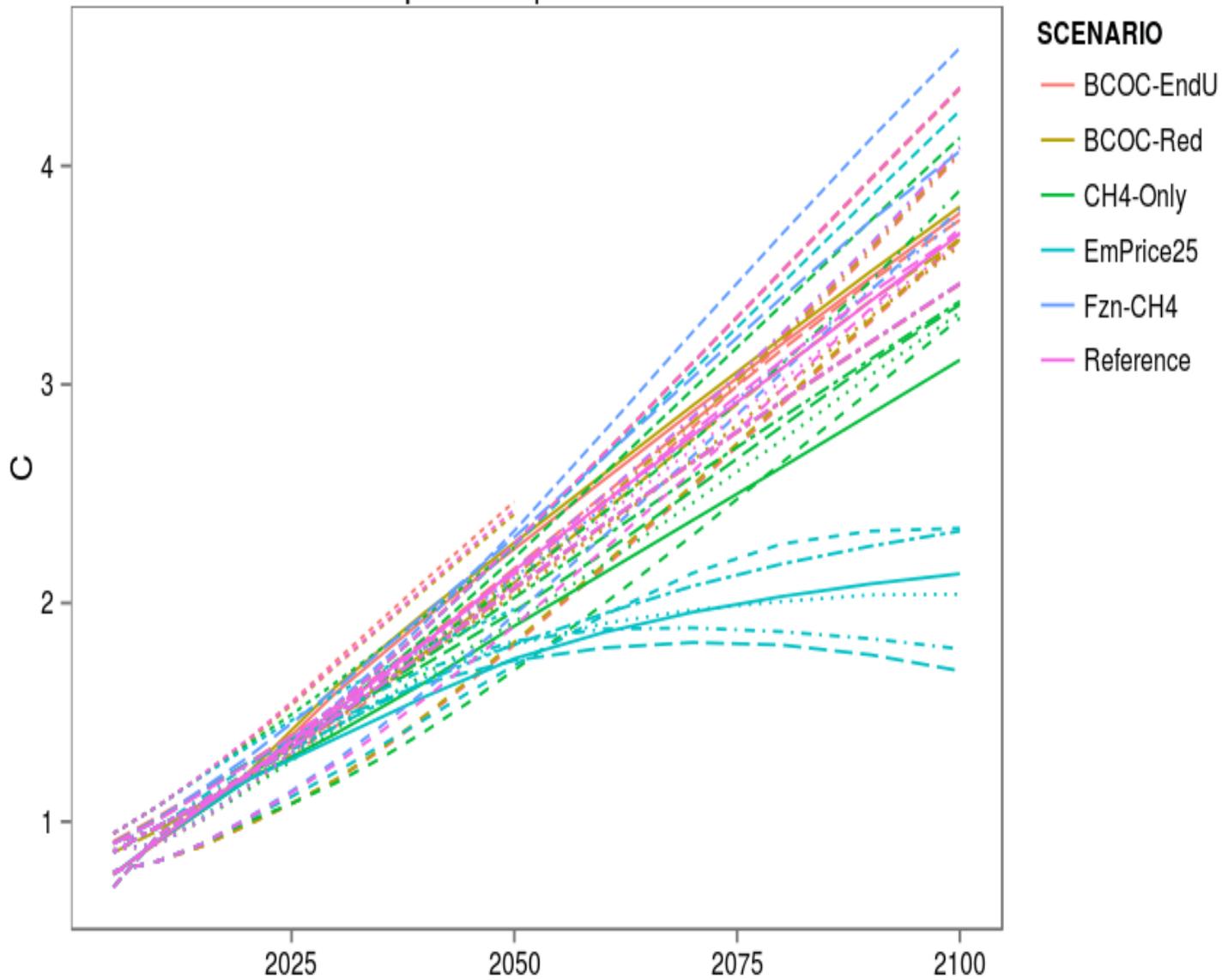
Forcing (2010)



Forcing|Aerosol



Temperature|Global Mean



Next Steps

Scenario Matrix: Planned additions

Scenario	Reference	Climate constraints		
		Optimal Global all GHG	Slower Action	CO ₂ -only (diagnostic)
Reference CH4 & BC/OC (CLE+)	XX	XX	V	X
Frozen Pollutant EF - <i>diagnostic</i>	X			
Frozen CH4 - <i>diagnostic</i>	XX			
CH4 Only Reduction	XX			
BC/OC Reduction	XX			
BC/OC Em only - <i>diagnostic</i>	XX			
SLCF (BC/OC + CH4)	X	XX	V	

Red **XX** indicates scenarios already in current pilot run set. V = voluntary scenario.

Potential new scenarios (Air Pollution)

Full SLCF scenario – BC/OC + CH4 (combine two of the existing pilot scenarios)

Diagnostic scenario: Frozen pollutant controls (EFs) for the emissions reduced in the SLCF scenarios

Potential new scenarios (Climate)

Change to CO2 cumulative emissions target for consistency between models.

Some teams may add a slower near-term action scenario

Next Steps

There will be at least two more rounds of scenario submissions:

- Refine scenarios and resolve remaining reporting issues.
- Take into account model improvements over the fall

Through EMF-30 we are aiming to improve the state of SCLF modeling in IAMs more generally

- The GAINS team will be providing an extended base-year and projections dataset (and mitigation analysis) to help IAMS better resolve SLCF emissions in a number of key sectors: residential biomass heating and cooling, transportation and off-road sources, electric power plants, and waste (landfills vs wastewater)
- The EMF-30 process itself results in many model and scenario improvements