

The impact of the economic crisis on GHG mitigation potentials and costs in Annex I countries

- Mitigation cost curves for pre- and post-crisis activity projections
- Analyses of current pledges:
 - IIASA's GAINS model
 - PBL's IMAGE/FAIR model
 - NIES' AIM model
- Discussion

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GHG mitigation potentials and costs for pre- and post-economic crisis activity projections

We acknowledge the IEA for providing early access to the forthcoming IEA World Energy Outlook 2009

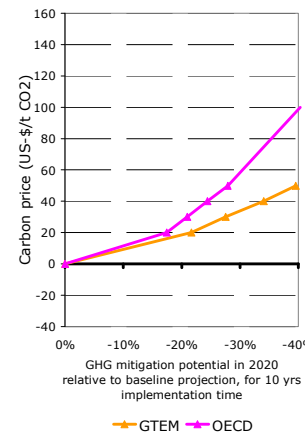
Model estimates of mitigation potentials and costs agree once they are corrected for key assumptions



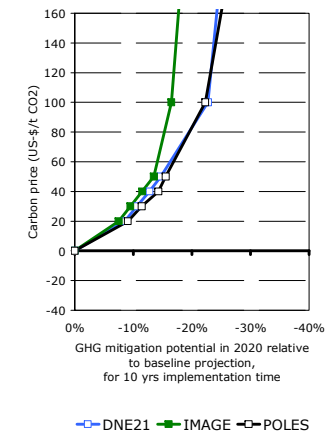
The IIASA model comparison demonstrated that model results are most sensitive towards assumptions on

- future economic development,
- the time window for implementation,
- the model approach (e.g., inclusion of macro-economic feedbacks),
- the definition of the baseline and how measures with negative costs are treated.

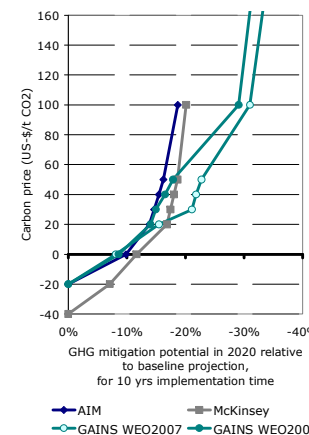
Top-down (CGE) models



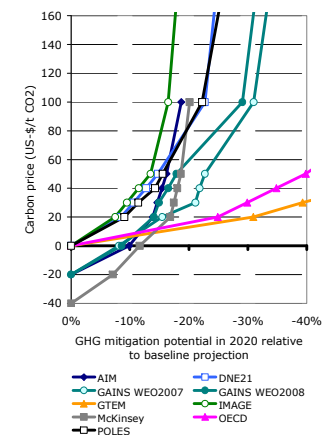
Bottom-up models with cost-optimal baseline



Bottom-up models with negative cost measures



All models



Sensitivity analysis with IIASA's GAINS model for different projections of economic development

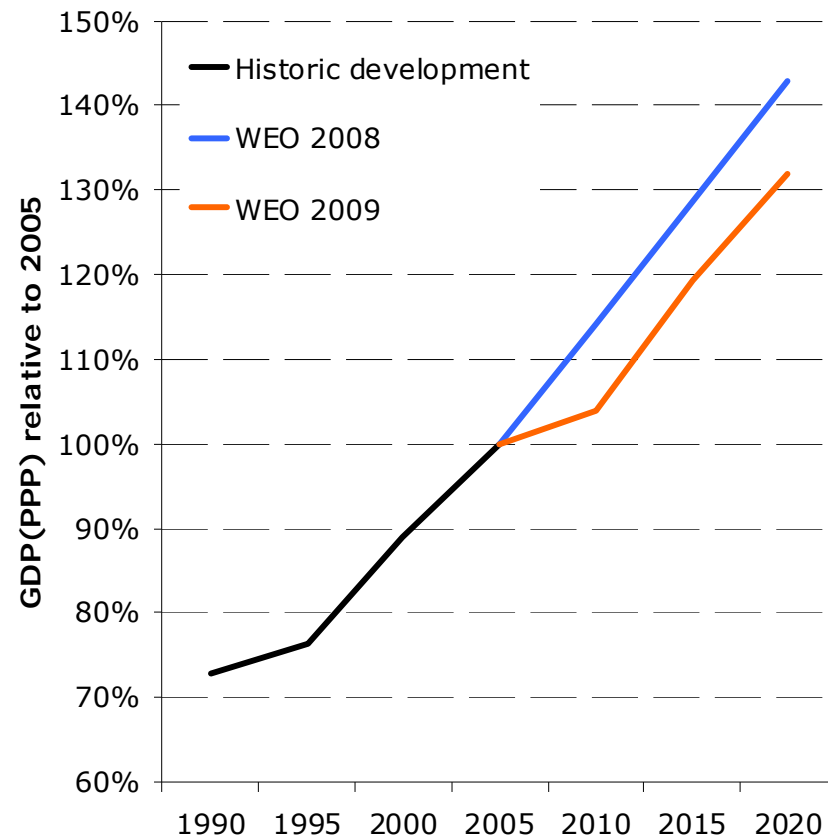


GAINS uses exogenous projections of economic activities.

A sensitivity analysis explores:

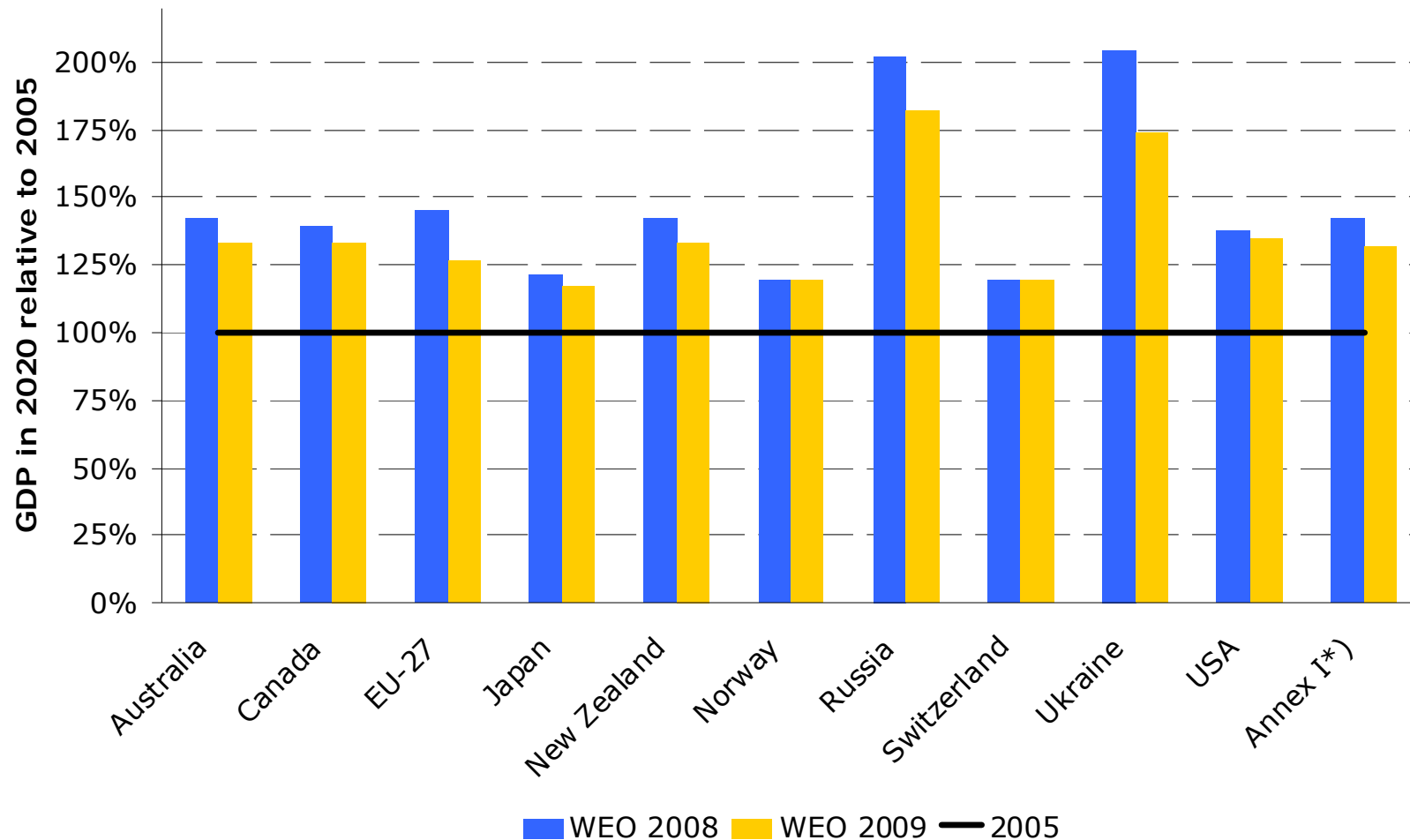
- a pre-crisis perspective:
 - IEA World Energy Outlook 2008
 - PRIMES 2007 for EU countries
- a post-crisis perspective:
 - IEA World Energy Outlook 2009
 - PRIMES 2009 for EU countries

All other assumptions equal



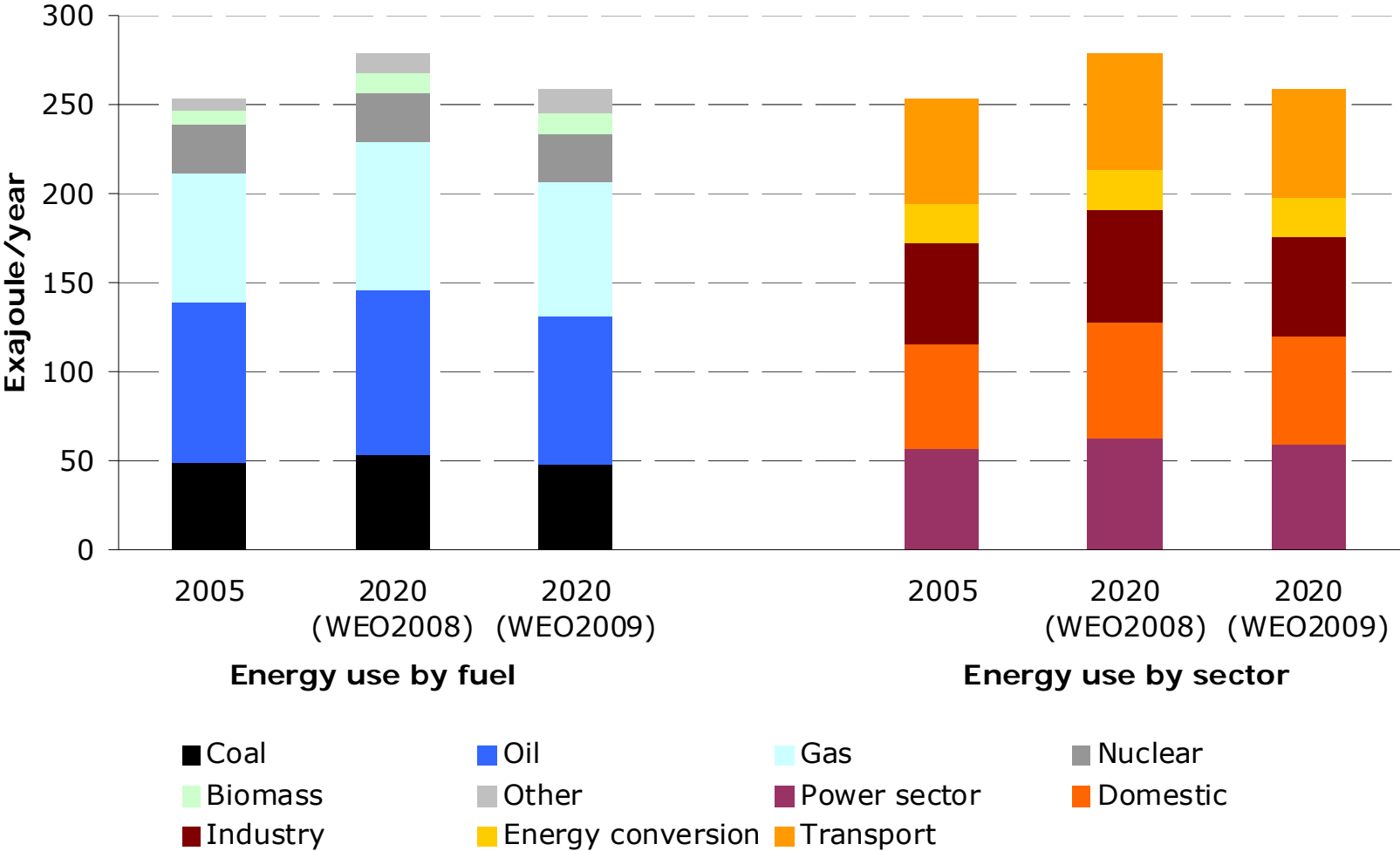
GDP assumptions for 2020

IEA World Energy Outlook 2008 vs 2009

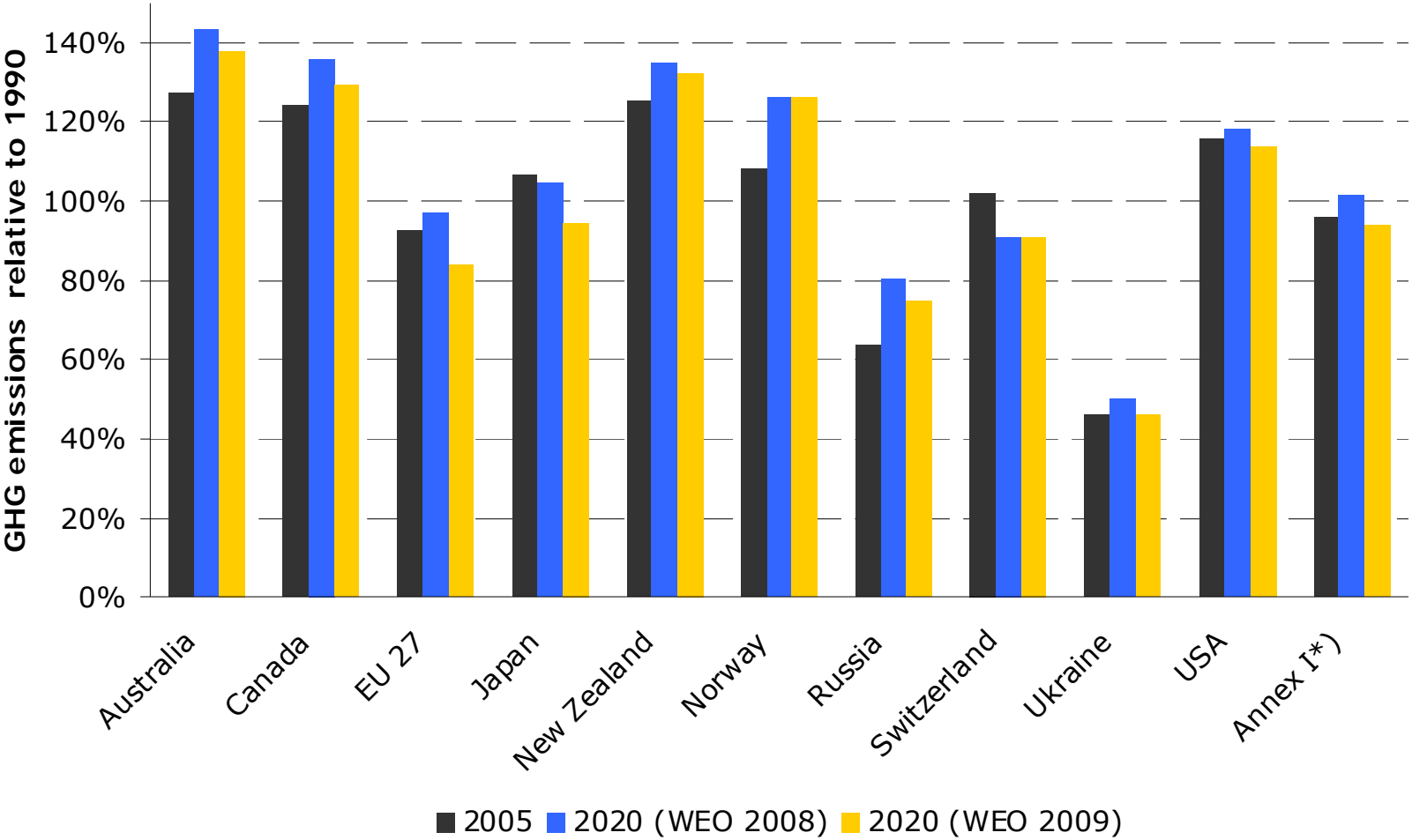


Energy projections for 2020

Source: IEA WEO 2008 and 2009



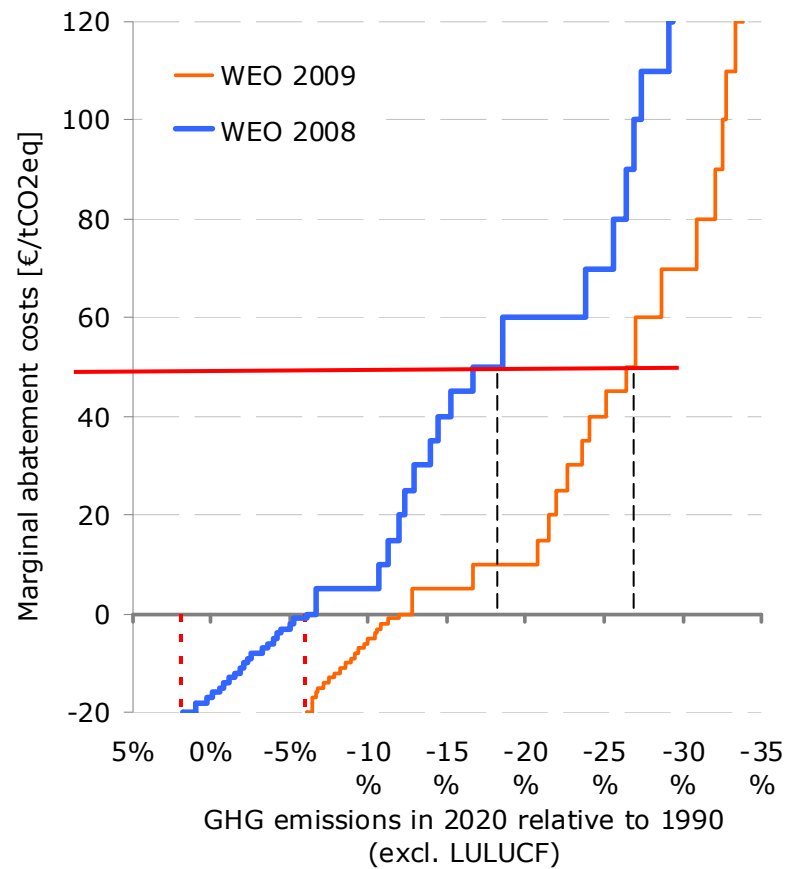
Baseline emissions 2020 (excl. LULUCF)



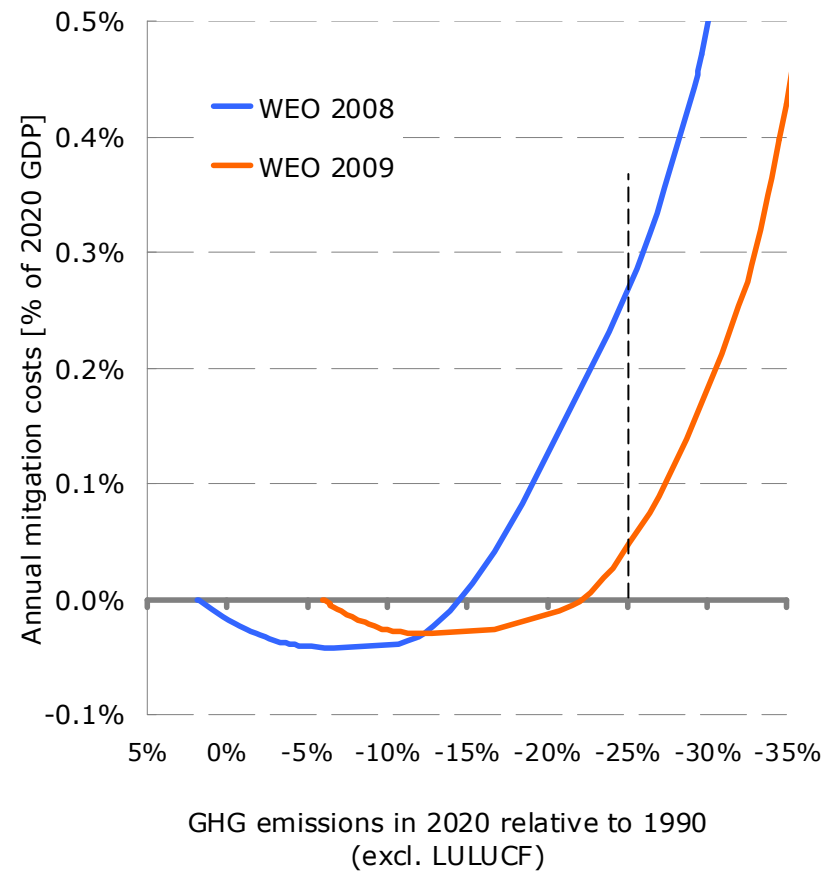
Cost curves for Annex I, 2020 (excl. LULUCF)



Marginal abatement costs



Total abatement costs

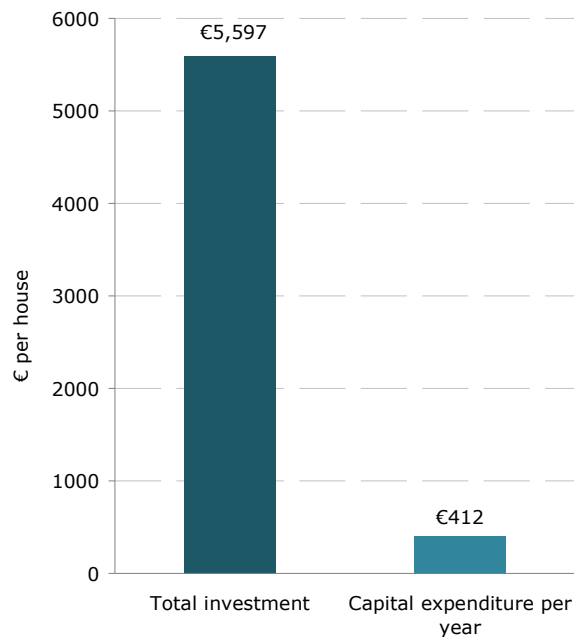


Up-front investments and net annual costs

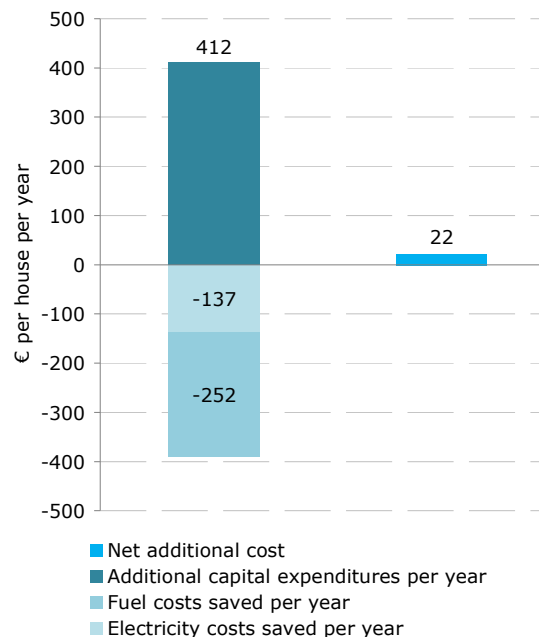


Example calculation for a 156 m² Single Family House in Canada

Investments and capital costs

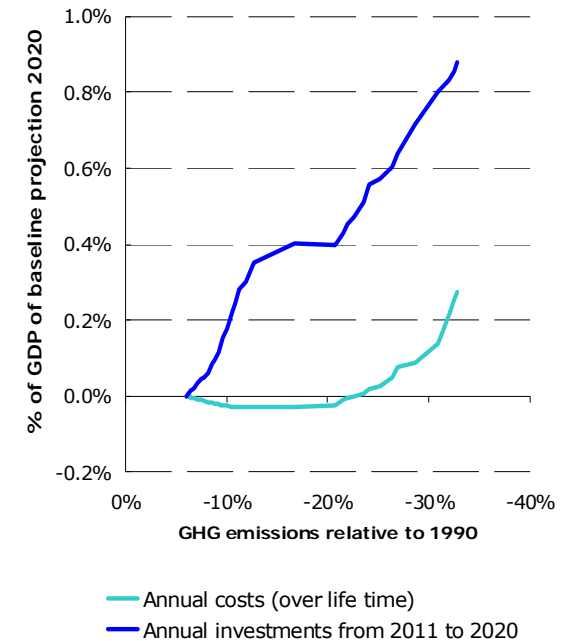


Annual costs and cost savings



Annex I:

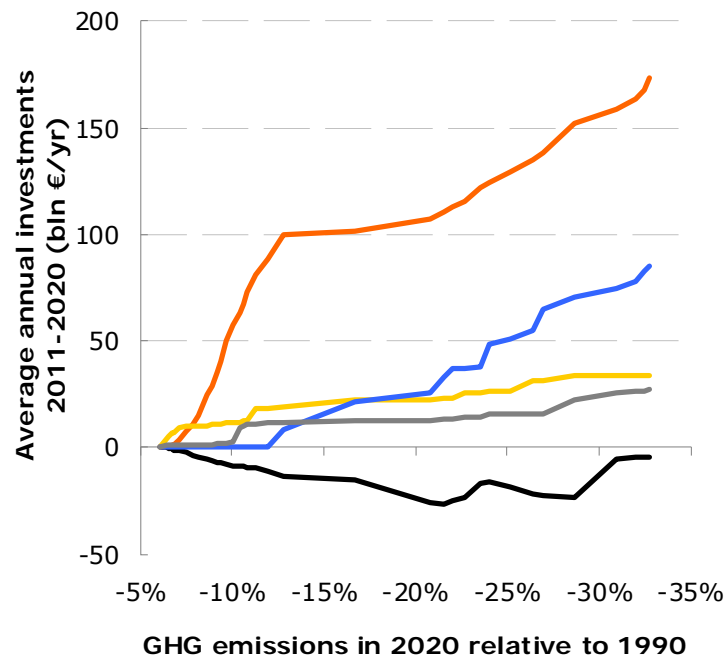
Up-front investments until 2020 and annual costs over lifetime



Sectoral up-front investments and annual costs over life time

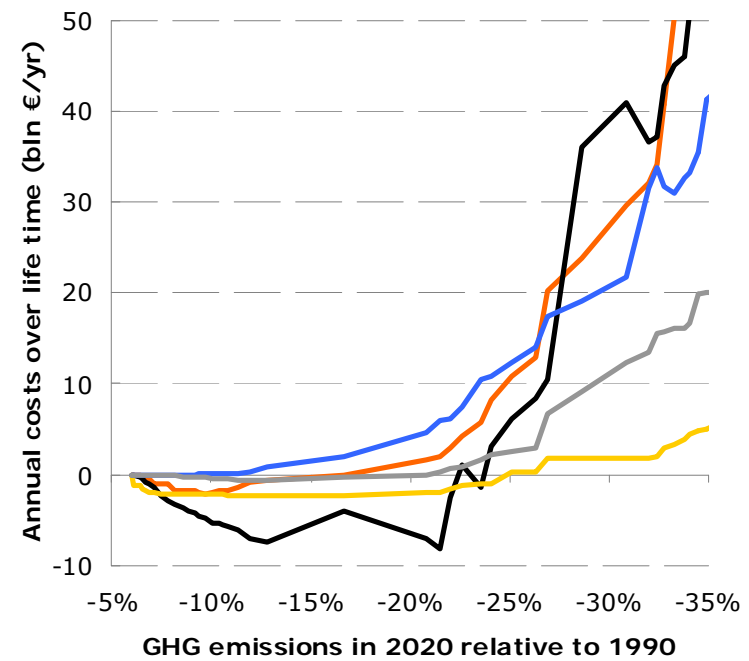


Annual investments in 2011-2020



- Domestic sector
- Transport
- Other
- Power generation
- Industry

Annual costs during life time (annuities + operating costs)



- Domestic sector
- Transport
- Other
- Power sector
- Industry

Conclusions (1)



- Estimates of future GHG mitigation potentials and costs are sensitive towards assumptions on economic growth.
- GHG emissions of Annex I in 2020 (relative to 1990):

	Pre-crisis (WEO 2008)	Post-crisis (WEO 2009)
Baseline (without add. measures)	+2%	-6%
With a carbon price of 50 €/t CO ₂	-17%	-27%

- Emission caps that are developed for 2020 based on a pre-crisis perspective might not induce any need for further mitigation measures in a post-crisis world!

Conclusions (2)



- While annual mitigation costs over life time are low compared to GDP (e.g., $\sim 0.1\%$ of GDP for a 25% cut for the post-crisis projection), up-front investments during next 10 years are larger (e.g., $\sim 0.5\%$ of GDP from 2011-2020 for a 25% cut).
- Largest investment demand occurs in the domestic sector.
- Report, presentation file, free access to the GAINS-online calculator and all input data available at:

<http://gains.iiasa.ac.at>

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Analysis of Annex I Pledges with GAINS

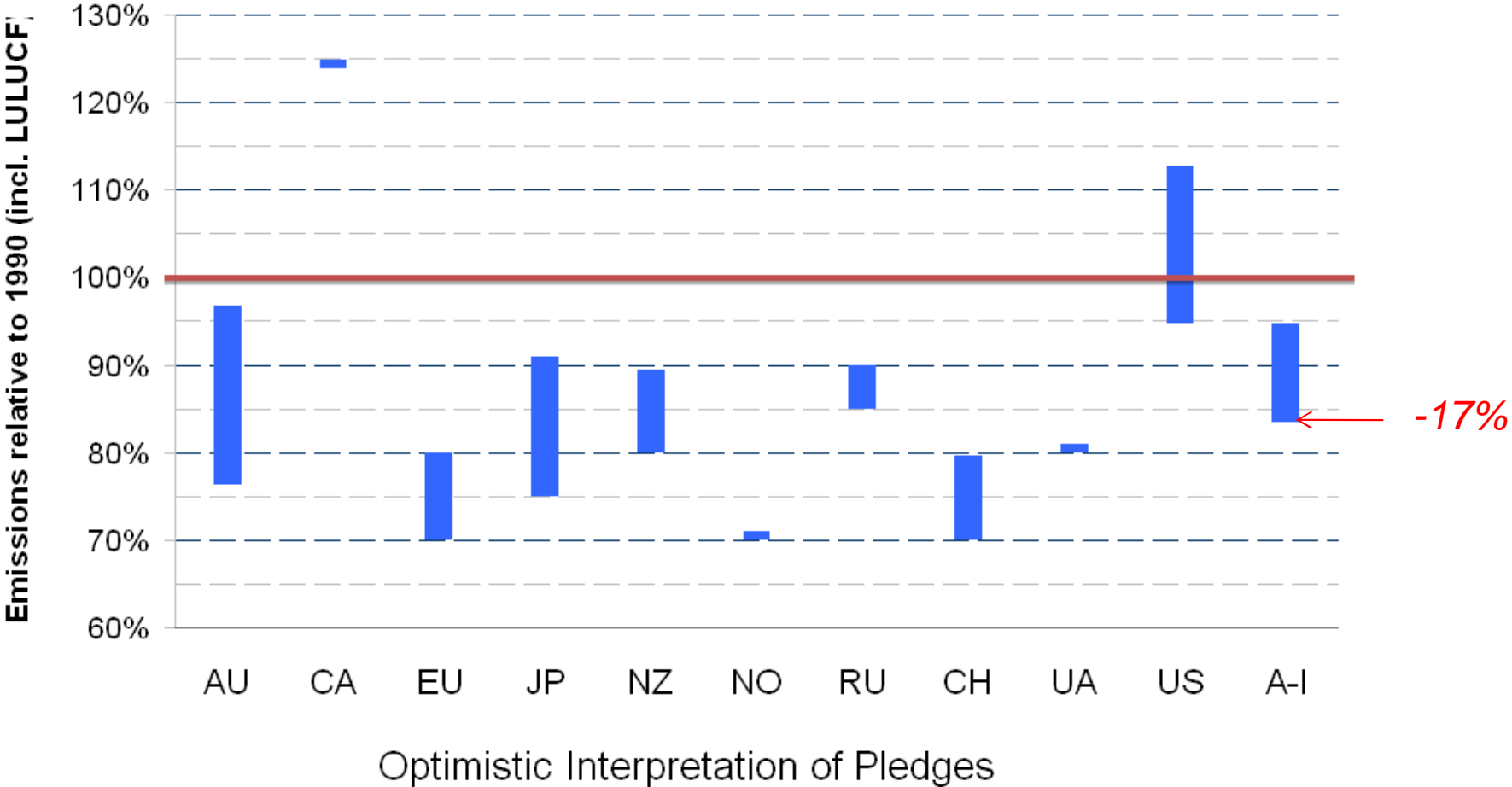
The Post-Crisis Update

Annex I Parties have 'pledged' emission reductions



	Conservative interpretation	Optimistic interpretation	Reference year	Inclusion of LULUCF	Status
AUSTRALIA	-5%	-25% through -20% cap and trade of domestic emissions and -5% government purchases of international credits	2000	Yes	Officially announced (May 4, 2009)
CANADA	-20%	-20%	2006	t.b.d.	Officially announced
EU	-20%	-30%	1990	Not for the 20% target, t.b.d. for the 30% target	Adopted by legislation
JAPAN	-15% (relative to 2005; through domestic measures)	-25% (relative to 1990)		Not for the 15% target, t.b.d. for the 25% target	Low pledge officially announced June 10, 2009; high pledge demanded by the Democratic Party
NEW ZEALAND	-10%	-20%	1990	Yes (with current rules)	Announced in Bonn (11 August 2009)
NORWAY	-30%	-30%	1990	Yes (with current rules)	Officially announced
SWITZERLAND	-20%	-30%	1990	Yes	Switzerland announced to follow the EU
UKRAINE	-20%	-20%	1990	?	Under consideration
USA	-1% (cap: 6,095 Mt COeq)	-17% (5,123 Mt COeq) (through cap plus complementary measures)	1990	Yes	Waxman & Markey bill as of May 19 (WRI paper 22 June 2009)
RUSSIA	-10%	-15%	1990	?	Announced by president Medvedev

Comparing 2020 pledges with 1990 emissions (incl. LULUCF)

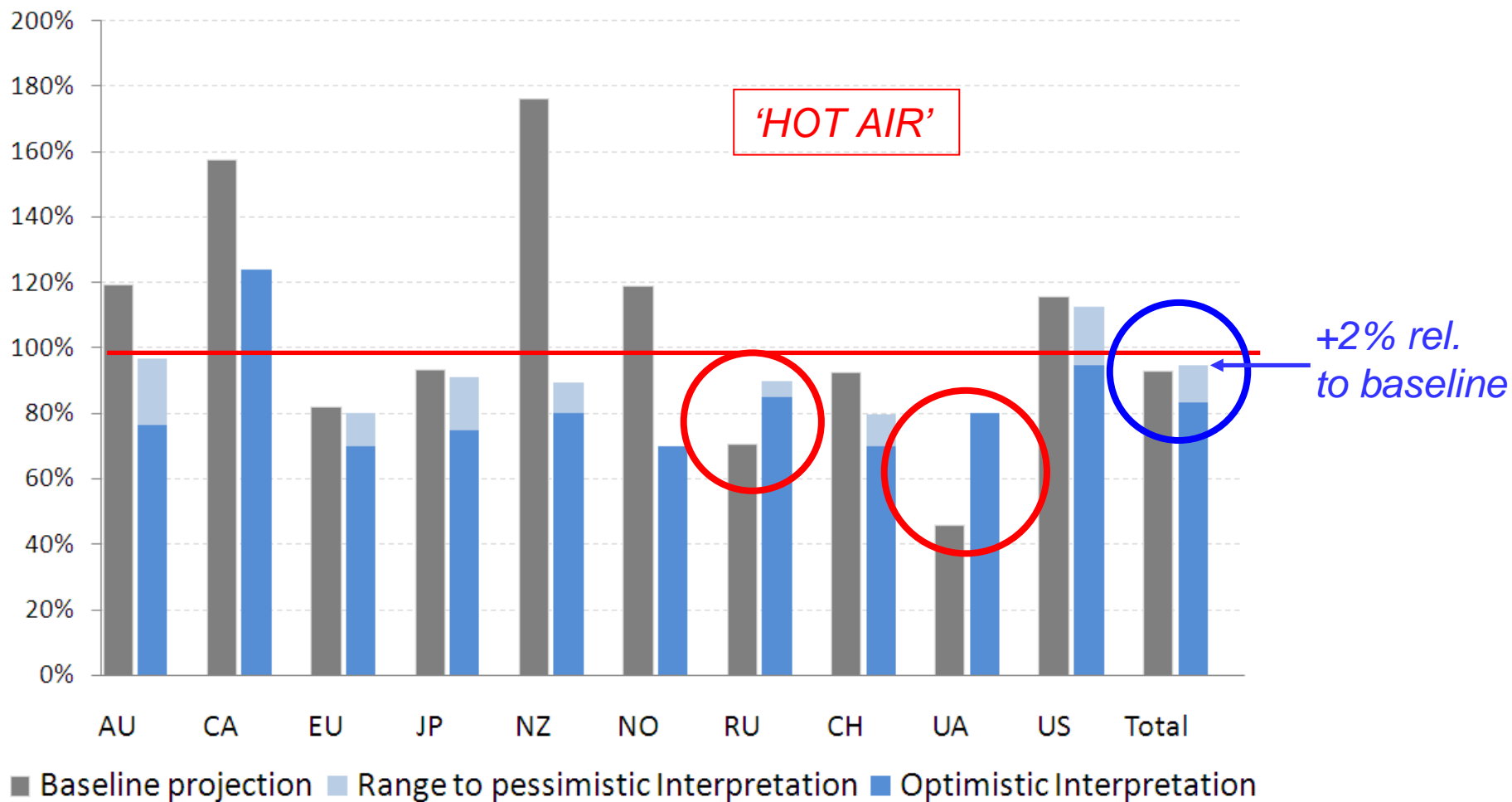


Treatment of LULUCF emissions/removals



- Baseline projection
 - National projections from 4th National Communication (if available)
 - Extrapolation of trends in LULUCF inventories 1990-2006 (if trend is discernible) – 2008 submission used
 - Conservative extrapolation of sinks (if necessary)
- Mitigation options beyond baseline
 - not considered for this analysis (conservative assumption)

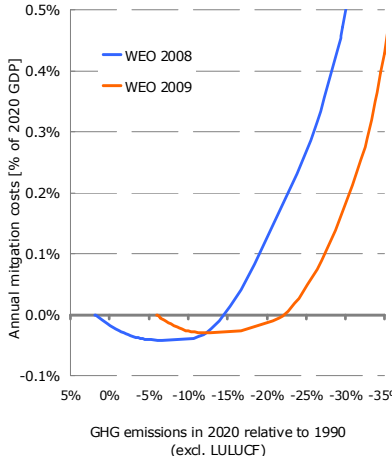
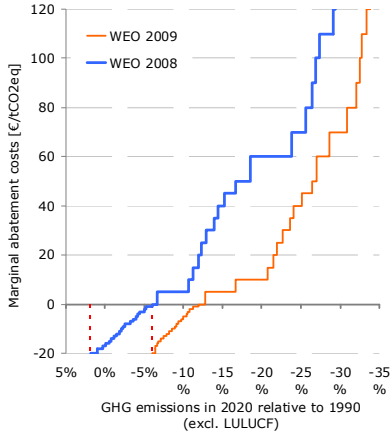
... and comparing with baseline emissions in 2020 (post-crisis IEA *World Energy Outlook 2009*)



Calculating costs with the GAINS online tool



GAINS Mitigation Efforts Calculator (MEC)



GAINS • MITIGATION EFFORTS CALCULATOR

Version 2.0 Scenario: EA 2009 Year: 2020

Options: Co-benefit, Flattech, Graph, Export, Logout

Simulation Settings:

No Annex I trading-no CDN

With Annex I trading-no CDN

No Annex I trading-with CDN

With Annex I trading-with CDN

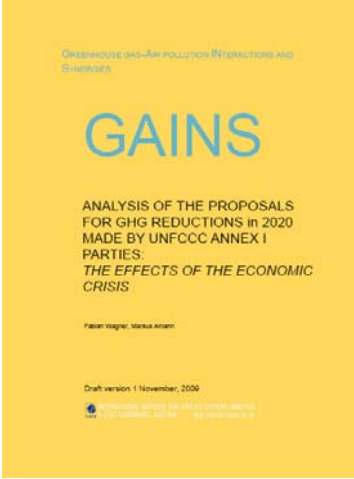
	LULUCF	Emissions		Allocation				Mitigation costs			Carbon price	
		Base year	Target 2020	Total	Change to Domestic	Credits for domestic	Credits for domestic	total costs	% of GDP	Per capita		
		1990	2020	1990	2020	2020	2020	2020	2020	2020	€/tCO ₂ eq	
Total for Annex I												
Target for each Party												
Australia	incl	526	394	-23.8%	554	160	0.09	3.21	3.30	0.45%	139.7	20.0
Canada	incl	486	534	+10.8%	500	46	-0.25	0.92	0.67	0.06%	14.4	20.0
EU 27 ⁽¹⁾	incl	5363	3495	-32.3%	3623	129	-2.83	2.56	0.03	0.00%	1.3	20.0
Japan	incl	1180	885	-25.0%	993	109	-0.42	2.15	1.53	0.04%	12.3	20.0
New Zealand	incl	41	33	-20.0%	63	30	0.01	0.59	0.60	0.57%	128.6	20.0
Norway	incl	36	25	-30.0%	36	11	-0.03	0.21	0.18	0.10%	37.3	20.0
Russian Federation	incl	3506	1929	-45.0%	1965	36	-0.25	0.73	0.48	0.02%	3.6	20.0
Switzerland	incl	50	35	-30.0%	41	6	-0.05	0.12	0.07	0.03%	9.9	20.0
Ukraine	incl	855	355	-58.5%	346	-9	0.18	-0.17	0.00	0.00%	0.1	20.0
United States of America	incl	5411	5032	-7.0%	4896	-135	2.94	-2.71	0.23	0.00%	0.7	20.0
Total for Annex I		17245	12718	-24.3%	13098	381	-0.51	7.610	7.10	0.02%	5.8	

Please select year best guess about equilibrium price in global CDN market: 20 CONFIRM

Data for Turkey, Monaco, Liechtenstein, Iceland, Croatia, Belarus and individual Member States of the EU-27 are under development.

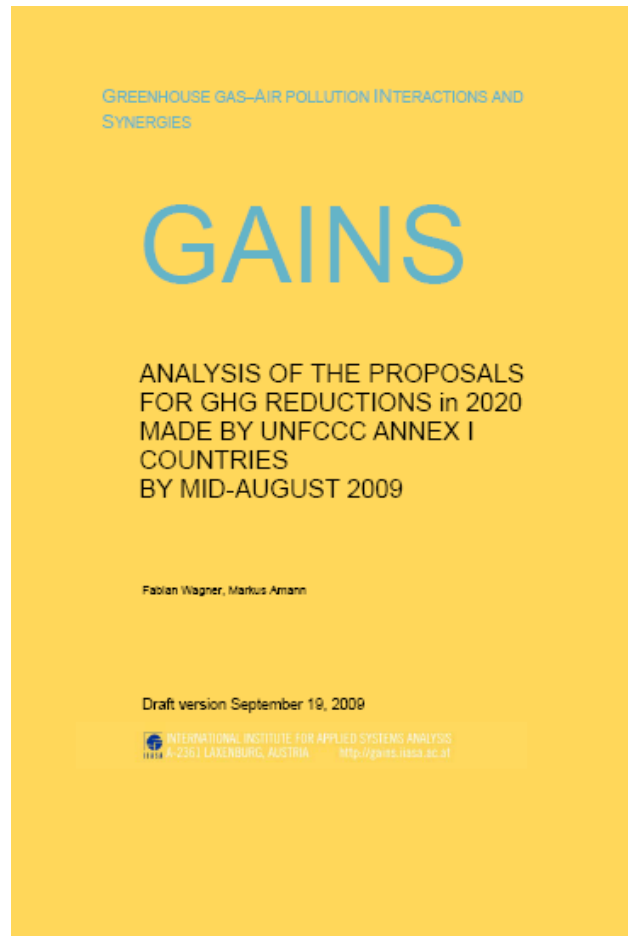
⁽¹⁾ does not include costs for meeting EU targets on renewable energy.

[Introductory video](#) [Contact Us](#)

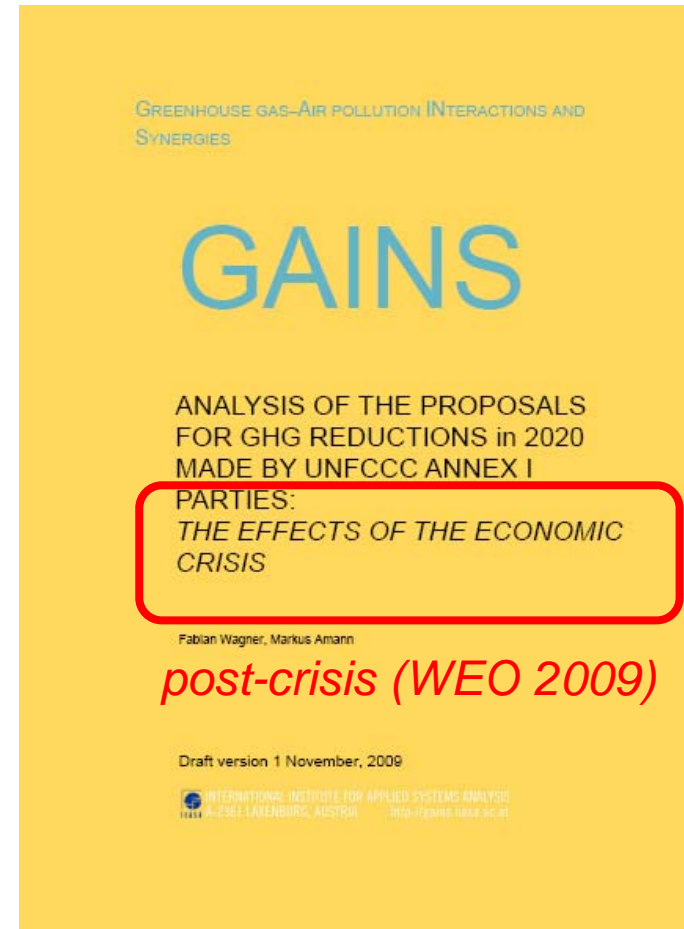


<http://gains.iiasa.ac.at/MEC>

Finding the right report at:
<http://gains.iiasa.ac.at/>



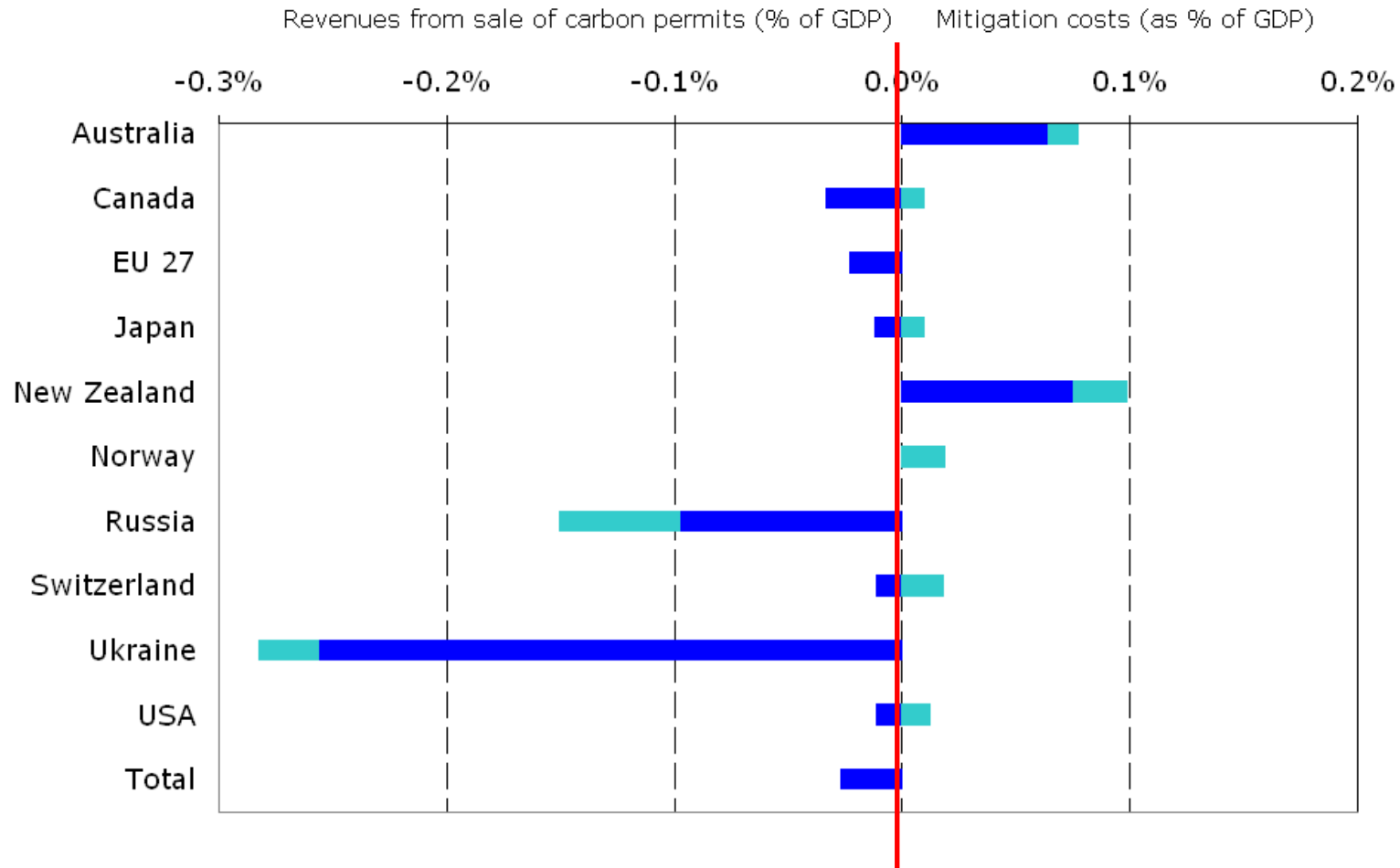
pre-crisis (WEO 2008)



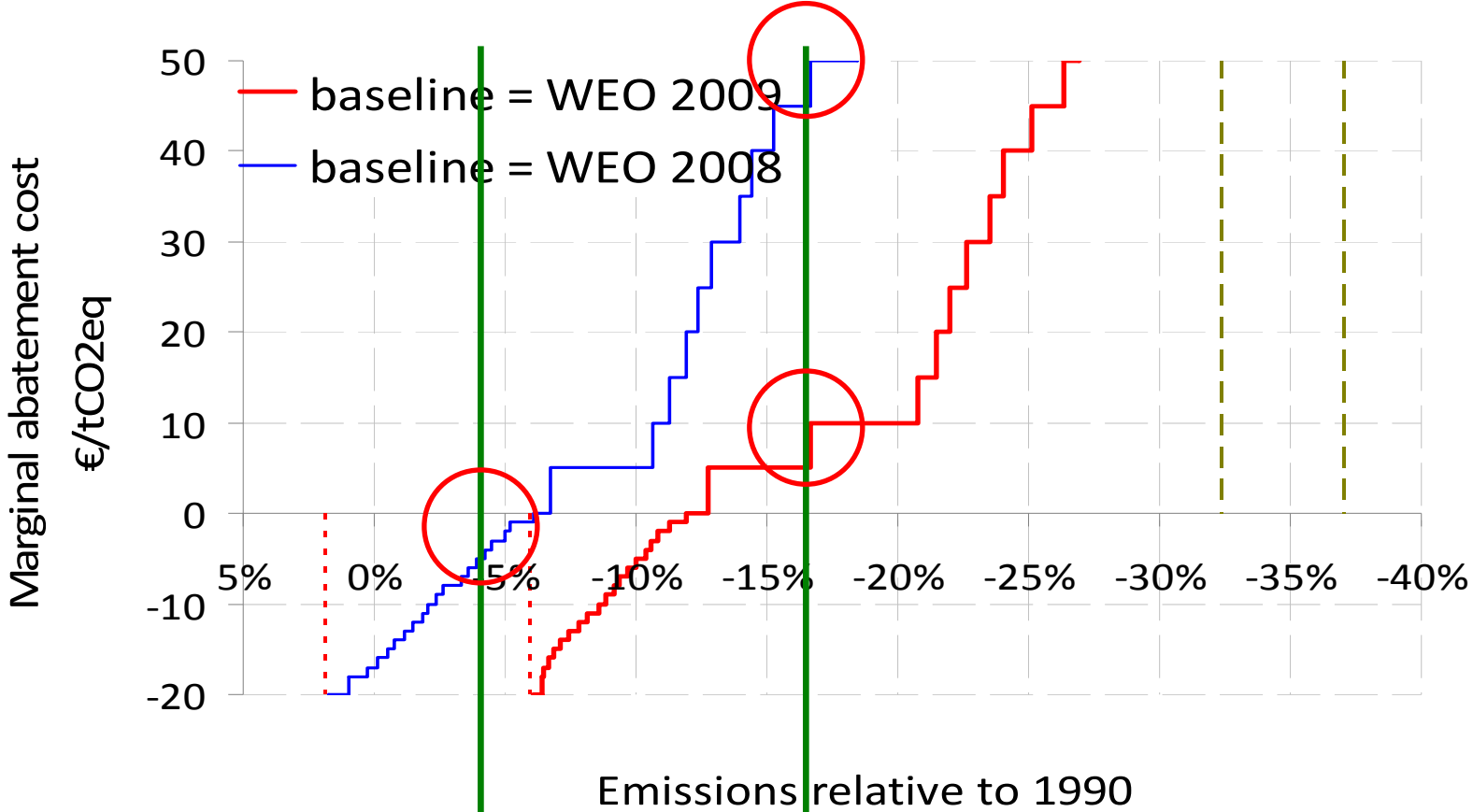
post-crisis (WEO 2009)

Total costs are small, if not negative

Optimistic interpretation of pledges



Implications for carbon price and carbon markets



'conservative' 'optimistic' **Post-crisis: < 10€/tCO₂**
No carbon market

Conclusions



- Current Annex I pledges add up to -5% to -17% of 1990 emissions (incl. LULUCF)
- Post-crisis baseline projection incl. LULUCF: -7% relative to 1990
- 'Hot air' implied by the pledges: $\sim 1 \text{ GtCO}_2$
- Overall costs: small, if not negative
- Carbon prices would be low ($< 10 \text{ €/tCO}_2$)
 - even without banked AAUs from 1st commitment period
 - LULUCF measures beyond baseline would further reduce costs and the carbon price