Greenhouse Gas Emissions Technical Mitigation Potentials and Costs in 2020
- discussions on mid-term target -

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New Japan's Mid-term Target

Japan's mid-term target was announced by New Prime Minister Hatoyama on September 22nd, 2009. The target is

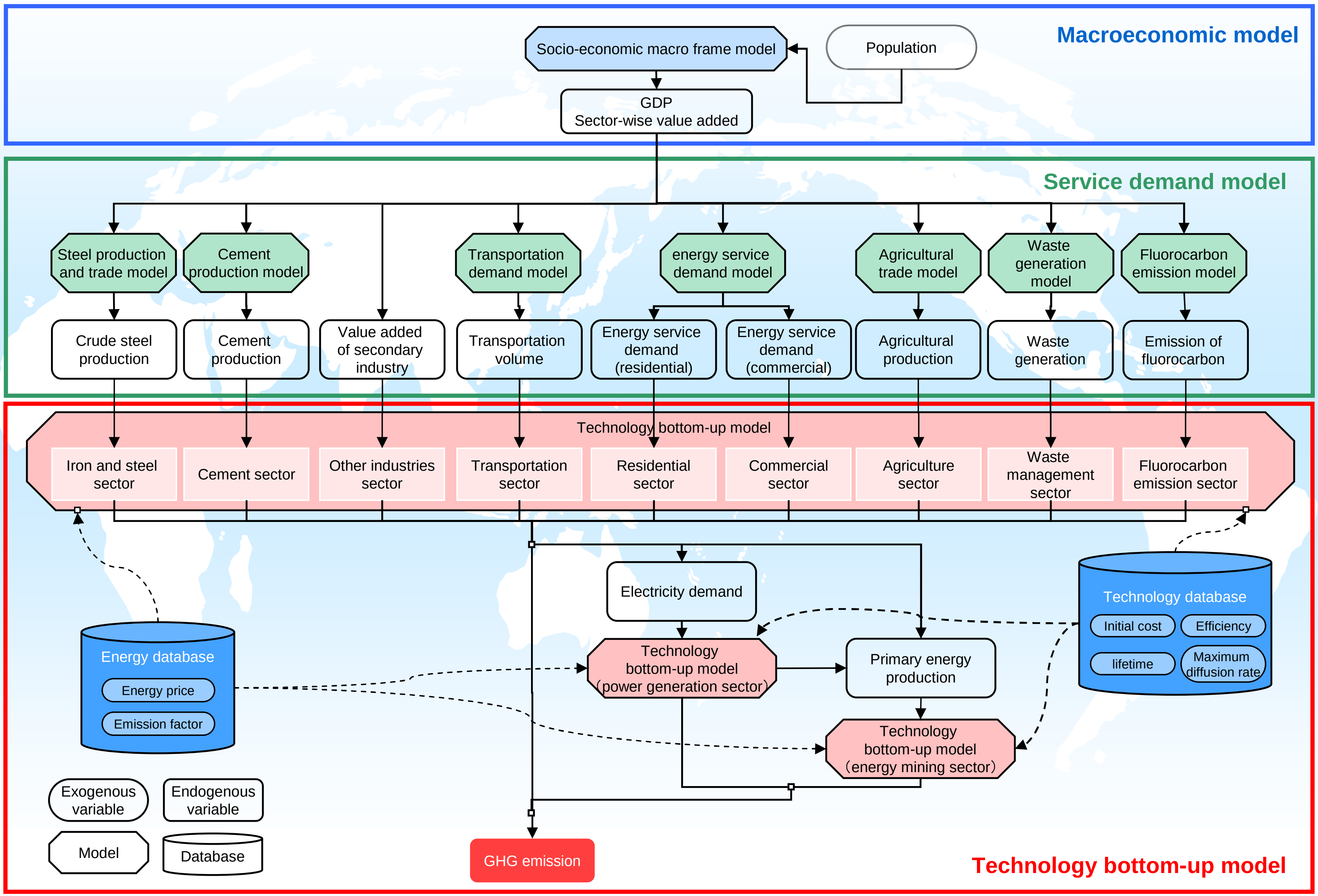
25 percent reduction from the 1990 level by 2020

New Prime Minister Hatoyama　鳩山由紀夫

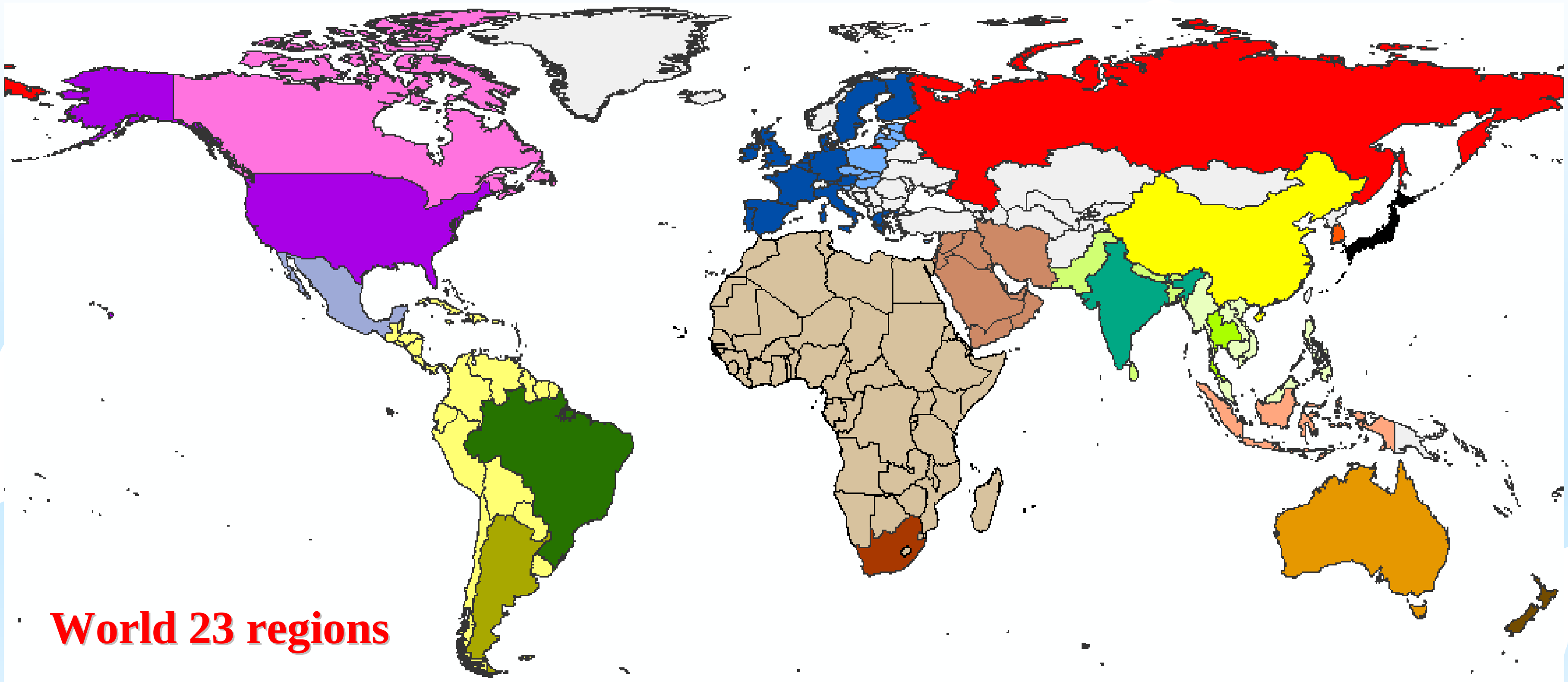
	New Mid-term target	Old Mid-term target	Kyoto target
Target Year	2020	2020	2008 - 2012
Base Year	1990	2005(1990)	1990
Domestic reduction		15(8)%	0.6%
Carbon sinks	**Totally 25%**	-	3.8%
Credits		-	1.6%

*Japan's Kyoto target (6% reduction) includes carbon sinks and credits through the Kyoto mechanisms.

Overview of AIM/Enduse[Global]



Regional Classification



- JPN (Japan)
- CHN (China)
- IND (India)
- IDN (Indonesia)
- KOR (Korea)
- THA (Thailand)
- XSE (Other South-east Asia)
- XSA (Other South Asia)
- XME (Middle East)
- AUS (Australia)
- NZL (New Zealand)
- CAN (Canada)
- USA (United States)
- XE15 (EU15 in Western EU)
- XE10 (EU10 in Eastern EU)
- RUS (Russia)
- ARG (Argentina)
- BRA (Brazil)
- MEX (Mexico)
- XLM (Other Latin America)
- ZAF (South Africa)
- XAF (Other Africa)
- XRW (Rest of the World)

Developed countries

Baseline assumption & technologies

Baseline assumption

Baseline is set as a technology frozen case, i.e. when the future share and energy efficiency of standard technologies are fixed at the same level as in the base year.

Mitigation technologies

This study is based on realistic and currently existing technologies, and future innovative technologies expected in 2020 are not taken into account.

Note1）For example, CCS is one of expected future innovative technologies that is likely to have large effect on mitigation measures. due to the lack of data availability, CCS is not taken into account as a mitigation measure in this study.

Note2) Effects of mitigation measures such as additional policies promoting modal shift, public-enlightment actions are not considered in this study.

Key factors for MAC

Results of mitigation potentials vary widely depending on data assumptions such as socio-economic characteristics

Coverage

1) Geographical coverage
2) Sectoral coverage
3) GHG coverage
4) Mitigation options coverage

Definition

1) Definition of "potential"
2) Definition of "cost"
3) Definition of "drivers"
4) Definition of any specific terms…

Data assumptions

1) Population
2) GDP and service demands
3) Energy price
4) Discount rate
5) Payback period
6) Composition of power sources
7) Baseline scenario

Detail information (which reflects key uncertainties)

1) The rate of technology development and diffusion
2) The cost of future technology
3) Climate and non-climate policy drivers

…. and so on

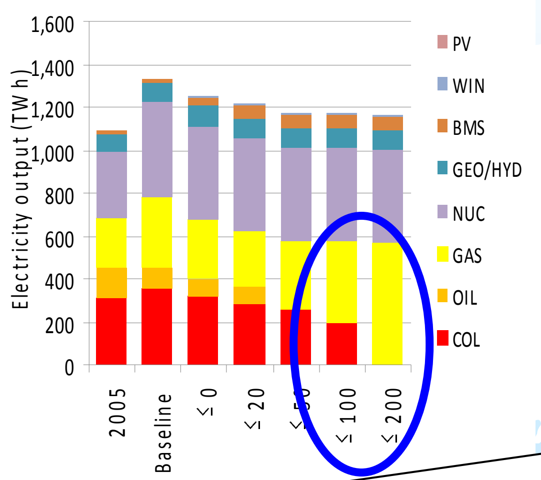
Settings of payback period

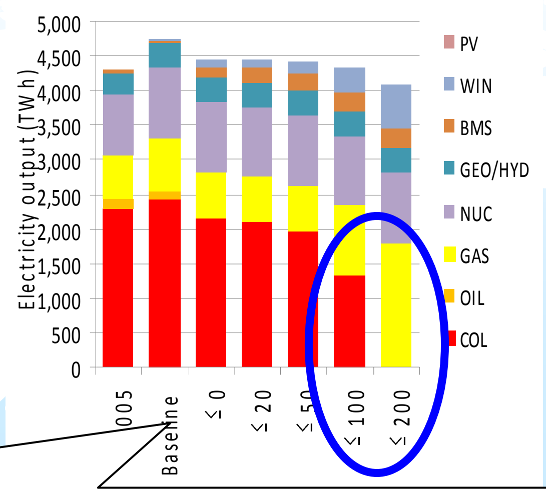
Case	Sector	Setting of payback period	Example of payback period (Lifetime use in the model)
Case 1 Short payback	Industry, Residential, Commercial, Transport	For energy-related sectors such as industry, residential, commercial and transport, where a rate of technology improvement is high and there are technology perspectives on the temporal horizon, the payback period is assumed as around three years across these sectors. (i.e. the annual discount rate is set at 33% which corresponds to approximately three years payback period).	Residential equipments: 3 years (10-15years) Car, truck, bus: 3 years (8-12 years)
	Power plant Industry plant Infrastructure House insulation	The power generation sector which is considered as a kind of public industry, and facilities with long lifetimes, such as industrial plants, public transportation, and thermal insulation for homes and buildings, have longer payback periods to reduce investment risks. Therefore, the payback period is considered longer and assumed as around ten years. (i.e. the annual discount rate is set at 10 % which corresponds to approximately nine to ten years payback period under the assumption of 30 years lifetime for power plants).	Plant: 9-10 years (30 years) Train, ship, aircraft: 8-9 years (20 years) Insulation housing: 9-10 years (30years)
	Agriculture Waste Fluorocarbons	The features of the agriculture, waste, and fluorocarbon emission sectors are different from those of energy-related sectors. In these sectors, a rate of technology improvement is slow and there is less technology perspective in a short term, the payback period should be assumed longer enough to consider the lifetime of technology options. (i.e. in this study, it is set at a five % annual discount rate note 1)).	Agriculture: 1-11 year (1-15 year) MSW: 10-16 year (15-30 year) Fluorocarbons: 1-13 year (1-20year)
Case 2 Long payback	All sectors	Assuming shorter payback periods, only technologies with a low investment risk and a certain level of energy conservation are introduced. In order to promote more measures for energy conservation, policy measures should allow adequately long payback periods corresponding to about 50~70% of the technology's lifetime. (i.e. a 5% annual discount rate was considered across all sectors and all regions).	Residential equipments: 7-10 years (10-15years) Car, truck, bus: 6-9 years (8-12 years) Plant: 14-15 years (30 years) Insulation housing: 15-16 years (30years)

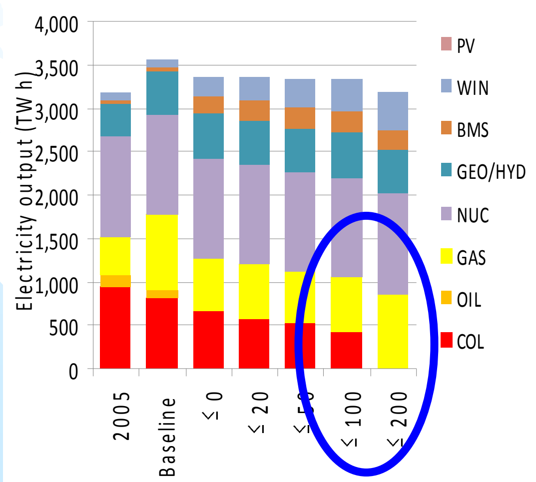
Composition of power sources

Japan | **USA** | **EU25**

Case 1

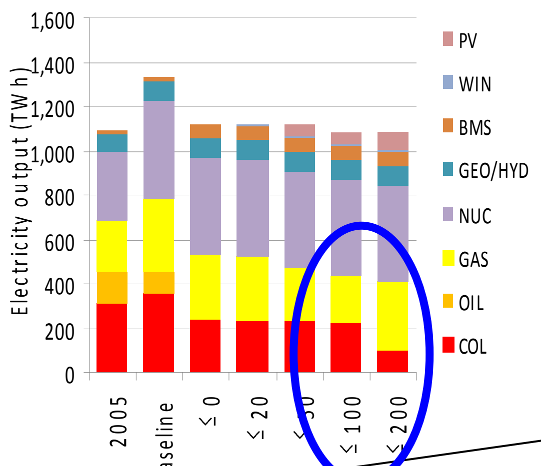


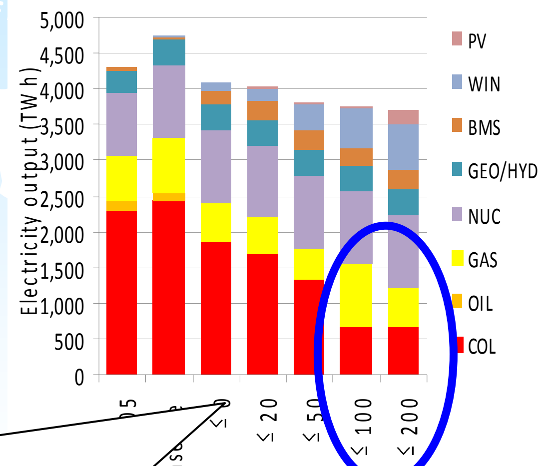


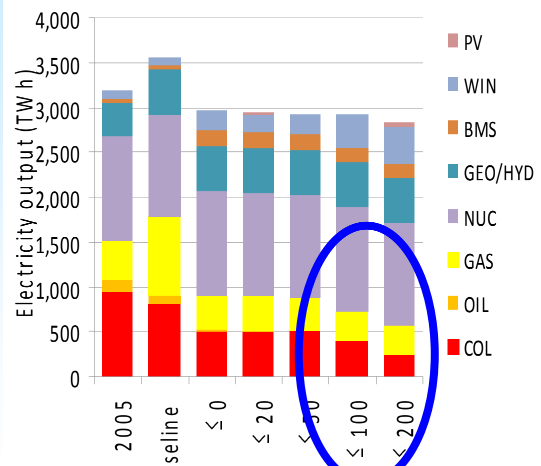


A drastic energy shift from coal and oil to gas is allowed if it is cost effective.

Case 2



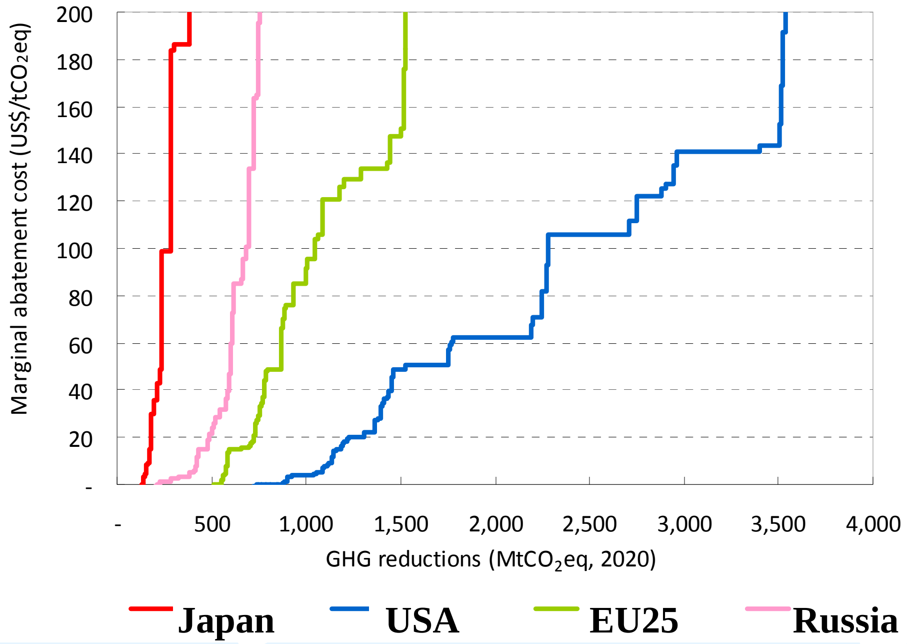




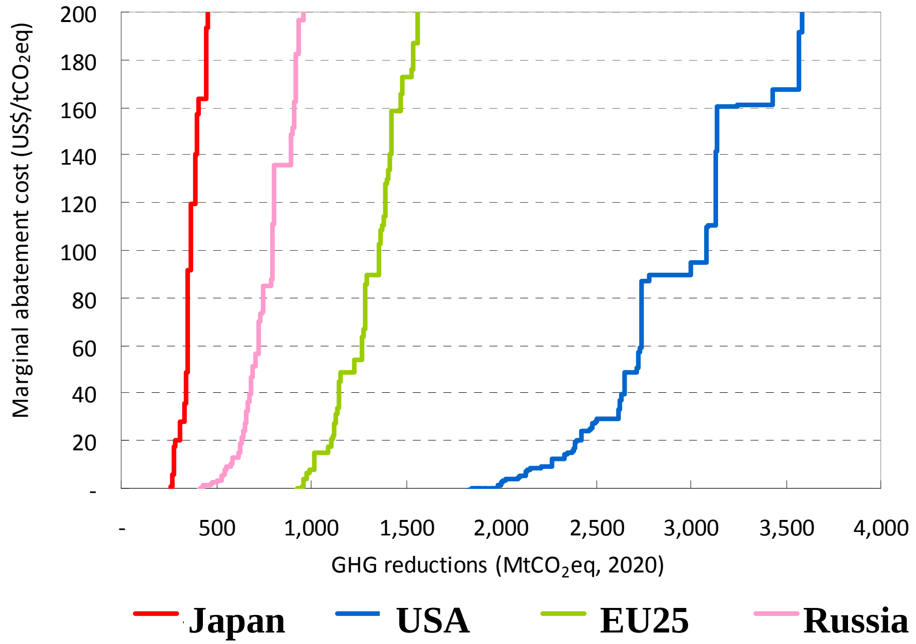
Social barriers restrict any drastic energy shift considering realistic state.

Marginal abatement cost curves in 2020 in major developed countries

Case 1
short payback period & cost optimization (i.e. no restrictions) in power sector



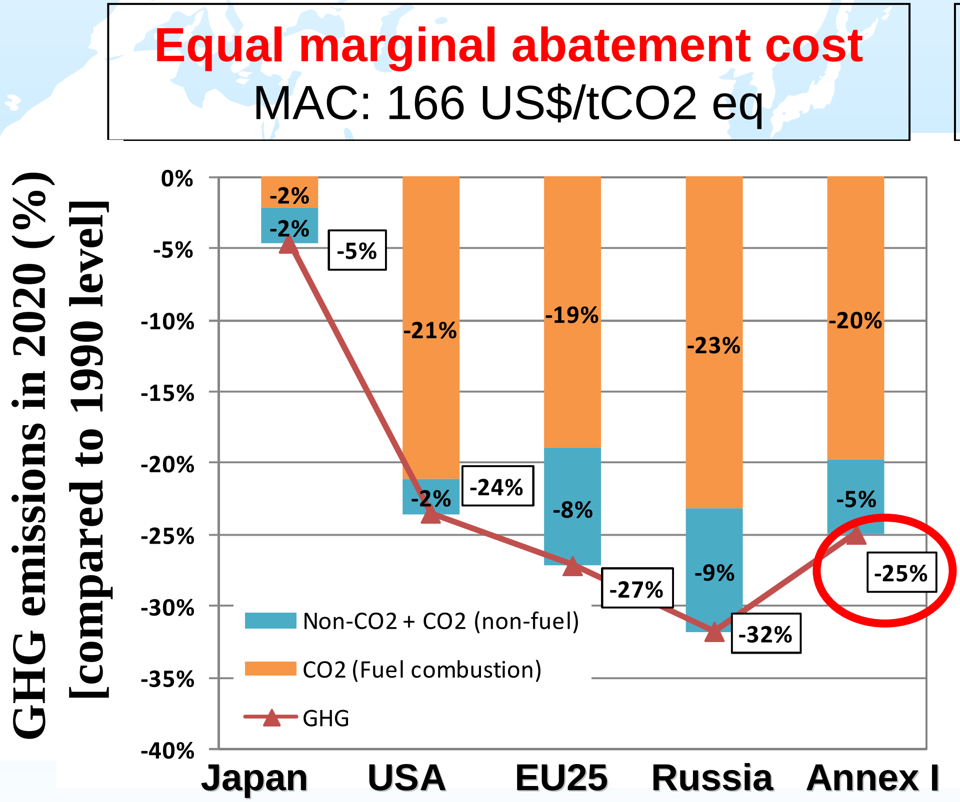
Case 2
long payback period by policy & energy security restrictions in power sector

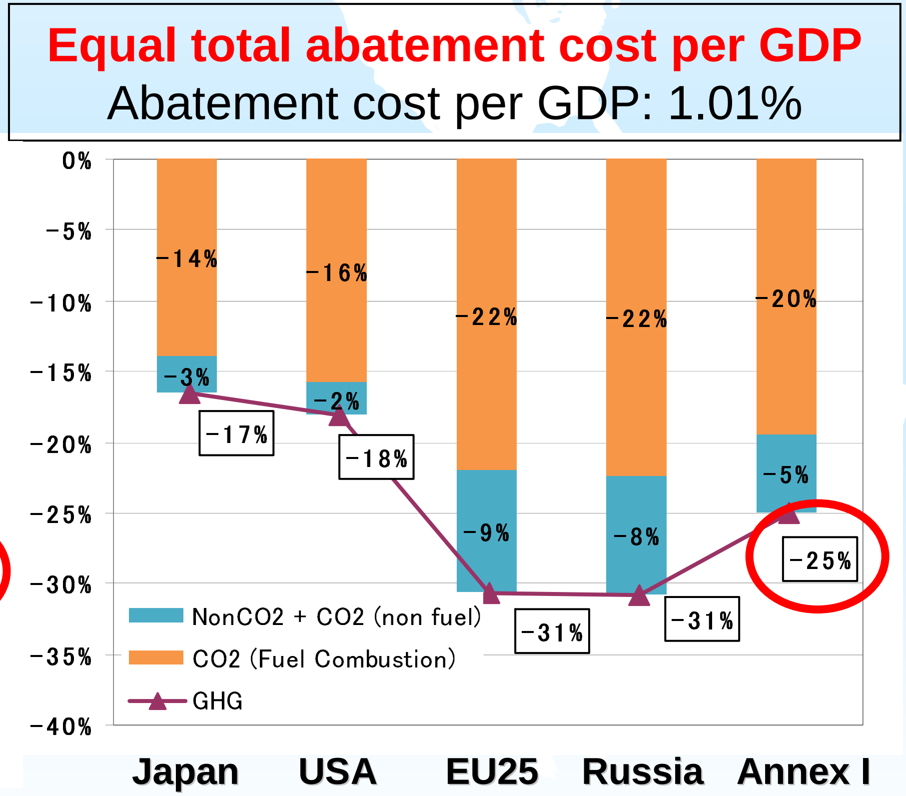


- **Under the long payback period in Case 2, more reduction potentials at lower costs are estimated due to the effects of promoting high efficient technologies on the demand side.**
- **Under cost optimization without energy security restrictions in power sector in Case 1, more mitigation potentials are estimated above 50 US$/t-CO2 eq due to the effects of a drastic shift from existing coal and oil power plants to efficient gas power plants.**

Example of equitable emission allocation to achieve 25% reductions in Annex I

Imposing equal marginal abatement cost (left figure) and equal total abatement costs per GDP (right figure) across Annex I countries to achieve a 25 % reduction target in Annex I countries.





- It is important to compare reduction targets by using different indices.

NIES side event
on Nov 4, 11:00-12:30
at Room ALMEZ

"Comparison of model analyses on mitigation efforts among developed countries"

1. **Criteria for equitable emission allocation and international law (Prof. Y.Takamura)**
2. **Comparison project on mitigation potentials and costs in 2020 by bottom-up type models (NIES, Hanaoka)**
3. **Model comparison project by IEA/OECD**
4. **Model comparison project by IIASA**