Development of AIM/Enduse[Global] model - GHG emissions reductions and costs in Asia regions -

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Topics

1. Objective

2. Overview of developing Enduse[Global]

**3. Scenario outline**

4. Results in Asia regions

- Global and regional reduction potentials

- Marginal abatement costs

Objective of this study

Background

- According to recent scenario studies, most of BaU scenarios show increase of GHG emissions toward the latter half of the 21st century.
- Considering socioeconomic and technology level in each country & region, studies such as burden sharing, CDM potentials, regional and global economic impacts become major interests in the world.
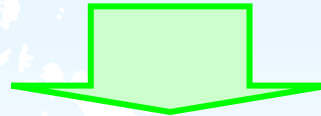
To evaluate GHG mitigation potentials and estimate marginal abatement costs in world regions.

- Comparison of region-wise & sector-wise reduction potentials and reduction costs
- Technologies with large reduction potentials

Overview of Enduse[Global]

◆ **Target Regions : 23 geographical world regions**

◆ **Time Horizon   : 2000 – 2020**

   (planning to expand up to 2050)

◆ **Target Gas : CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 (CFCs, HCFCs)**

◆ **Target Sectors : multiple sectors**

   (Power generation sector / Industry sector / Residential sector /

   Commercial sector / Transport sector / Agriculture sector /

   CH_4 & N_2O emissions sector / F-gas emissions sector)

Geographical coverage

Depending on what is to be analyzed, there are different approaches for regional aggregations

➡ In this study, focus major GHG emission regions, especially Again regions in detail

Region	Code
1) Japan	JPN
2) China	CHN
3) India	IND
4) Indonesia	IDN
5) Korea	KOR
6) Thailand	THA
7) Other South-east Asia	XSE
8) Other South Asia	XSA
9) Middle East	XME
10) Australia	AUS
11) New Zealand	NZL

Region	Code
12) Canada	CAN
13) USA	USA
14) EU-15 in Western Europe	XE15
15) EU-10 in Eastern Europe	XE10
16) Russia	RUS
17) Argentine	ARG
18) Brazil	BRZ
19) Mexico	MEX
20) Other Latin America	XLM
21) South Africa	ZAF
22) Other Africa	XAF
23) Rest of the World	XRW

Target gas and sectors

Target gas	Target sector	Target service
CO2	Power generation	Coal power plant, Oil power plant, Gas power plant, other powers generation (wind, biomass, PV)
CO2	Industry	Iron and steel, cement, other industries
CO2	Residential & commercial	Cooling, heating, hot-water, cooking, lighting, refrigerator, TV
CO2	Transportation	Passenger vehicle, truck, bus, ship, aircraft, passenger train, freight train (except for pipeline transport and international transport)
N2O	Industry process & agriculture	Adipic acid, nitric acid, cropland
CH4	Agriculture & non-agriculture	Coal mining, gas production, livestock rumination, manure management, paddy field, municipal solid waste
HFCs, PFCs, SF6	F gas	By-product of HCFC-22, refrigerant, aerosol, foams, solvent, etching, aluminum production, magnesium production. Insulation gas, others.

Outline of model simulation

- Base year: **2000**
- Target year : **2020**
- Discount rate: **5%/year**
- Baseline scenario: **technology-frozen case**

Assuming the characteristics in 2020 as the case under existing technology options with the same technical and economic characteristics as in 2000
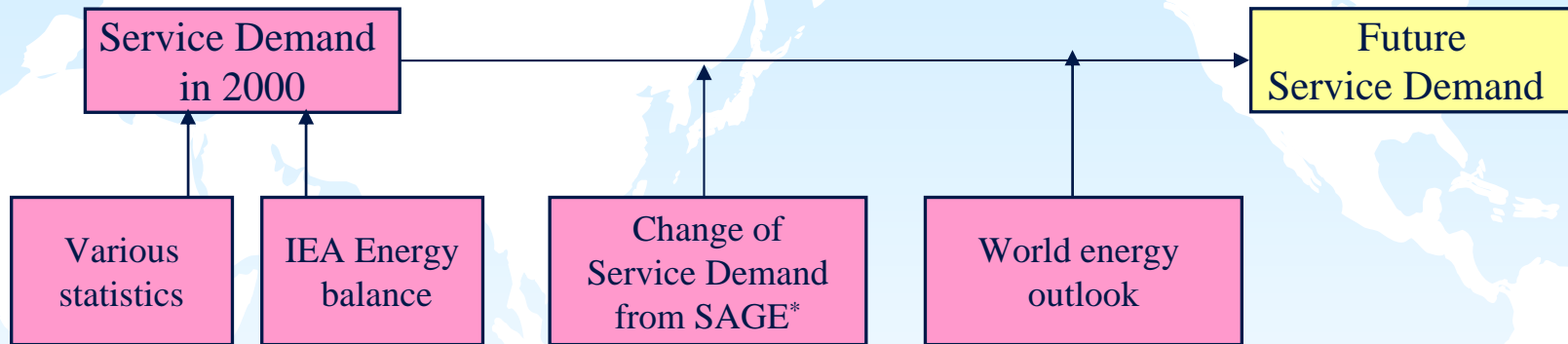
➢Reduction potentials are estimated by consideration of diffusion of of selected advanced technology.

➢Additional costs are estimated by subtraction of the cost of existing technology and the one of selected advanced technology in each sector
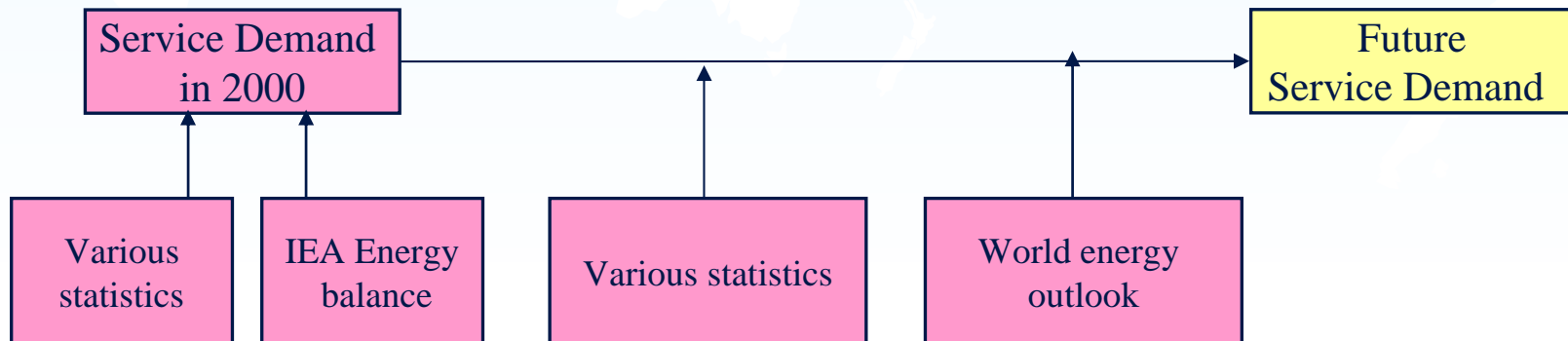
Estimation of service demands

Current method of estimating future service demand

◆ in sectors in residential, commercial, transportation, industry

| Service Demand in 2000 | → | Future Service Demand |

- Various statistics
- IEA Energy balance
- Change of Service Demand from SAGE*
- World energy outlook

SAGE* : USDOE, 2003, Model Documentation Report: System for the Analysis of Global Energy Markets

◆ in sectors in non-CO2 emission

| Service Demand in 2000 | → | Future Service Demand |

- Various statistics
- IEA Energy balance
- Various statistics
- World energy outlook

# Example of on-going work and issues

- General
  - Refine & investigate data of driving forces in the base year and future.
  - Develop rich database of technology options
- Data preparation in residential and commercial sector
  - Detailed check of biomass energy consumption
  - Detailed check of biomass energy technologies
  - Consideration of relationship between building types and warming demand
  - Consideration of technology substitution over energy kind in cooking, hot water and warming
  - Detailed check of energy technology of hot water and warming in Europe and the United States
  - Estimation of future driving force not using SAGE
- Data preparation in transportation sector
  - Detailed check of service demand in year 2000 (Check consistency with energy consumption, energy efficiency, number of vehicle)
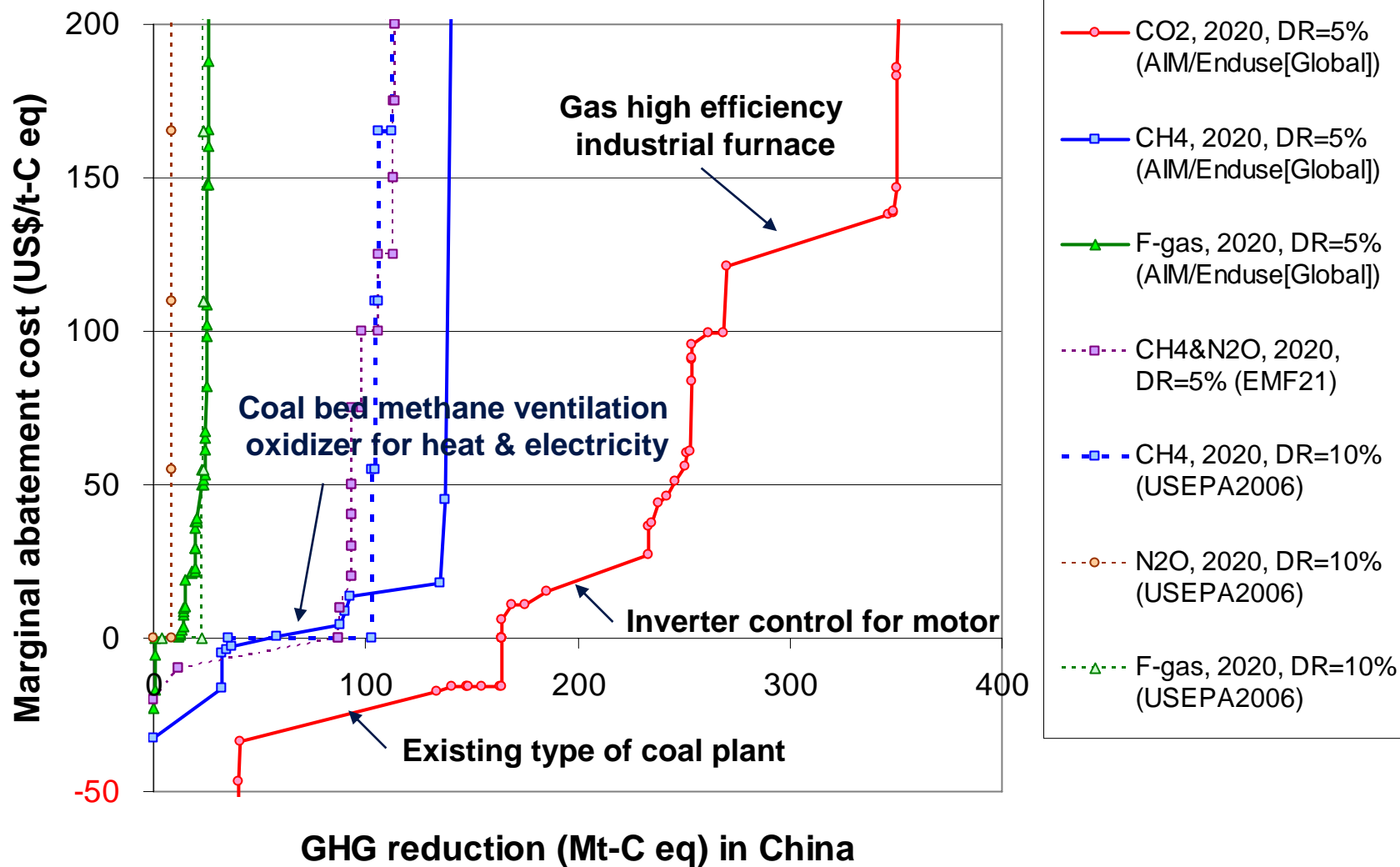 - Estimation of future service demand by econometric model
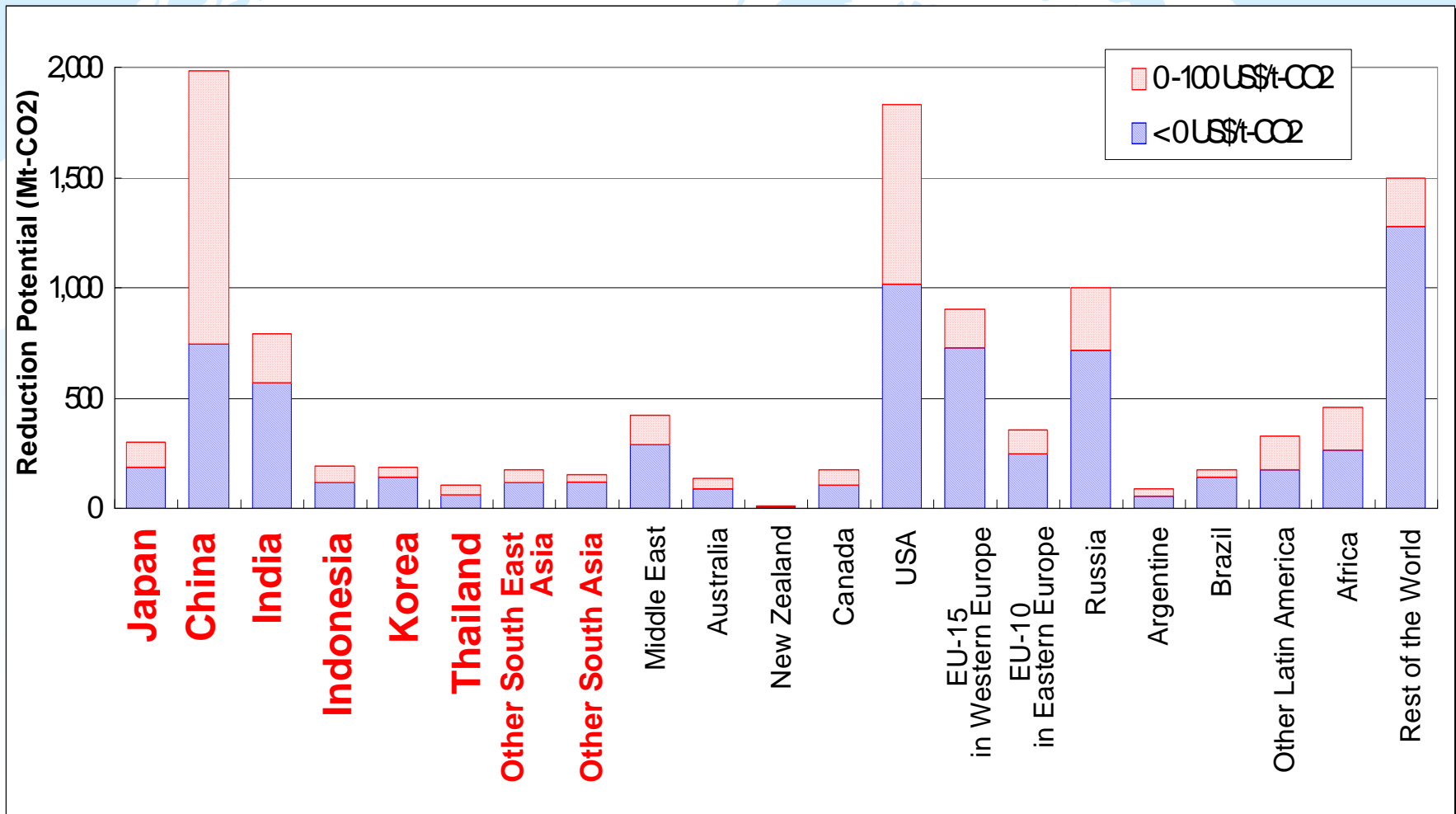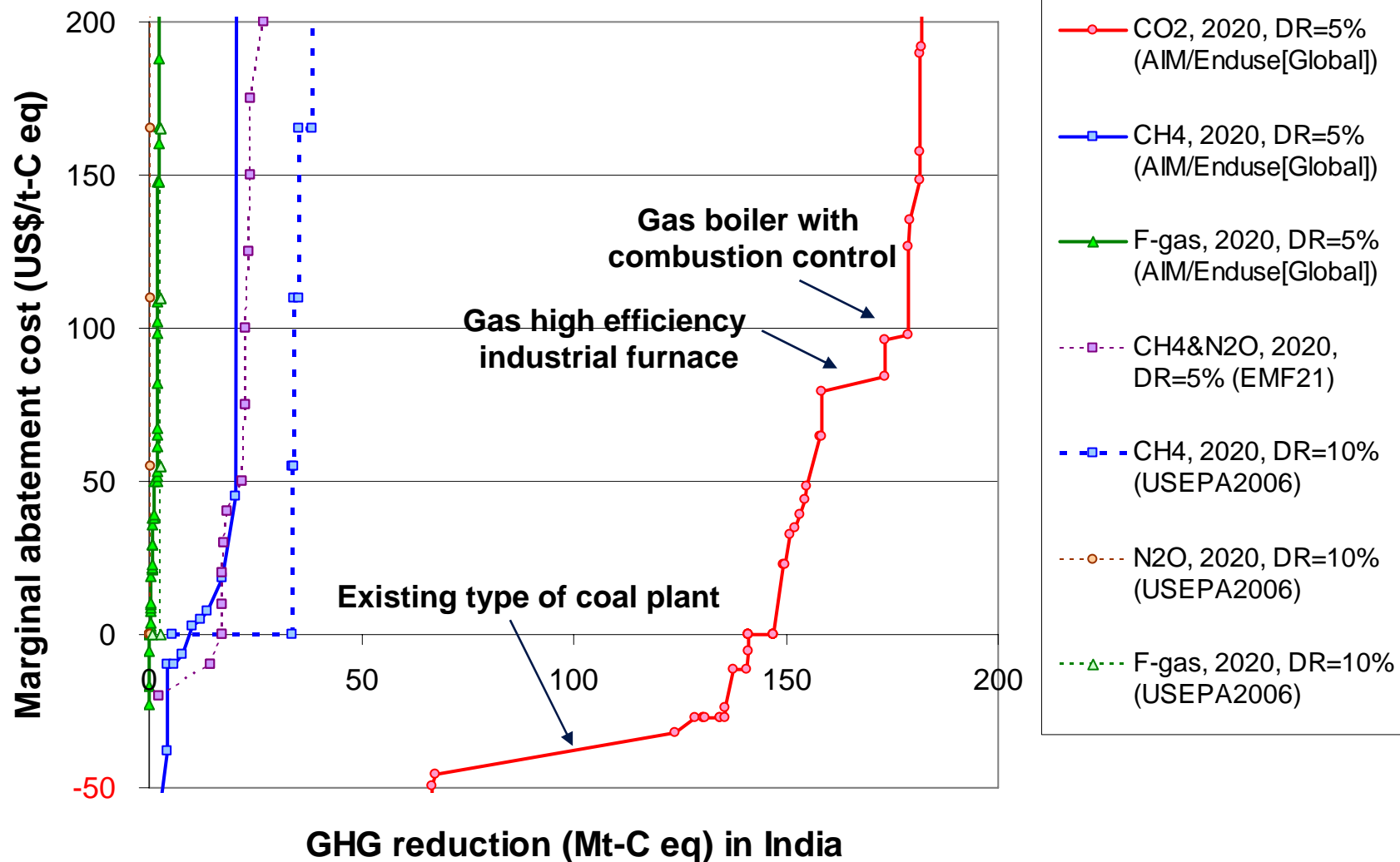
Comparison of marginal abatement costs curves in China

Comparison of marginal abatement costs curves in India

GHG reduction (Mt-C eq) in India

Comparison of marginal abatement costs curves in SA&SE
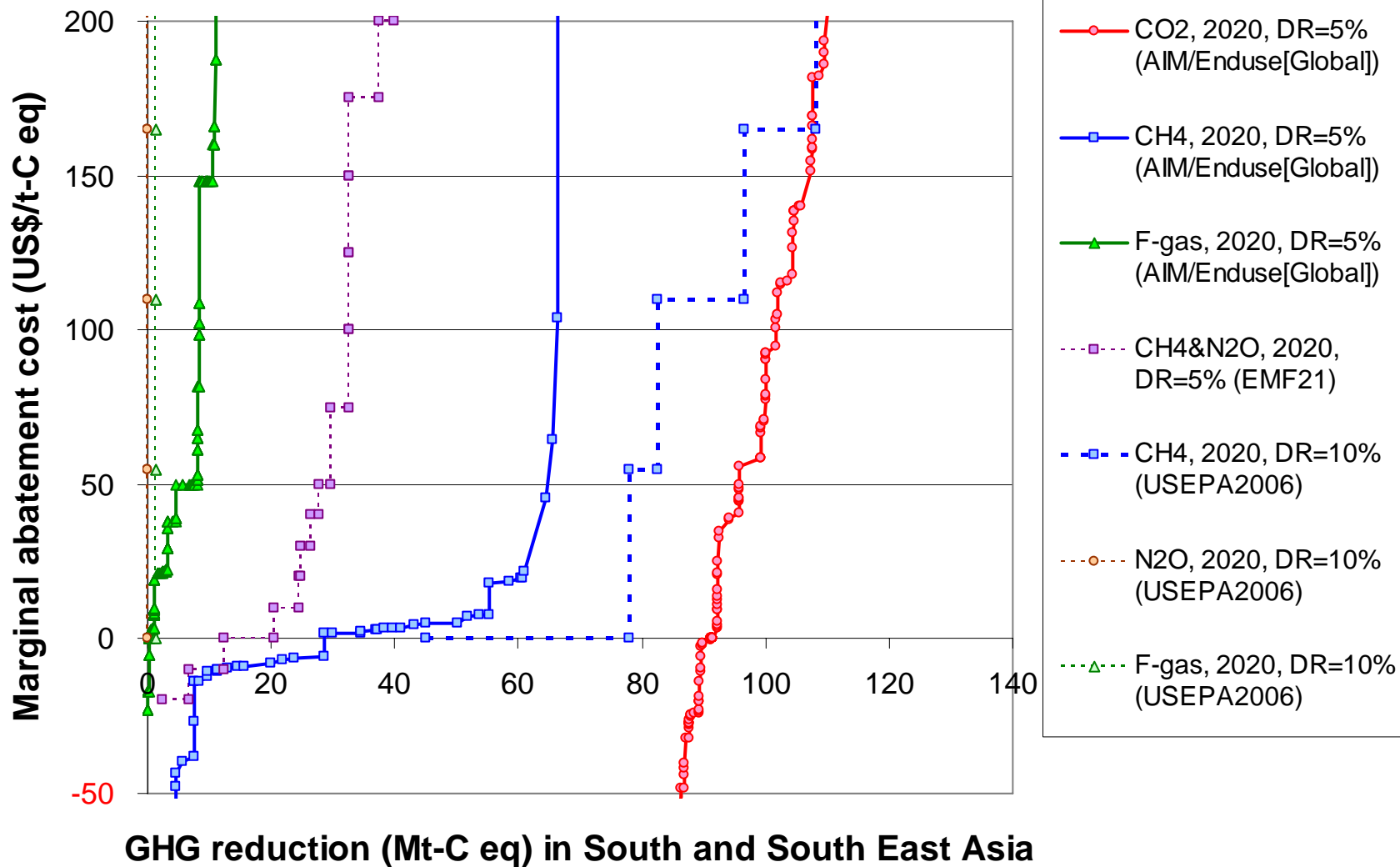
GHG reduction (Mt-C eq) in South and South East Asia

Comparison of marginal abatement costs curves in Korea

Gas high efficiency industrial furnace

GHG reduction (Mt-C eq) in Korea

Marginal abatement cost (US$/t-C eq)

- CO2, 2020, DR=5% (AIM/Enduse[Global])
- CH4, 2020, DR=5% (AIM/Enduse[Global])
- F-gas, 2020, DR=5% (AIM/Enduse[Global])
- CH4&N2O, 2020, DR=5% (EMF21)
- CH4, 2020, DR=10% (USEPA2006)
- N2O, 2020, DR=10% (USEPA2006)
- F-gas, 2020, DR=10% (USEPA2006)
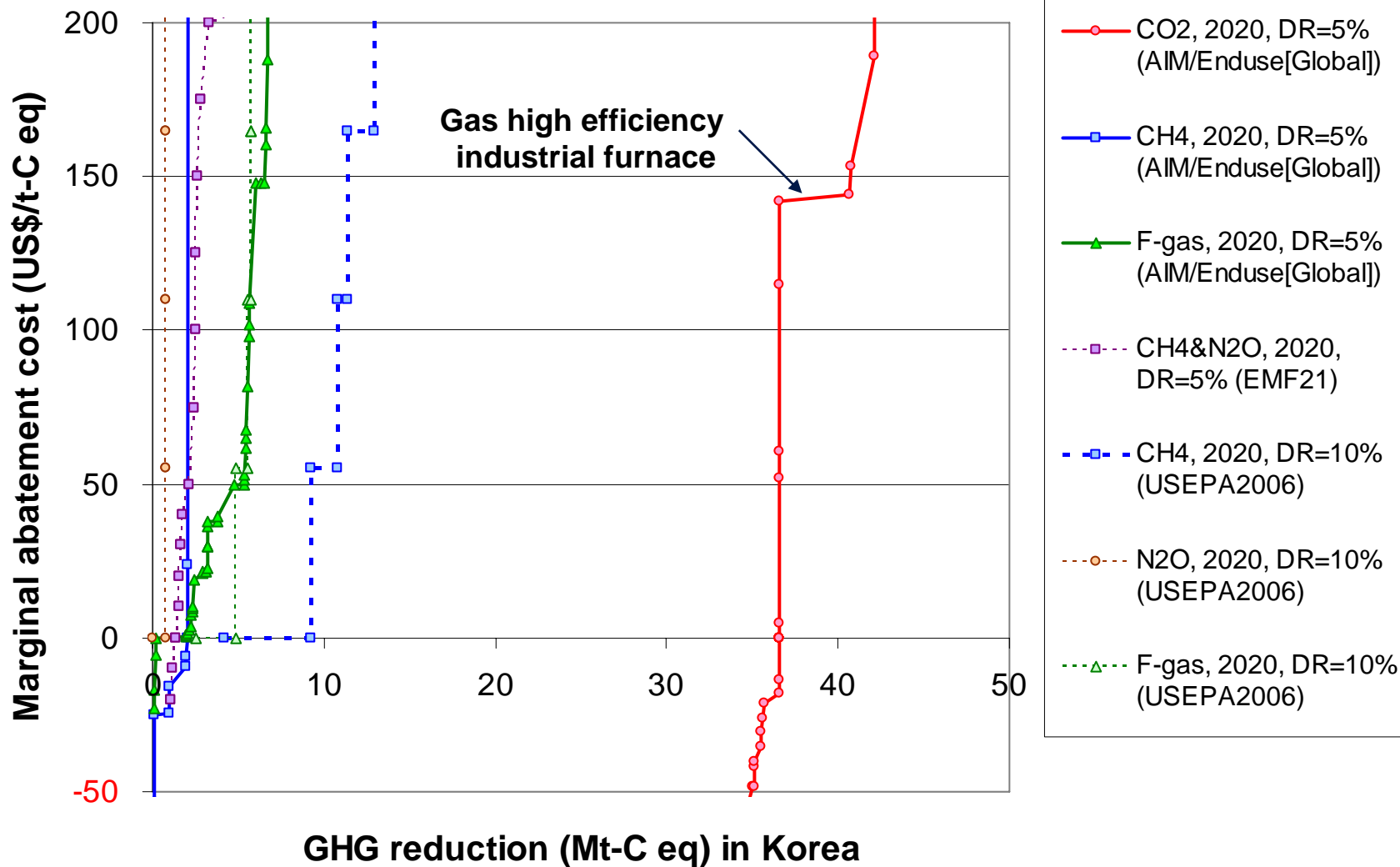
Comparison of marginal abatement costs curves in Japan
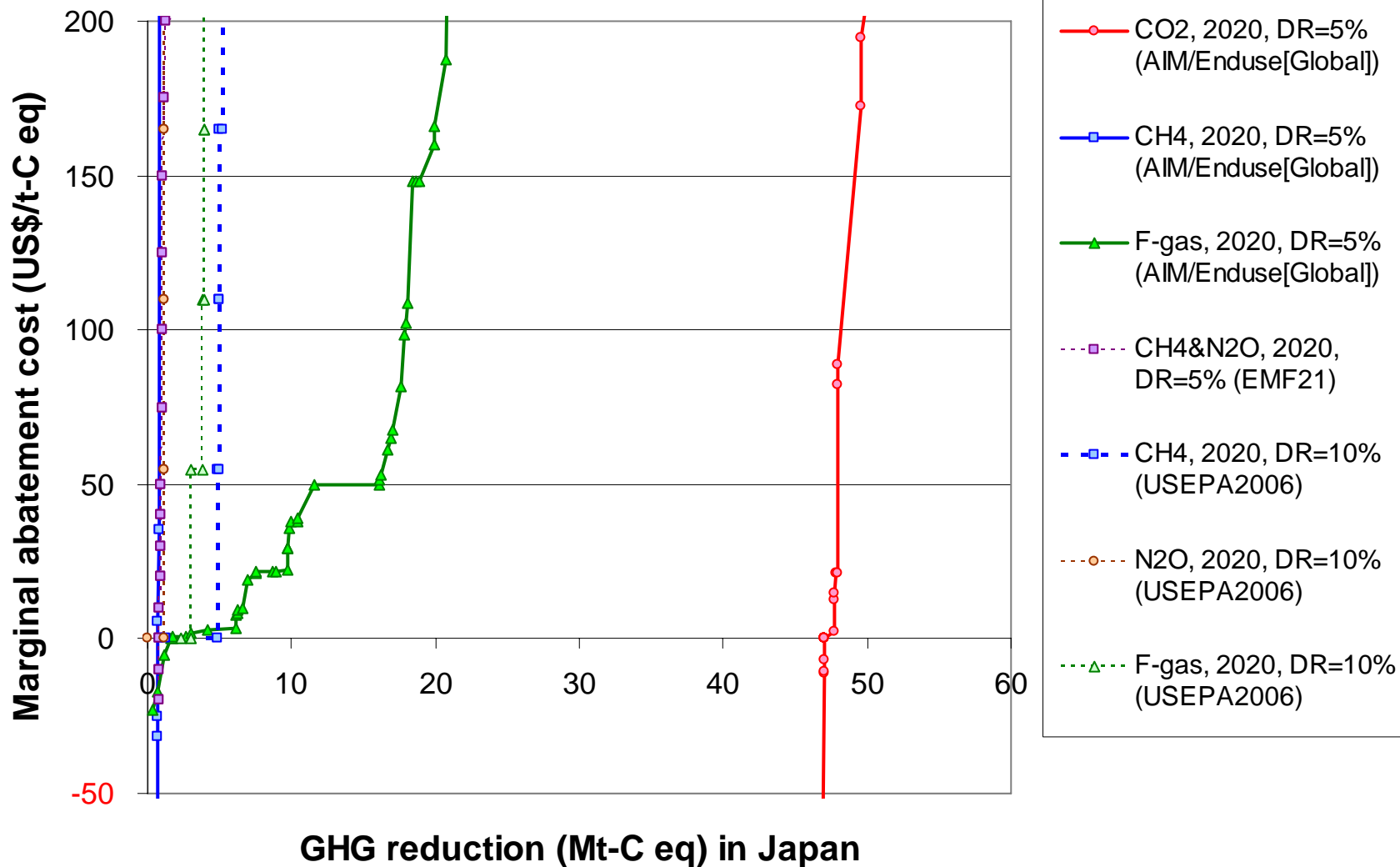
Scope for further development

Thank you