

US/Japan Cooperative Strategy for Combating Climate Change

September 27, 2010

Masakazu Toyoda
CEO & Chairman

The Institute of Energy Economics, Japan

Contents

1. Present State of Negotiations and Desirable Cooperative Initiative
2. What could be Appropriate Reduction Targets by Major Economies by 2020 ?
3. Reductions by Developing Countries and Contribution by Developed Economies

1. Present State of Negotiations and Desirable Initiative

①) Present state of negotiations

① Points of Discussion

1) Present state of negotiations

- Even after the Copenhagen Accord (CA), major differences in opinion remain among advanced, emerging, and developing countries.
- The US registered to reduce GHG emissions by 4%(compared to 1990 level) by 2020 on condition that the emissions trading bill is approved in the Congress, which is unlikely before the midterm election.
- EU registered to reduce by 20-30% depending on the efforts of other major countries
- China and India registered to reduce GHG per GDP by 40-45% and by 20-25% respectively, which means that they would increase GHG emissions by almost 100% in the next ten years. China hesitates to sign a legally binding international agreement.
- Japan registered to reduce by 25% on the premise that major economies make comparable efforts
- All the countries have concerns with the impact on economic growth..
- An agreement at COP16 in Mexico looks very difficult to be made

1-1) Present State of Negotiations and 2) Suggested Approaches

② Summary of Targets by Country

- The targets of each major country are based on the Copenhagen Accord.
- Advanced countries have promised gross reductions in GHG emissions; developing countries have promised reductions based on Business-as-Usual (BaU) ratio or emission intensity.

	Reference year	Mid-term target	Reduction from 1990	Reduction from 2005	IEA suggestion (reduction from 1990)	Marginal cost for reduction (\$)
Japan	1990	-25% (※1)	-25%	-30%	-10%	476
EU	1990	-20%~ -30% (※1)	-20%~ -30%	-13%~ -24%	-23%	48 ~ 135
US	2005	-17% (※2)	-4% (claimed by US)	-17%	-3%	60
Canada	2005	-17% (※2)	+3%	-17%	—	92
Australia	2000	-5% ~ -25% (※1)	+13% ~ -11%	-10% ~ -29%	—	46 ~ 92
New Zealand	1990	-10% ~ -20% (※1)	-10% ~ -20%	-28% ~ -36%	—	n.a.
Russia	1990	-15% ~ -25% (※1)	-15% ~ -25%	+18% ~ +33%	-27%	0
Brazil	-	-36.1% ~ -38.9% (reduction from BaU in 2020)	—	-23%	—	n.a.
South Korea	-	-30% (reduction from BaU in 2020)	—	-4%	—	21
China	2005	-40% ~ -45% (reduction in GDP-based emission intensity)	Assuming 8% economic growth up to 2020: emissions to increase by 1.9 times from 2005 level	-47% (from 2005 level)	0	
			Assuming 6% economic growth from 2015: emissions to increase by 1.7 times from 2005 level			
India	2005	-20% ~ -25% (reduction in GDP-based emission intensity)	Assuming 7% economic growth up to 2015 and 6% thereafter: emissions to increase by 2.1 times from 2005 level	-40% (from 2005 level)	Less than zero	

Note 1: Targets marked *1 are accepted with preconditions concerning scenarios, etc. Targets marked *2 are accepted with preconditions about assumed scenarios concerning passage of bills, etc.

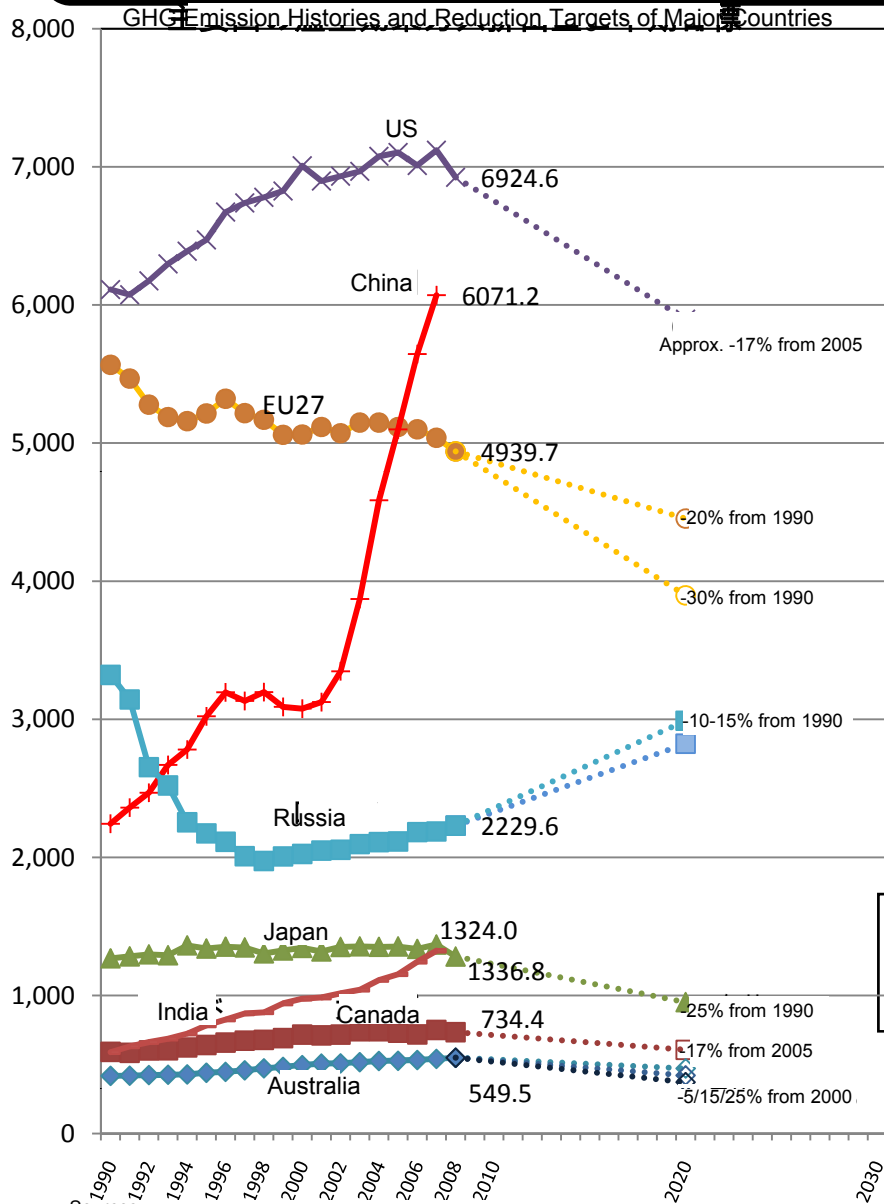
Note 2: Marginal cost for reduction was estimated by Research Institute of Innovative Technology for Earth (RITE).

Note 3: "BaU ratio" refers to reduction from the Business-as-Usual case that assumes no special measures are taken.(Business As Usual)

Source: RITE, etc.

1-1) Present State of Negotiations and 2) Suggested Approaches

③ Emission Trends and Situations by Country



US

- Will reduce from high emission levels produced by fast economic growth and increased emissions in the 1990s. Is introducing a domestic emissions trading system with >80% coverage. Auction-based trading is proposed for reducing emissions, but the bill is facing difficulties.
- Is pursuing own approach regardless of the international community, rejects control over gross emissions under the Kyoto Protocol. Is designing a unique credit market with voluntary certification. At the policy level, seeks to help other countries reduce emissions, particularly China and South American countries.

EU

Emissions are decreasing thanks to EU Bubble initiatives (reduction initiatives with East European countries, etc.), methane control initiatives (garbage incineration, etc.), a shift to natural gas (as already achieved by Japan), etc.

Generation Mix in the UK

Year	Coal	Natural gas	Petroleum	Nuclear power	Hydro	Others
1990	65.0	1.6	10.9	20.7	1.6	0.2
2006	30.5	33.8	10.9	20.7	1.6	4.1

- EU is shifting to natural gas by an emissions trading system that keeps only electricity uncapped. Offers financial support for wind turbine and photovoltaic system manufacturers, etc., and is vitalizing the financial market by a fixed price purchasing system for renewables. Large reductions expected from measures other than emissions trading.

China

- Emissions have been increasing sharply since 2000; cumulative emissions (up to 2005) have already surpassed Japan.
- China is a party to the international framework but basically takes voluntary actions. (Its target for 2020 is softer than under the present 11th Five year plan.) Seems to assume that external support is needed for further efforts.
- China is the greatest beneficiary of the existing CDM, receiving about 60% of total support. Is already a strong rival to Japan in exporting energy conservation technologies to other countries, and is keenly developing technologies.

Sources:
 Data on the US, Japan, Canada and Australia are from UNFCCC.
 Data on EU27 are from EEA.
 Data on China and India are from IEA (reference to energy-derived CO2 emissions data).

1. Present State of Negotiations and Desirable Initiative

1-2) Desirable Approach ① Points of Discussion

2) Desirable approach

- US and Japan should lead the negotiation toward an agreement by adopting the second-best solution.
- Best solution
 - : Fair sharing of burden by major countries. All advanced countries commit to 25% reduction like Japan, to achieve a total reduction of 25-40%. And developing economies, emerging ones in particular, make the best comparable efforts
- Second-best solution
 - : Proceed with legally binding reductions based on the Copenhagen Accord.

1. Present State of Negotiations and Desirable Initiative

1-3) Undesirable Approach ① Points of Discussion

3) Undesirable approach

- Simple continuation of the Kyoto Protocol

Reasons:

- a. Not meaningful without the US and China, which produce more than 40% of global emissions
- b. Damaging and harmful to the efforts to curve Climate Change as well as the efforts to recover from serious recession in the countries under extended Protocol, since factories in those countries will simply relocate, increasing GHG emissions in emerging countries, and reducing employment in those countries.

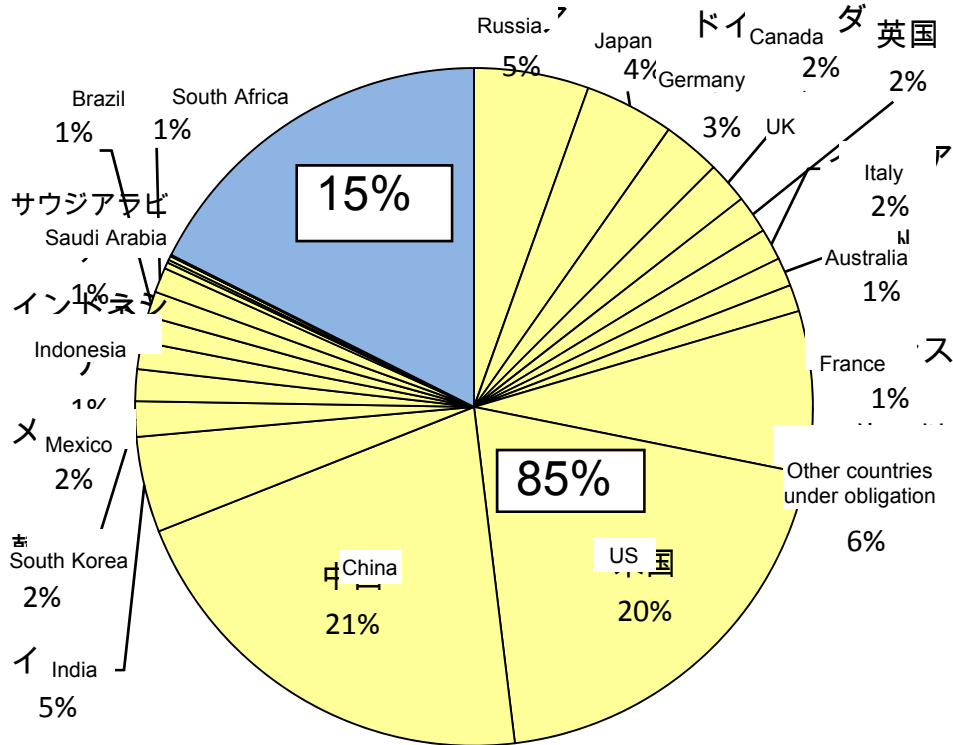
1-3) Undesirable Approach

④ Coverage under the Copenhagen Accord

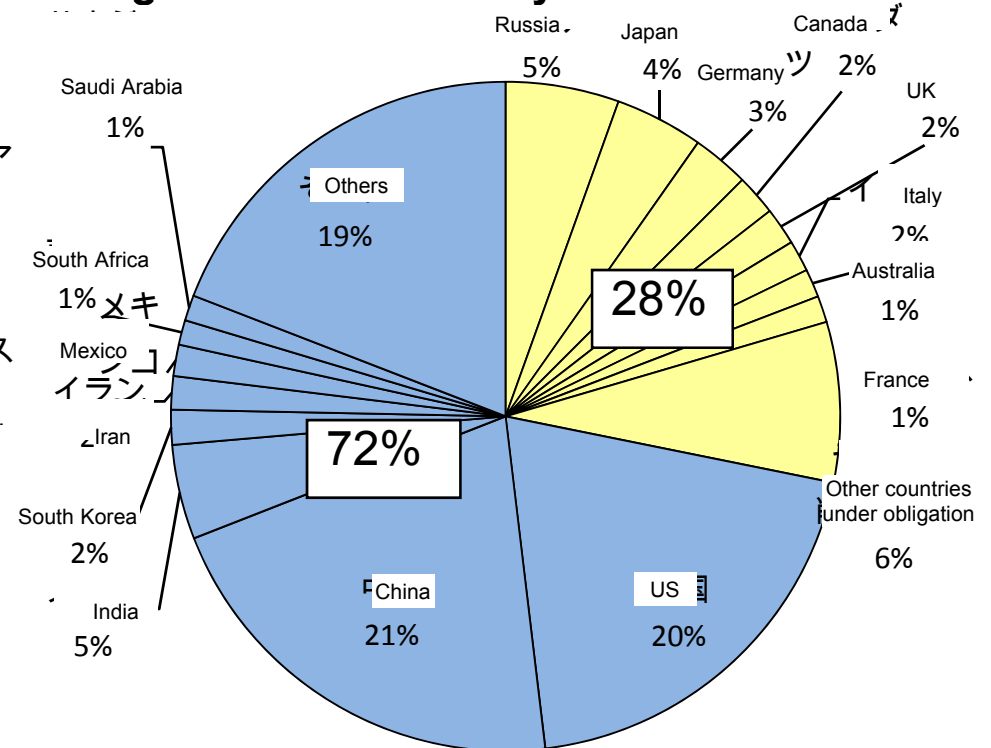
- More than 130 countries, including the US and China, have expressed support for the Copenhagen Accord (by June 23).
- This covers >80% of energy-derived global CO₂ emissions.

Country Breakdown of Energy-Derived CO₂ Emissions (2007)

Shares of countries supporting the Copenhagen Accord



Shares of countries that accepted obligations under the Kyoto Protocol



2.What could be Appropriate Reduction Efforts by 2020 ?

2-1) Reduction targets for major economies

① Points of Discussion

- 1) **Reasonable reduction targets for major economies**
 - We could determine targets for respective economies to be achieved by 2020, based on present registered commitments

 - What could be comparable reduction efforts among major economies.

 - MRV(Measurable, Reportable and Verifiable) method would be important particularly I developing economies

2-1) What could be Appropriate Reduction Efforts by 2020

2-2) Reduction targets for major economies

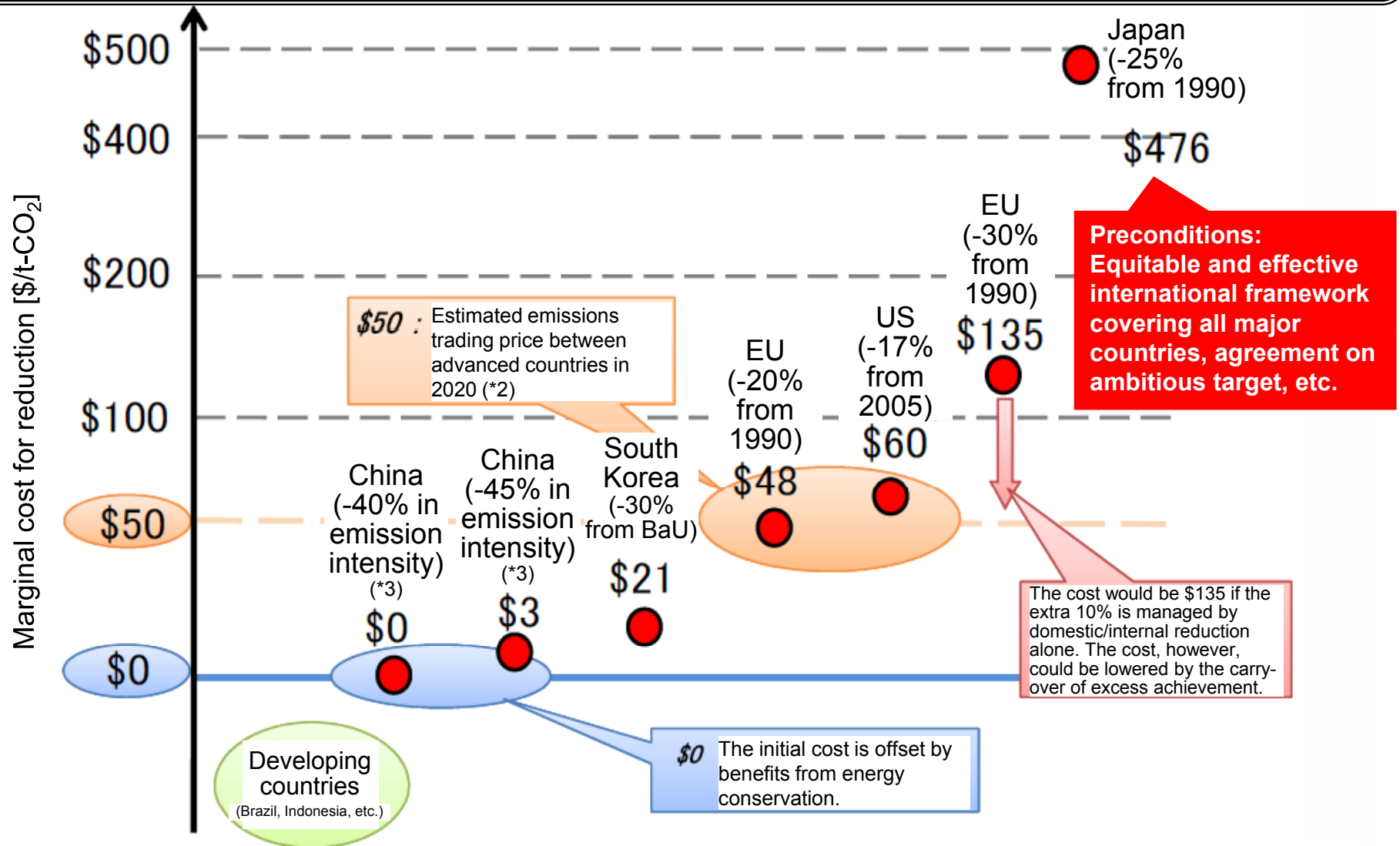
② Evaluation of International Fairness of National Reduction Targets

GHG reduction ratio (from 1990, net domestic)		-10%	-15%	-25%
Marginal cost for each country (\$/t-CO ₂)	Japan	\$167	\$283	\$476
	EU	\$20	\$50	\$125
	US	\$70	\$80	\$160
Reference: GHG reduction achievable if other nations accept the marginal cost accepted by Japan	Japan	-10%	-15%	-25%
	EU	-28%	-33%	-39%
	US	-26%	-39%	-44%

Source: RITE

2-1) Reasonable Reduction Target for Japan by 2020

③ Comparison of National Targets by Marginal Cost for Reduction



Source: RITE

*1: The marginal cost for reduction is defined as the cost of additional effort for reducing CO₂ emissions (unit: \$/t-CO₂).

The figures given here are estimated by RITE.

*2: Assumes the IEA's 450ppm stabilization scenario (requiring the halving of global emissions by 2050).

*3: The target announced by China is to reduce the GDP-based emission intensity by 40-45% from the 2005 level.

2. What could be Appropriate Reduction Target by 2020

2-2) Reduction targets for major economies

④ Evaluation of International Fairness (Analyses by Respective Research Institutions)

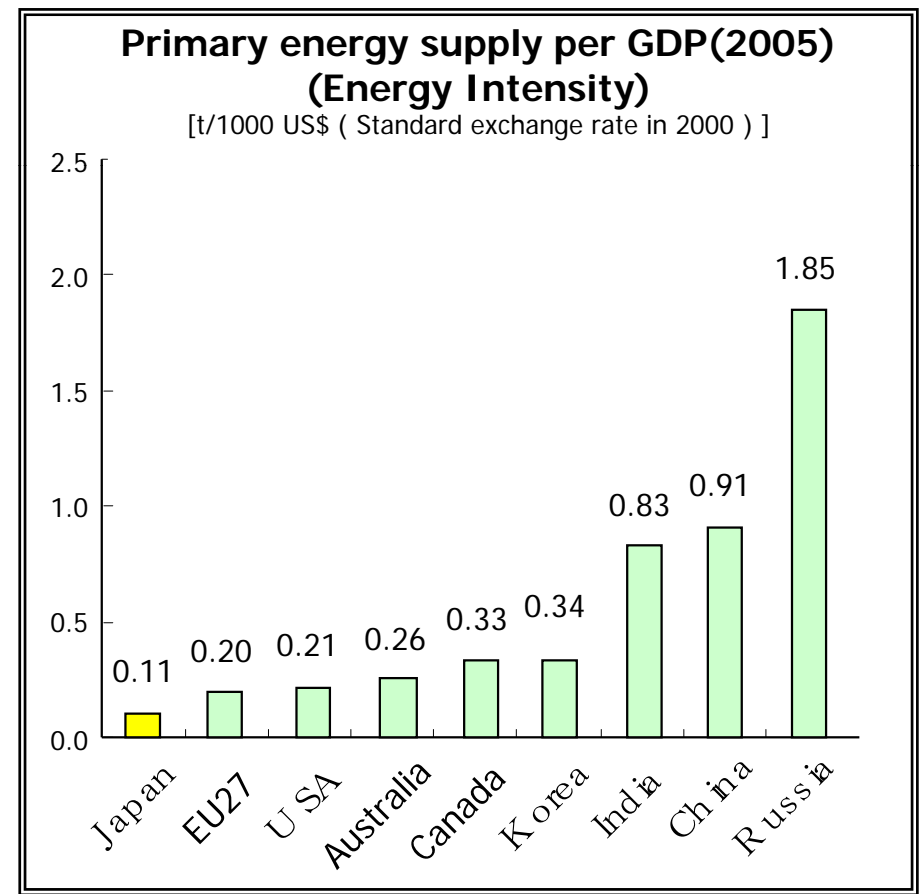
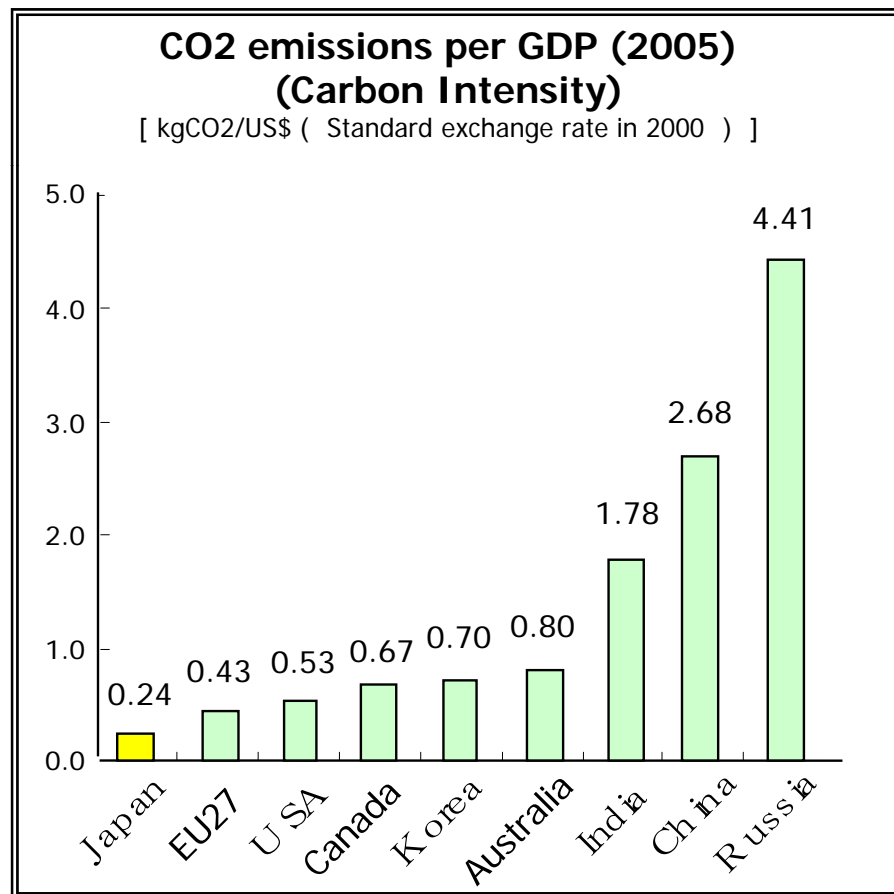
	Japan	EU	US	Remarks
International Energy Agency (IEA)	-10%	-23%	-3%	WEO 2009, 450ppm stabilization scenario
Research Institute of Innovative Technology for the Earth (RITE)	-10%	-28%	-26%	Proposes -31% overall (incl. all parties/countries to the annex). Proposes leveling of the marginal cost for reduction.
Netherlands Environmental Assessment Agency (PBL)	-5 to -10%	-30 to -40%	-10 to -20%	Proposes -30% overall (incl. all parties/countries to the annex). Proposes leveling of the marginal cost for reduction.
International Institute for Applied System Analysis (IIASA)	-8%	-27%	-14%	Proposes -25% overall (incl. all parties/countries to the annex). Proposes leveling of the marginal cost for reduction.
National reduction targets for 2020 (reduction from 1990 level)	-25%	-20% to -30%	-4% equivalent (-17% from 2005)	After the Copenhagen Accord

Sources: materials of respective institutions

<Reference>International Comparison of energy and carbon intensity

Intensity Improving Efforts

- * Domestic mitigation efforts could be based on intensity improvement efforts.
- * Two indicators are here: energy and carbon intensity



Source: IEA (2007), "CO₂ emissions from fuel combustion 1971-2005"

2. What could be Appropriate Reduction Efforts by 2020

2-1) Reduction targets for major economies

⑤ Impacts of Reduction Targets on the Japanese Economy

GHG reduction ratio (from 1990, net domestic)	-10%	-15%	-25%
GDP	-1.2%	-2.1%	-5.6%
Energy cost	+27%	+41%	+72%
Number of unemployed	+290,000	+460,000	+1,130,000

Source: Nomura, Associate Professor, Keio University

<Reference> Assumptions for Model Analysis (by Task Force on Mid-Term Target)

Item	Assumption	Basis
Substantial GDP growth	Approx. 1.3% per annum (mean annual growth 2006 - 2020)	JCER's estimation based on average of growth rates estimated by various research institutions
Population	122.81 million in 2020	Mid-level estimate of National Institute of Population and Social Security Research
Crude oil price	56\$/bbl (2005) → 121\$/bbl (2020) (nominal)	Estimated by IEEJ based on IEA's forecast, etc.
Crude steel production	113 million tons (2005) → 120 million tons (2020)	Discussion with Japan Iron and Steel Federation
Demand for transportation services	Passenger: Same as 2005 (2020) Freight: up 10% from 2005 (2020)	Forecast by Ministry of Land, Infrastructure, Transport and Tourism
Nuclear power	9 additional reactors, capacity factor 81%	Estimated by IEEJ based on electricity supply programs, etc.

Case examples of economic impact analysis in other countries

- ✓ While showing an active posture toward counter-global warming measures, countries are conducting economic analyses for their mid-term target setting.
- ✓ I P C C also indicated that GHG emissions reduction would adversely impact the economy.

【Economic impact analyses by countries】

	GDP suppression (for 2020)	(Ref) Marginal abatement cost*2
EU (Mid-term goal: -20% against 1990)	-0.35%	\$48 ~ 135
USA: House Bill (Tradable portion: -17% against 2005)	-0.13% to -0.57%	\$60
Canada (Mid-term goal: -20% against 2006*1)	-0.4%	\$111
Australia (Mid-term goal: -5% against 2000)	-1.1%	\$45 ~ 92

【 I P C C Report on economic impact】

Stabilization levels, (ppm CO2 eq.)	Range of GDP suppression (Drop from baseline in specific year)	
	2030	2050
445-535	Up to -3%	Up to -5.5%
535-590	-0.25% to -2.5%	Up to -4%
590-710	+0.6% to -1.2%	+1% to -2%

Note: The study premises on global implementation of GHG abatement; an individual effort will likely incur higher economic impacts.

Note*1: For Canada, analysis on the previous target before reporting to UN, Jan. 2010

Note*2: The cost of eliminating an additional unit of CO2, in US\$/ton-CO2, estimated by RITE-Japan. If these countries are to bear several hundred dollars like Japan, the economic impact will become much severer.

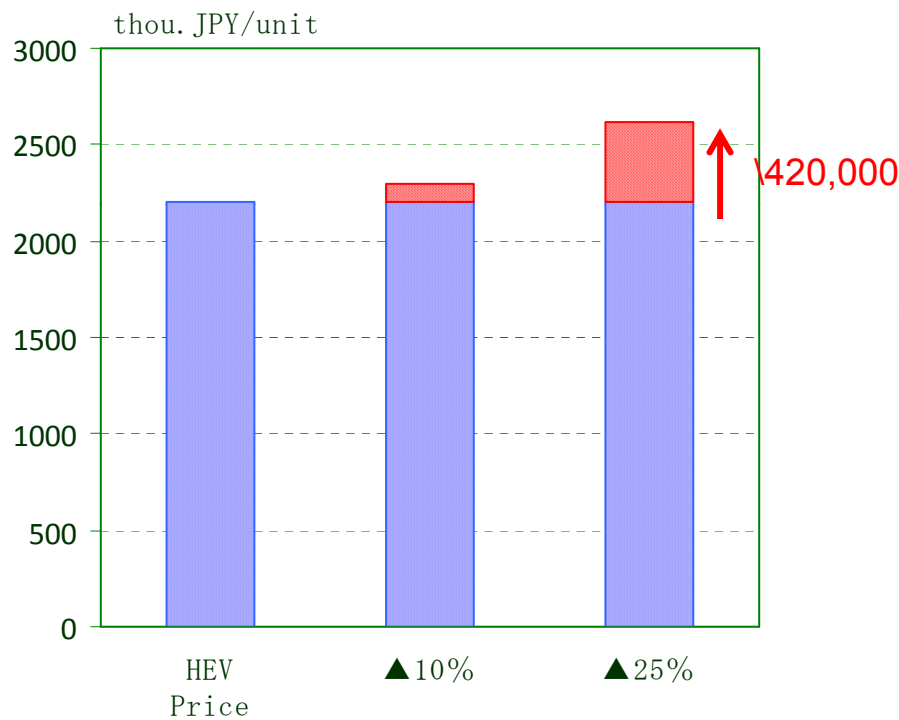
2. What could be appropriate efforts by 2020?

2-1) Reduction Targets for major economies

⑥ Impacts of Reduction Targets on the Japanese Economy

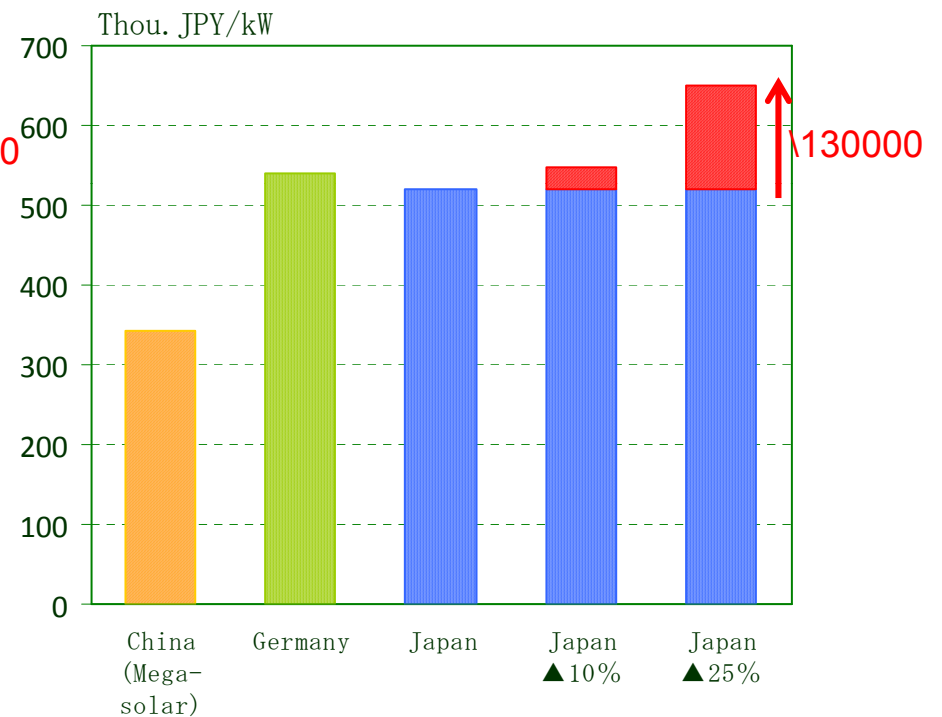
- Higher Cost for Manufacturers in Japan -

Next-generation hybrid cars



Source: IEEJ's estimation

Photovoltaic systems



Sources: Renewable Energy Technology White Paper from NEDO; estimates on costs in China from IEA/NEA; estimates on cost increase by IEEJ.

* The graphs show the increase in cost caused by measures to reduce emissions, assuming reduction target is met by domestic reduction alone: ¥20000/t-CO₂ for 10% reduction, ¥90000/t-CO₂ for 25% reduction.

2. What could be appropriate efforts by 2020?

2-1) Reduction Targets for major economies

⑦ Alleviation of Economic Losses from Reducing CO₂ Emissions

⊙ Export of energy/environmental technologies

Gaining 5-10% share of global market for environmental and energy technologies will **boost GDP growth by 0.9-1.8%**.

⊙ Lower crude oil prices by internationally coordinated efforts

* Estimates assume technological development through globally coordinated efforts as described in IEEJ's Asia/World Energy Outlook 2009.

- Consumption reduced by Japan alone:
\$1.4/bbl fall in price

→ 0.05% higher GDP growth

- Consumption reduced by Japan and rest of Asia: \$8.0/bbl fall in price

→ 0.3% higher GDP growth

- Consumption reduced worldwide:
\$20.3/bbl fall in price

→ 0.7% higher GDP growth

⊙ Accelerated innovation

- New technologies take time to develop and introduce. To achieve significant emission reductions in the future, Japan should accelerate technological development now.

- Technological development will bear fruit from 2030.

2. What could be appropriate efforts by 2020?

2-1) Reduction Targets for major economies

⑧ Scale of Global Market for Environmental and Energy Technologies

	Market(Accum.: bilUSD)		Market(bilUSD)		CO ₂ reduction (M tCO ₂)	
	2020	2030	2020	2030	2020	2030
Nuclear	560.2	1,122	56	56	916	1,633
Photovoltaics	370	1,558	52	173	86	322
Wind Power	721	1,920	89	146	493	1,168
Advanced Coal-power	836	2,271	84	144	268	728
Advanced Gas-power	259	952	26	69	144	530
CCS	35	402	3	38	61	980
HEV/PHEV/EV	6,063	14,043	801	1,147	253	691
(excl: Battery)	-	-	(89)	-	-	-
Total	8,844	22,268	1,110	1,773	2,221	6,051
Smart Grid						

Sources: estimates based on IEEJ's Asia/World Energy Outlook 2009, etc.

	2020	2030
Assuming 5-10% market share	4.7 to 9 trillion yen (0.9 to 1.8% of GDP*)	7.5 to 15 trillion yen (1.4 to 2.8% of GDP*)

* Relative to Japan's GDP of 531 trillion yen in fiscal 2009.

2. What could be Appropriate Reduction Efforts by 2020 ?

2-2) Domestic Reduction Target for Japan by 2030

① Points of Discussion

2) Domestic reduction target of Japan by 2030

-policies to achieve the country's mid-term target, namely, **30% reduction from the 1990 level (net domestic reduction)**, were approved at a cabinet meeting in June this year

2. What could be appropriate reduction target by 2020?

2-2) Domestic Reduction Target for Japan by 2030

② Overview of Basic Energy Plan (Decided by Cabinet in June 2010)

Targets for 2030:

- Increase the self-managed energy supply ratio (including indigenous supply and energy supply from self-developed sources) from 38% to 70%
 - Increasing the proportion of zero-emission power sources in the generation mix from 34% to 70%
 - Halving CO₂ emissions from homes (residential sector), etc.
- Japan can thus reduce energy-derived CO₂ emissions by **at least 30% from the 1990 level by 2030.**

Achieving the targets:

- Comprehensive measures for securing resources and ensuring stable supply
(strengthening strategic relationships with resource-exporting countries, improving the rare metal self-sufficiency ratio, etc.)
- Create independent, eco-friendly energy supply structure
(more renewables, nuclear power, IGCC, CCS, etc.)
- Create energy consumption structure for low-carbon economic growth
(ZEB/ZEH, energy-efficient lighting, next-generation vehicles, etc.)
- Create society with new energy technologies
(smart grid, smart community, etc.)

2-2) Reduction Target by 2030

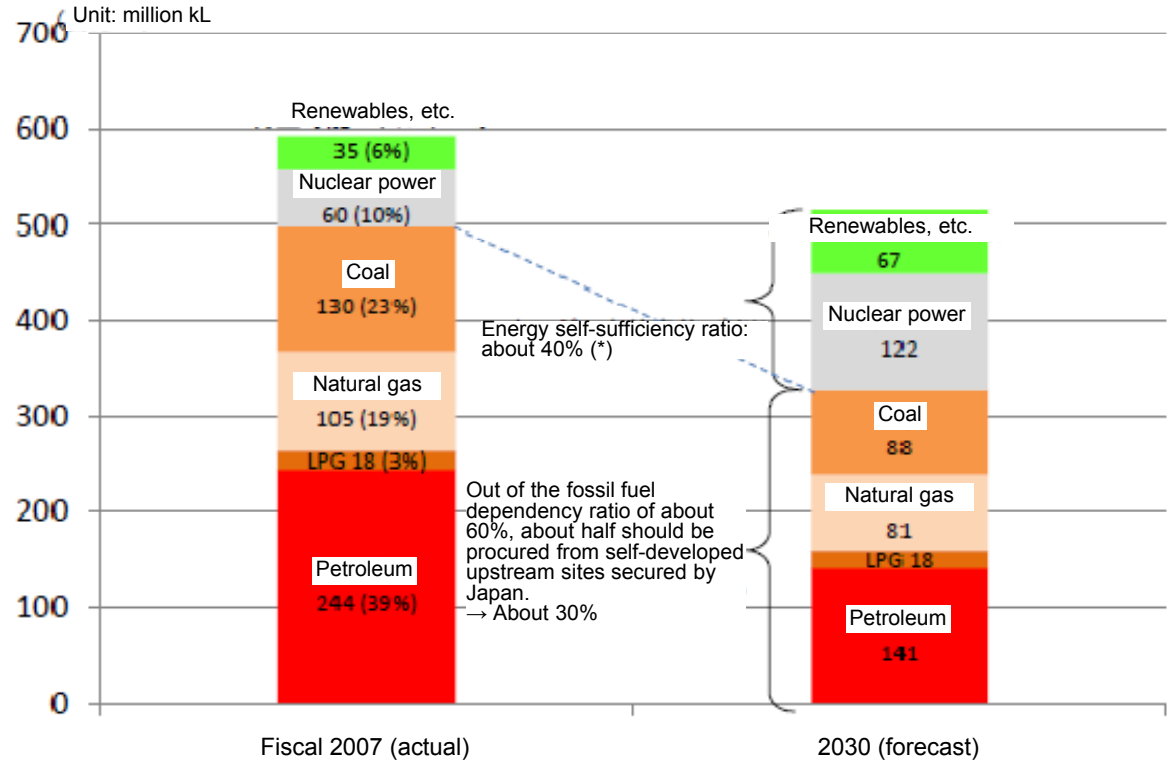
② Vision for Primary Energy Supply in 2030

Primary energy transforming sector

- **Renewables:** introduction of system for full-purchase of renewable-based power (effectiveness depends on the system design)
- **Nuclear power:** availability of 14 additional reactors, capacity factor improved to 90%

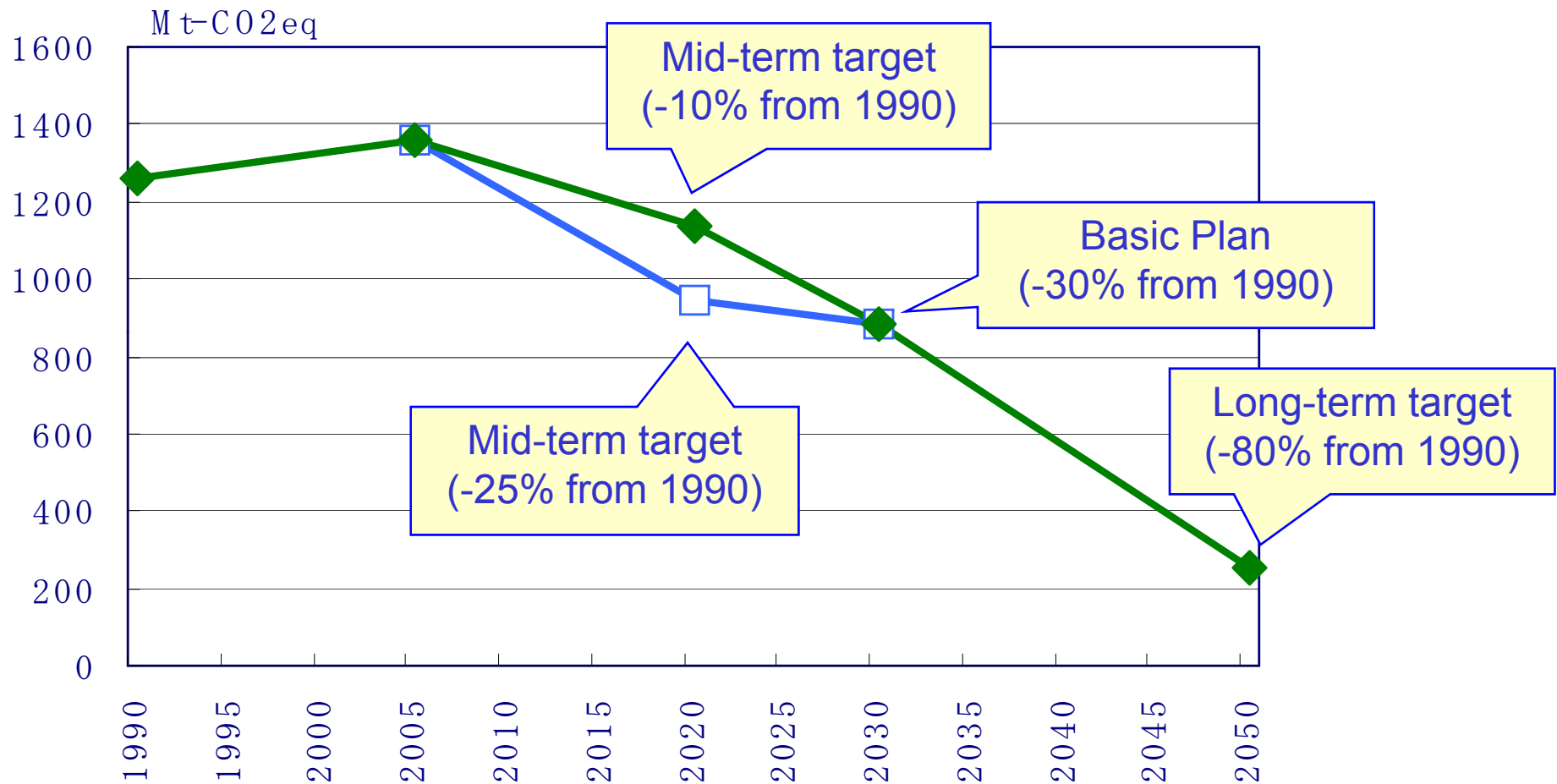
Estimation results

- The energy self-sufficiency ratio (presently 18%) is expected to double. The proportion of fossil fuel supply from the upstream development sites secured by Japan (presently 26%) is also expected to double. As a result, the proportion of self-managed energy supply (presently 38%) is expected to increase to about 70%.



Energy self-sufficiency ratio: approx. 40% + Supply of fossil fuel from self-developed upstream sites secured by Japan: approx. 30% = Self-managed energy ratio: approx. 70%

2.What could be appropriate target by 2020?
 2-2) Domestic Reduction Target of Japan by 2030
 ④ Long-Term Trend in GHG Emission Volume (Conceptual)



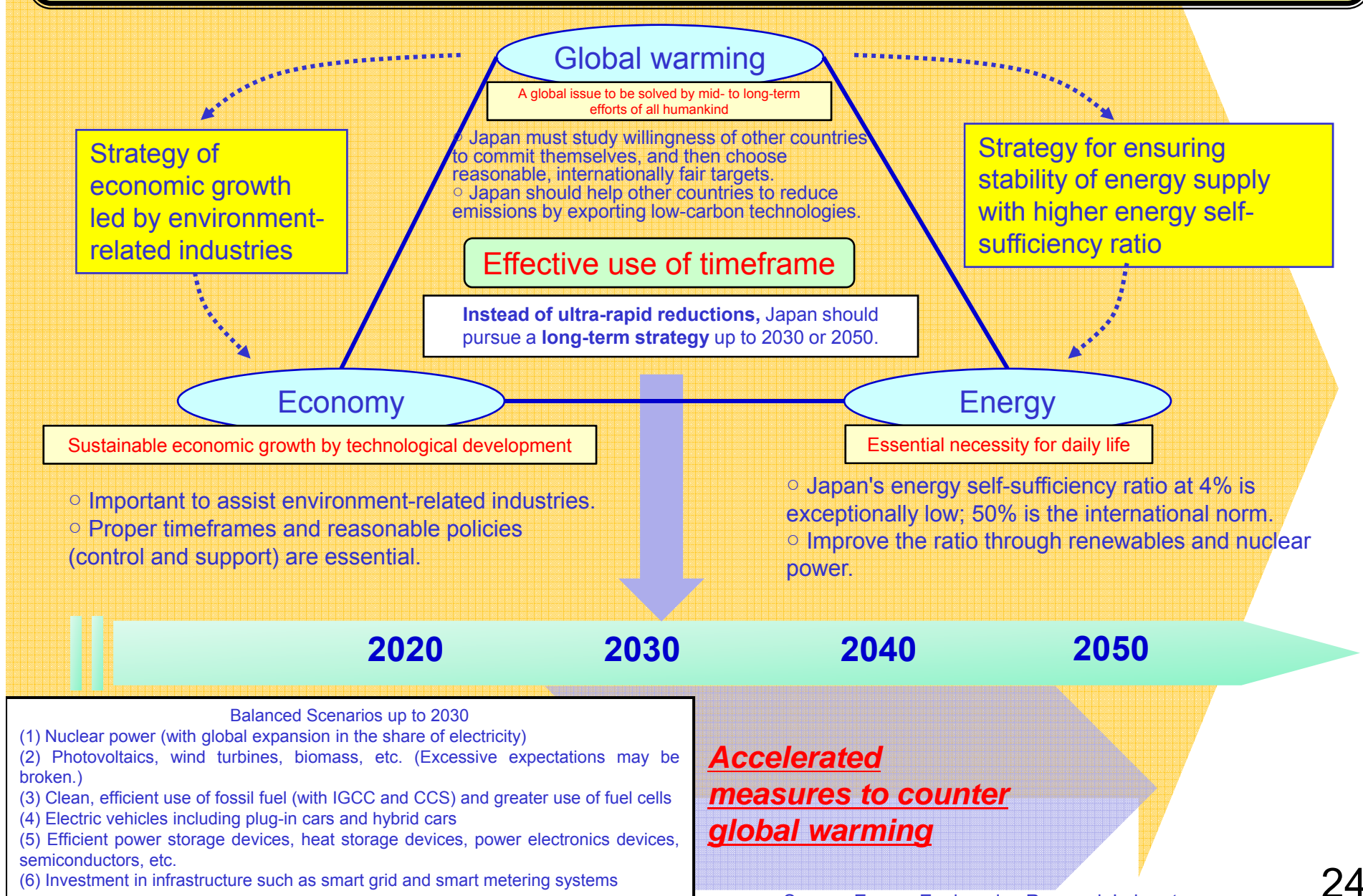
The trend in GHG emission volume (reduction targets) shows that the mid-term goal of -10% from 1990 is consistent with the Basic Plan target (-30% from 1990 by 2030) and the long-term target (-80% from 1990 by 2050).

Sources: materials of Advisory Committee on Natural Resources and Energy, bill on Global Warming Countermeasure Basic Law, etc.

2. What could be appropriate target by 2020?

2-2) Domestic Reduction Target by 2030

⑤ Three E's (Environment, Economy and Energy Security) and Mid- to Long-Term Vision



3. Cooperative Contribution to GHG Reductions by Developing Countries

3 - 1) Japan's support for developing countries ① Points of Discussion

1) Japan's support for developing countries up to 2012

- Steady execution of the Hatoyama Initiative (Of the 15 billion dollars to be spent over three years, more than 5 billion already provided.)

- It is easier and more cost-efficient to reduce emissions in developing countries than in advanced countries. Japan should forge ahead with support programs without delay.

Reason: Major reductions achievable with existing technologies

3 . Cooperative contribution for GHG reduction by developing economies

3-1) Japan's Support for Developing Countries up to 2012

② Present State of Support for Developing Countries

- Under the Copenhagen Accord, advanced countries have committed to:
 - Providing **financial support of 30 billion dollars** in total between 2010 and 2012.
 - **In total, preparing funds worth 100 billion dollars annually up to 2020** using diverse resources and funding instruments including governmental, private, bilateral and multilateral.

(Discussions on practical sources of long-term funding took place in the High-Level Advisory Group on Climate Change Financing (AGF) conferred by the UN Secretary General.)

- **Among advanced countries, Japan provides far more support.**

Japan's commitment :



To countries that combat climate change by reducing emissions, etc., and also to countries threatened by climate change, Japan, in line with international negotiations, will provide short-term funding totaling 15 billion dollars in the three years to 2012. Japan had already provided about 5.3 billion dollars by April 2010.

US' commitment :



A request was made for 1.9 billion dollars in the 2011 budget (1.3 billion dollars were allocated from the 2010 budget). The US expects to provide 0.9 billion dollars from climate-related export credit and development funding instruments, and promises 1 billion dollars for REDD and counter-deforestation measures. Has already provided 0.375 billion dollars to the Climate Investment Fund.

EU's commitment :



Plans support by short-term funding between 2010 and 2012 worth 2.4 billion dollars each year.

3. Cooperative Contribution to Emission Reductions by Developing Countries

3-2) US/Japan's support for developing countries

① Points of Discussion

2) US/Japan's support up to 2020 and creation of framework

- The Copenhagen Accord has created the possibility of UN-independent initiatives, pursued by countries on their own.
- US and Japan should help create a framework for fair evaluation of GHG emissions reduced through technologies and products from US /Japan under respective bilateral support programs, etc.

3.Cooperative Contribution to Emission Reduction by developing economies

3-2) US/Japan Support Initiatives and Framework up to 2020

③ Present State of Japan's Bilateral Support Programs

- This year, the Ministry of Economy, Trade and Industry started feasibility studies on creating a bilateral credit system. Agreed to start feasibility studies on 15 projects so far.
- Regarding Japan's support to developing countries including Indonesia, Vietnam, the Philippines and India, the government is supporting (1) projects to reduce emissions in these countries using excellent technologies and products from Japan, and (2) studies on GHG emissions reductions, measurement methods, and bilateral offset and support schemes.

◆ Projects selected in the First Call for Projects for Promoting Technologies to Counter Global Warming, etc.:

	Target country	Project	Organizer	Area
1	Indonesia	Highly efficient coal-fired generation (ultra supercritical)	IEEJ	Coal-fired generation
2	Indonesia	Geothermal generation (new and retrofit)	Mitsubishi Corporation	Renewable energy
3	Indonesia	IT-based optimal control of industrial facilities	Yamatake	Energy conservation at factory
4	Indonesia	REDD+	Marubeni	REDD+
5	Vietnam	Highly efficient coal-fired generation (ultra supercritical)	Tokyo Electric Power	Coal-fired generation
6	Vietnam	Reducing power distribution losses by introducing highly efficient transformers	Mitsubishi UFJ Morgan Stanley	Power transmission and distribution network
7	Philippines	Geothermal generation (retrofit)	Toshiba	Renewable energy
8	Philippines	Waste heat recovery, etc. at steel plant	JFE Steel	Steel
9	India	Highly efficient coal-fired generation (ultra supercritical)	Mizuho Information & Research Institute	Coal-fired generation
10	India	Waste heat recovery, etc. at steel plant	Nippon Steel	Steel
11	Thailand	Eco driving (digital tachometers)	Yazaki Corporation (Toyota partner company)	Road traffic
12	Thailand	IT-based optimal control of industrial facilities	Yokogawa Electric	Energy conservation at factory
13	Laos and Myanmar	Factory diagnosis at cement plant	Taiheiyo Engineering	Cement
14	China	Energy conservation at home (eco houses)	Nomura Research Institute	Product-oriented CDM
15	~	REDD+	~	~