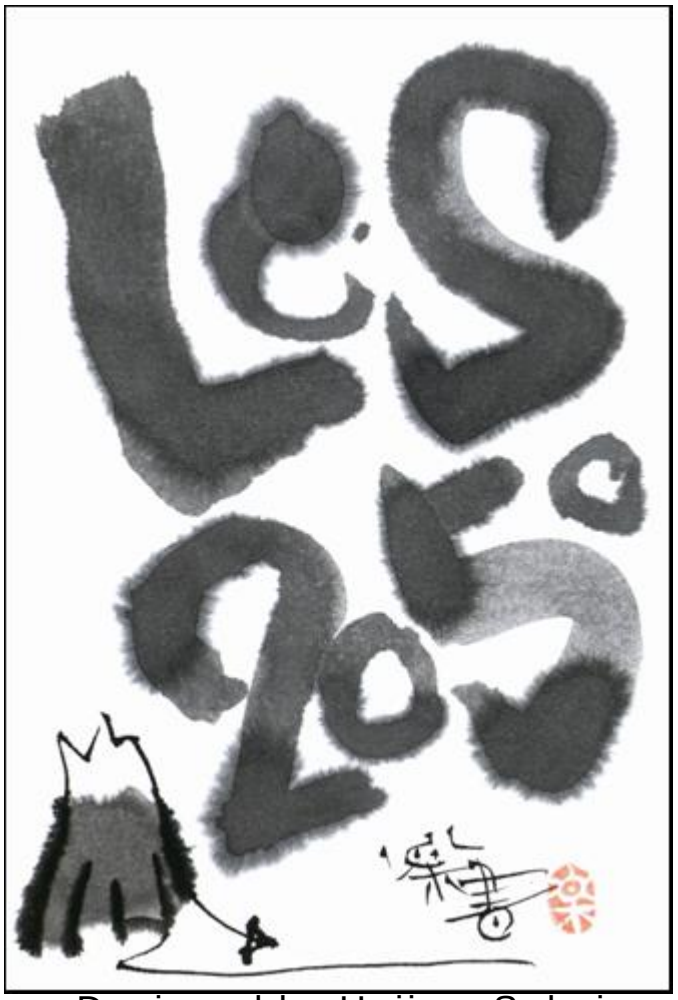
Low Carbon Development Plan In Japan

1. If we cannot go to LCS,…
2. LCS offers higher QOL with less energy demand and lower-carbon energy supply
3. LCS needs good design, early action, and innovations



Designed by Hajime Sakai

Junichi FUJINO (fuji@nies.go.jp)
NIES (National Institute for Environmental Studies), Japan

Workshop on A Systematic and Quantitative Design of Low Carbon Development Plan for Cambodia
Phnom Penh, 22 April, 2013

Japan LCS study by AIM

1990 start AIM (Asia-Pacific Integrated Model) project

1997 COP3 simulations (very hard battle with…)

2004-2008 NIES has coordinated Japan LCS research project funded by MOEJ (led by Prof. Shuzo Nishioka with 60 team members)

2008-2009 COP15 simulations (AIM/Enduse[Japan], AIM/CGE[Japan], AIM/Enduse[global])

2009- Middle and Long term roadmap development under MOEJ (led by Prof. Shuzo Nishioka with 8 working groups and more than 100 experts)

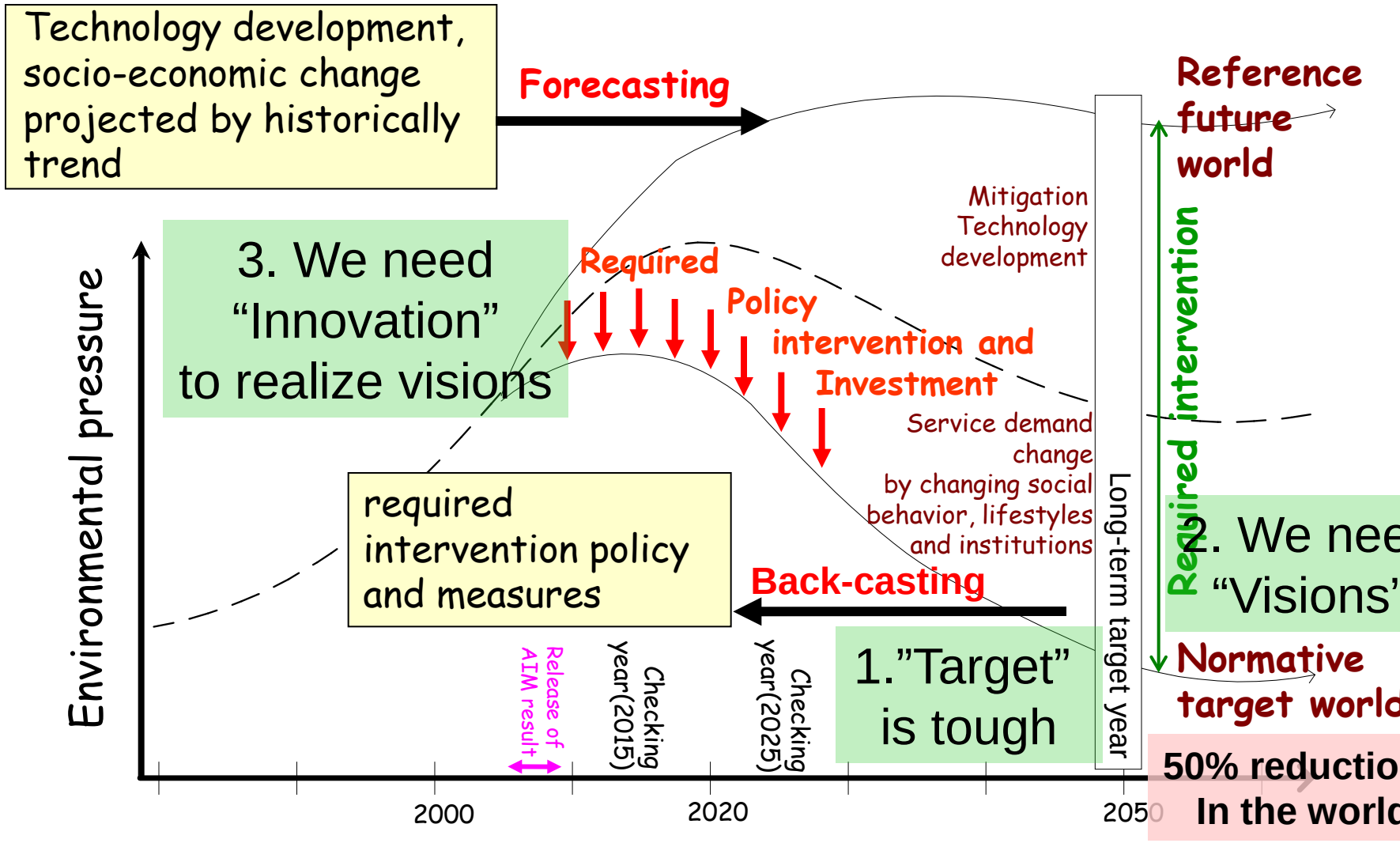
2011- Revision of “Energy and Climate Change Policy” by cabinet office together with METI and MOEJ (with AIM)

2004-2008

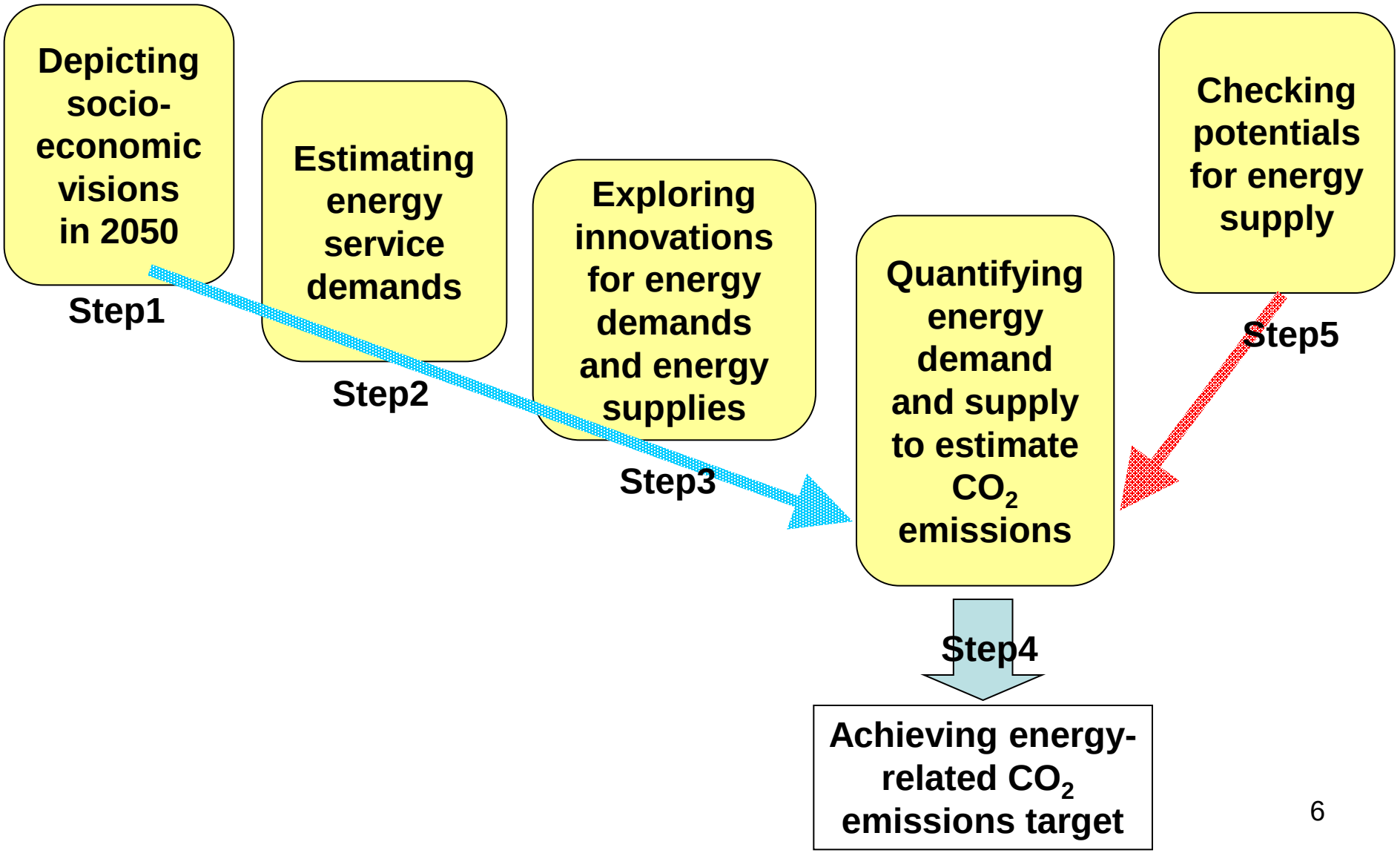
Japan LCS research project

Research project on Japan Low-Carbon Society (LCS) scenarios development
FY2004-2008 sponsored by Ministry of the Environment, Japan

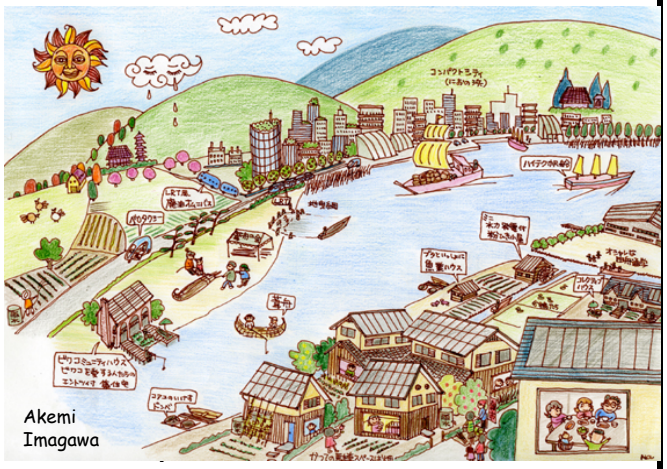
Forecasting from now and Backcasting from future prescribed/normative world



Scenario Approach to Develop Japan Low-Carbon Society (LCS)



As for LCS visions, we prepared two different but likely future societies

Vision A "Doraemon"	Vision B "Satsuki and Mei"
Vivid, Technology-driven	Slow, Natural-oriented
Urban/Personal	Decentralized/Community
Technology breakthrough Centralized production /recycle	Self-sufficient Produce locally, consume locally
Comfortable and Convenient	Social and Cultural Values
2%/yr GDP per capita growth	1%/yr GDP per capita growth
	

Doraemon is a Japanese comic series created by Fujiko F. Fujio. The series is about a robotic cat named Doraemon, who travels back in time from the 22nd century. He has a pocket, which connects to the fourth dimension and acts like a wormhole.

Satsuki and Mei's House reproduced in the 2005 World Expo. Satsuki and Mei are daughters in the film "My Neighbor Totoro". They lived an old house in rural Japan, near which many curious and magical creatures inhabited.

LCS house in 2050
Comfortable and energy-saving house

Utilizing solar power

Photovoltaic

34-69MW
(25-47% house has PV on roof (now 1%)) and develop high efficiency (<30%) PV

Eco-life education

10-20% energy demand reduction

rooftop gardening

High efficiency lighting
【eg LED lighting】

Reduce 1/2 energy demand
Share 100%

Solar heating

Diffusion rate: 20-60%
（currently 8%）

Monitoring system
equipped with appliances

High-insulation

Reduce 60% warming energy demand, share 100%

Super high efficiency air conditioner

COP (coefficients of performance=8), share 100%

Fuel cell

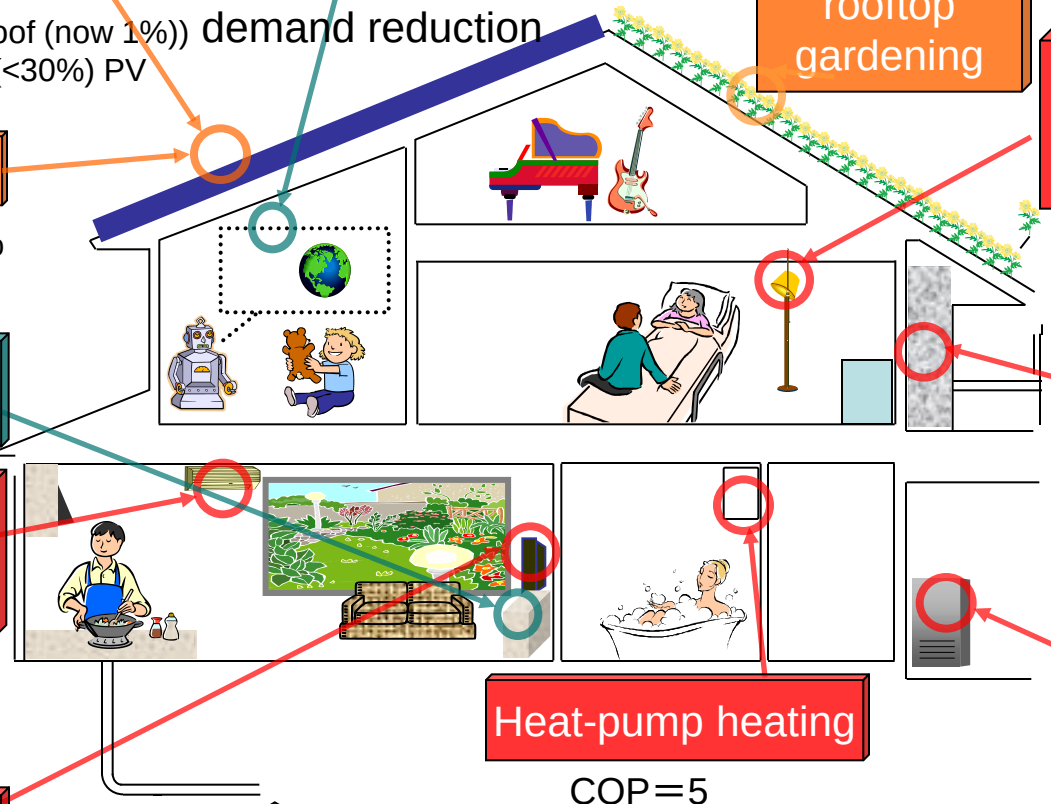
share 0-20%

Heat-pump heating

COP＝5
share 30-70%

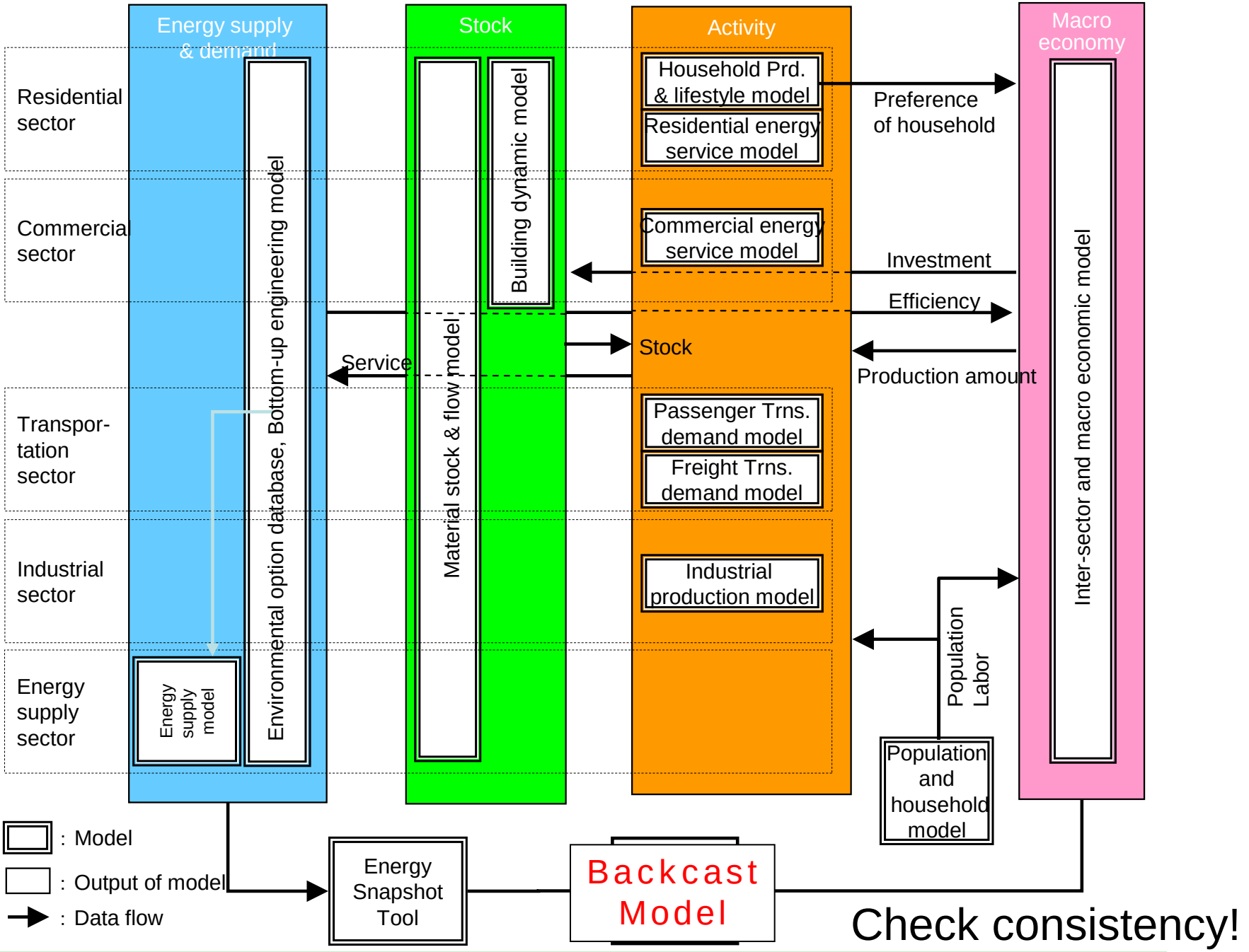
Stand-by energy reduction

Reduce 1/3 energy demand,
share 100%



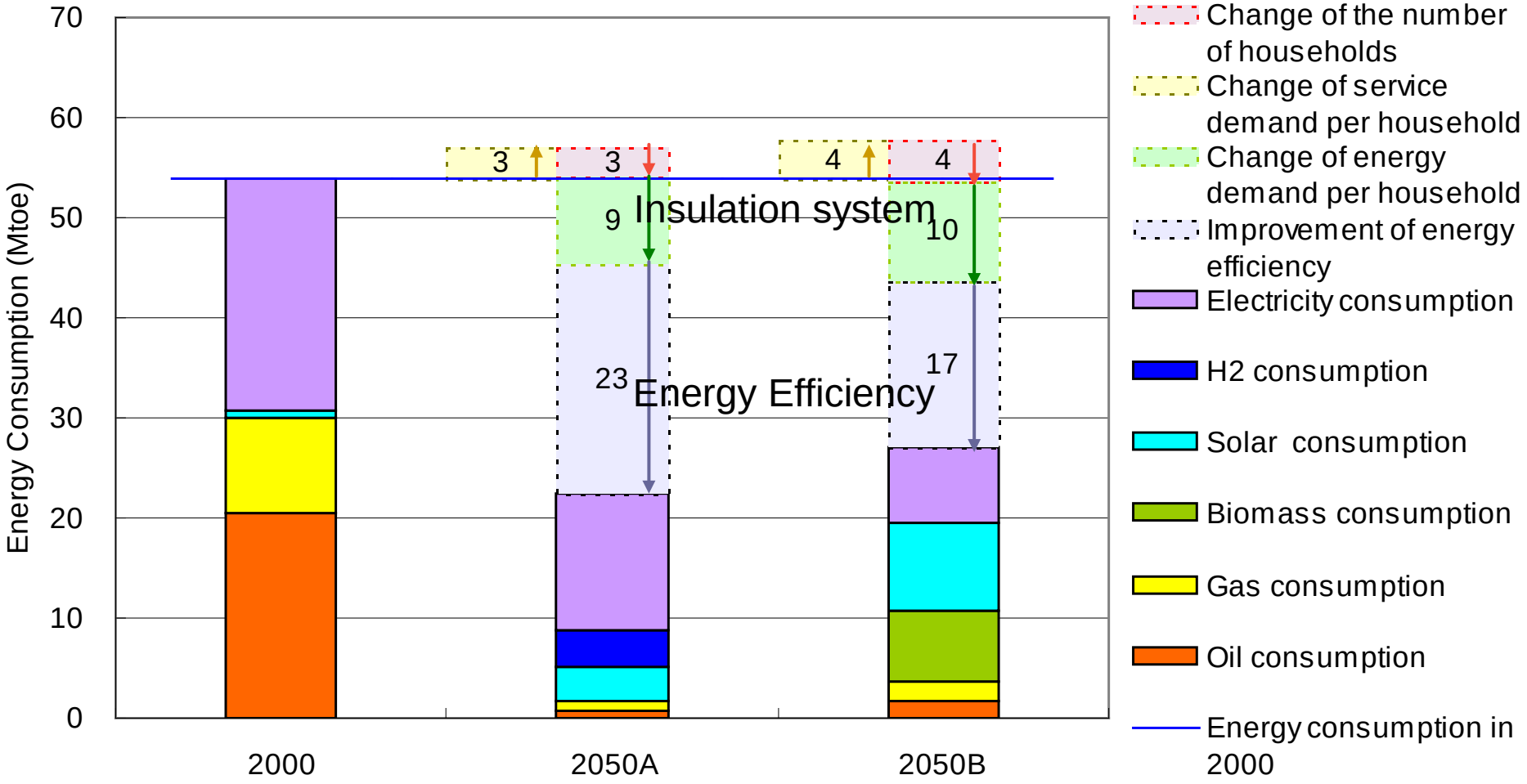
Good information for economy and environment makes people's behavior low-carbon

High efficiency appliances reduce energy demand and support comfortable and safe lifestyle



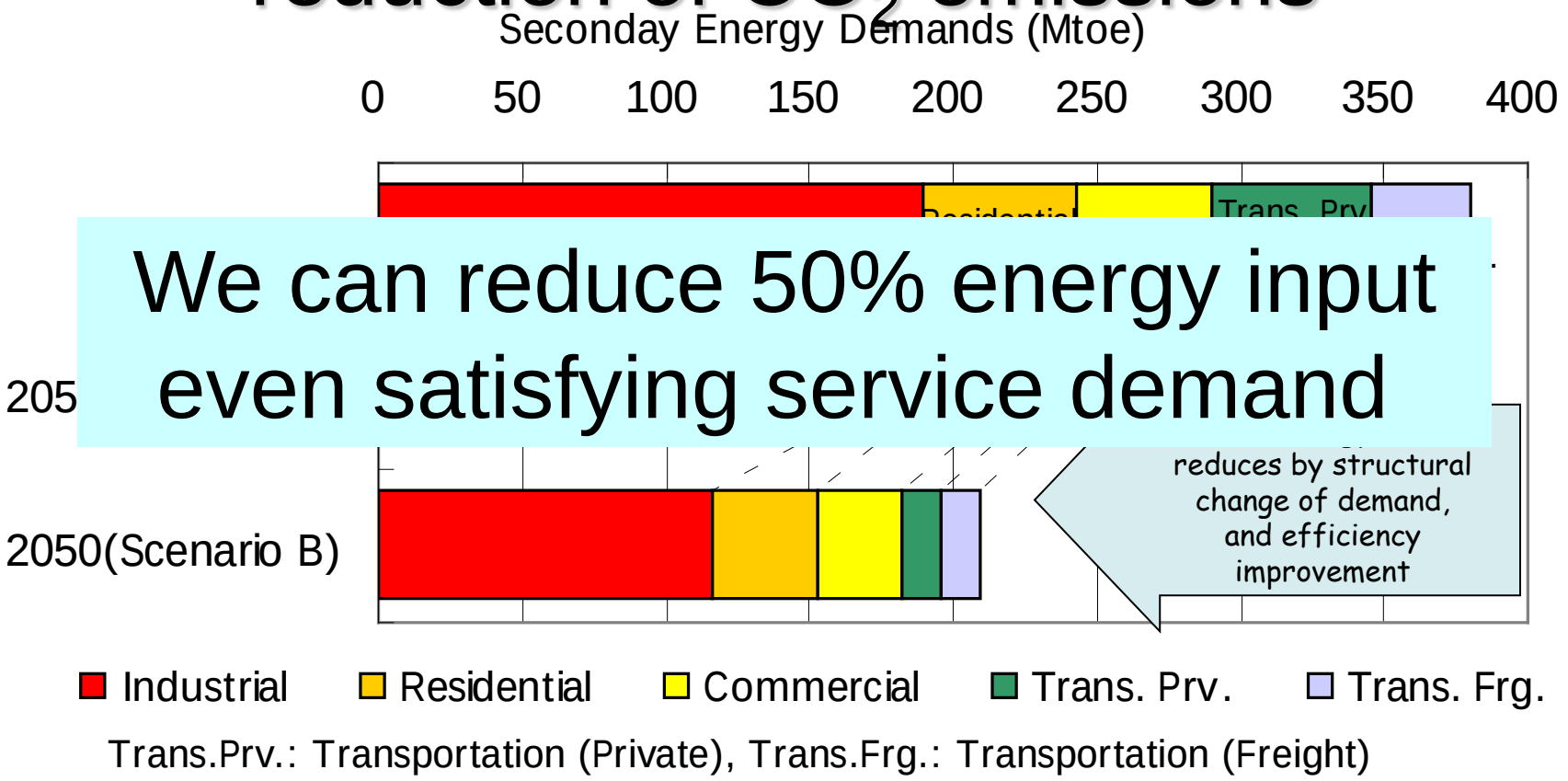
AIM (Asia-Pacific Integrated Modeling) for Japan LCS scenarios

Residential sector
Energy demand reduction potential: 50%



Change of the number of households: the number of households decrease both in scenario A and B
Change of service demand per household: convenient lifestyle increases service demand per household
Change of energy demand per household: high insulated dwellings, Home Energy Management System (HEMS)
Improvement of energy efficiency: air conditioner, water heater, cooking stove, lighting and standby power

Energy demands for achieving 70% reduction of CO_2 emissions

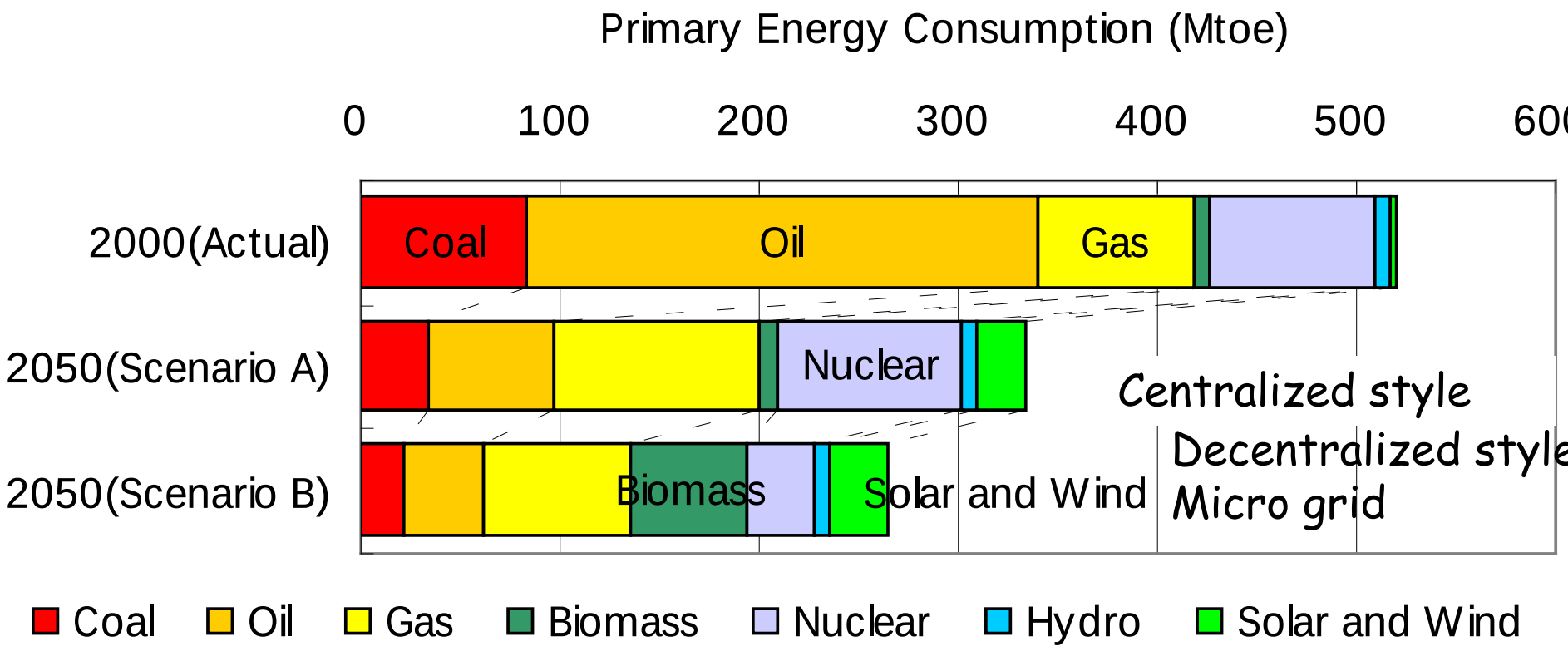


We can reduce 50% energy input even satisfying service demand

Trans.Prv.: Transportation (Private), Trans.Frg.: Transportation (Freight)

Possible energy demands reductions for each sector:
Industry：structural change and introduction of saving energy tech. 20～40%
Passenger Transport :land use, saving energy, carbon-intensity change 80%
Freight Transport :efficient transportation system, energy efficient 60～70%
Residential: high-insulated and energy-saving houses 50%
Commercial: high-insulated building and energy saving devices 40%

Energy supply for achieving 70% reduction of CO_2 emissions



12

Japan LCS research project and CC policy

0. FY1990- start AIM (Asia-Pacific Integrated Model) project
- FY1997 AIM provided Kyoto Protocol simulations for Japan
- FY2000 AIM provided IPCC SRES/A1B marker scenario

1. Feb 13th 2007, Interim Report "Japan Scenarios torwards Low-Carbon Society (LCS) -Feasibility study for 70% CO2 emission reduction by 2050 below 1990 level-"
- May 24th 2007 Former Prime Minister Abe launched "Cool Earth 50" to reduce 50% GHG emissions by 2050
- June 9th 2008 Former Prime Minister Fukuda set the target of Japanese CO2 emissions reduction by 60-80% in 2050

2. May 22nd 2008, Interim Report "Dozen Actions towards LCSs"
- July 29th 2008 Japanese government set "Action Plan for Achieving a Low-carbon Society"

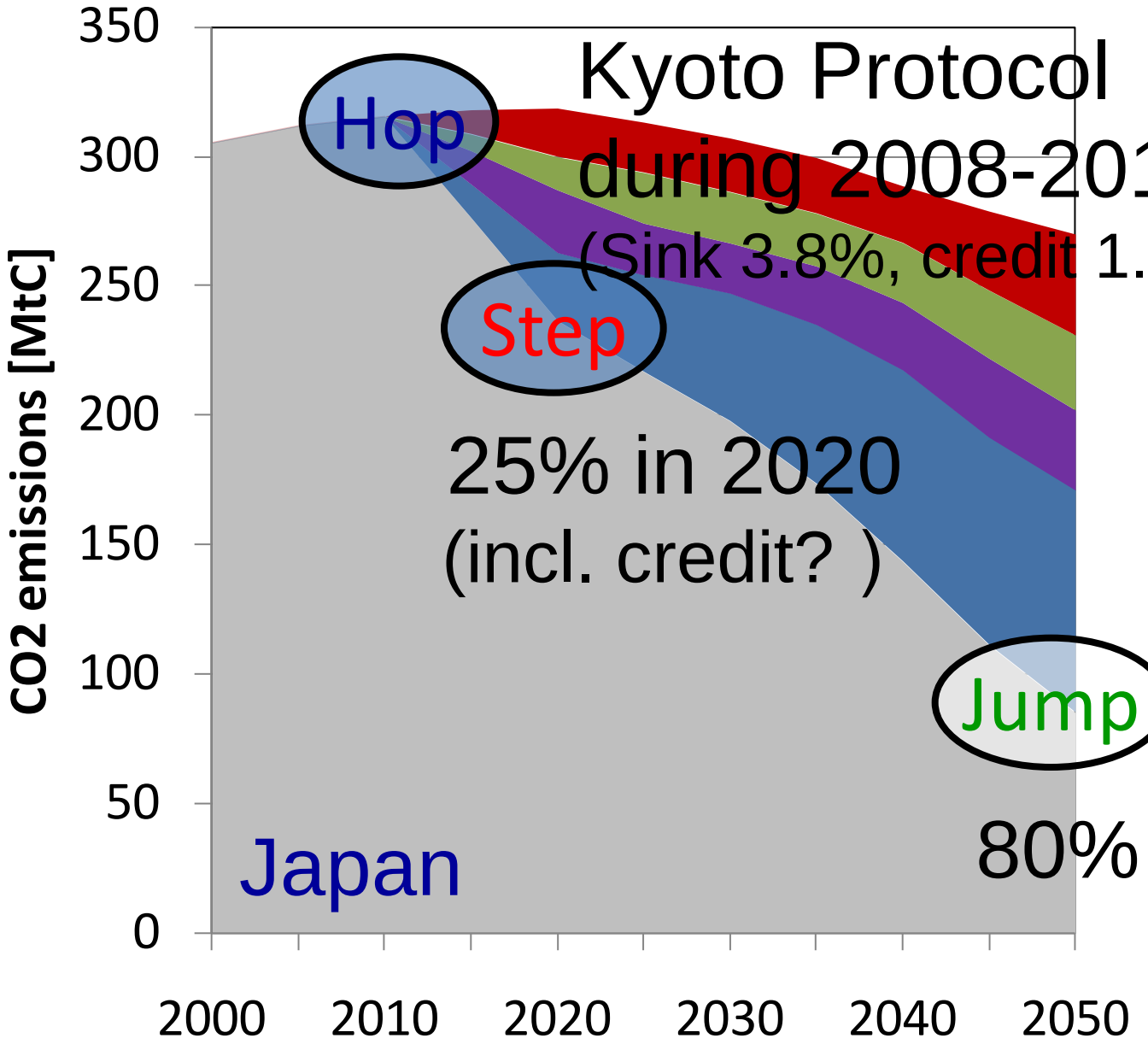
3. April 2009, The Mid-term Target Committee, "six options for 2020" (including 7%, 15%, 25% reduction compared as 1990 level)
- September 22nd 2009, New Prime Minister Hatoyama set the target as 25% for 2020.

2008-2011

LCS Middle (2020) and Long (2050) term strategy and roadmap

for COP15 and further

Japanese Emissions Targets towards 2050

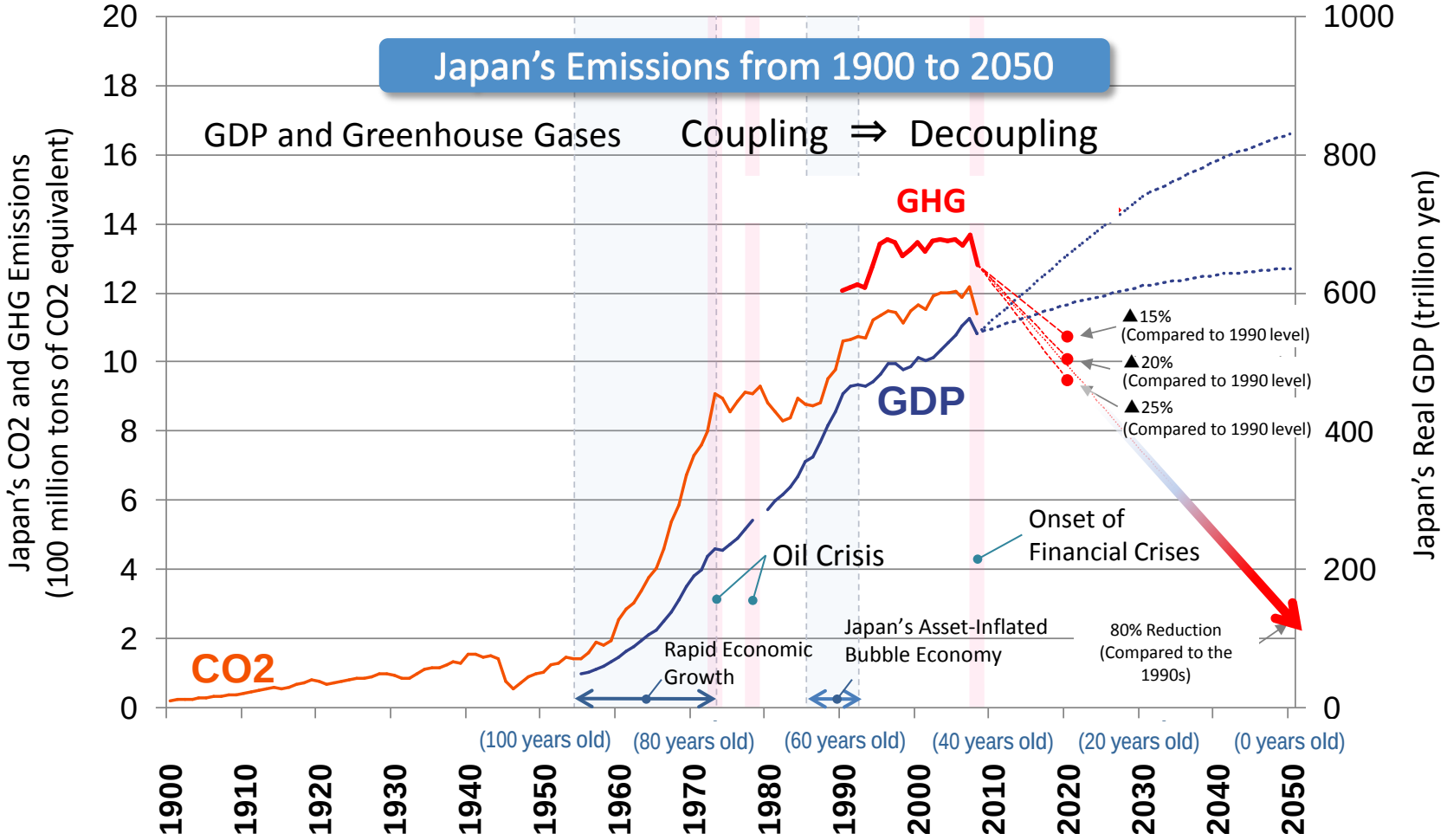


Former Prime Minister Hatoyama 鳩山由紀夫

Japan

Mid- and Long-term Target –Attempting to Build a Never-Before-Seen Society—

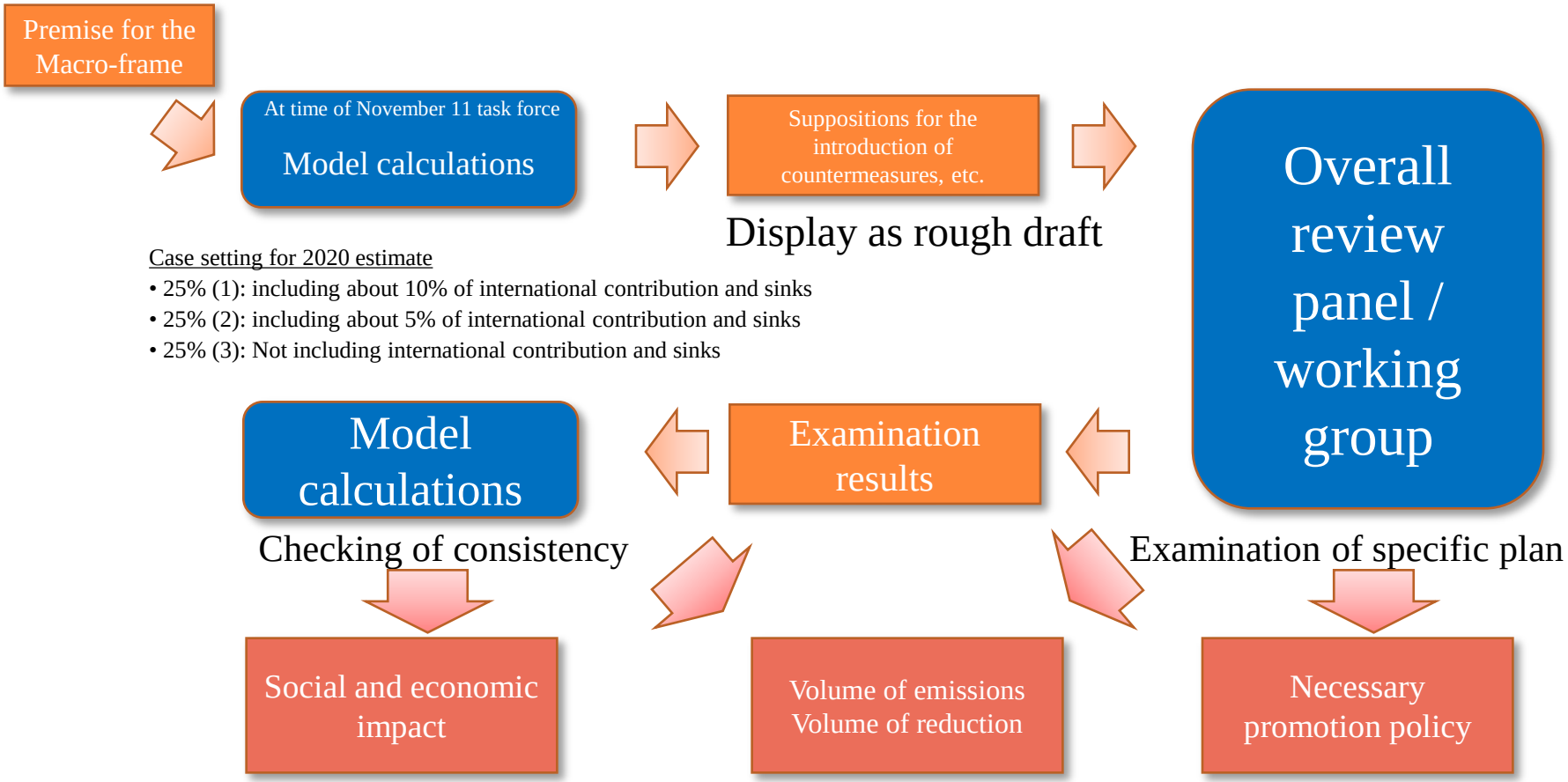
- An 80% emission reduction by 2050 will create a largely different society from today. It will be critical to strategically move forward under mid-term 2020 and 2030 targets that take into account this eventual 80% reduction.



1) Parenthesis indicates the age of which persons born in each respective year will be in the year 2050
2) Future GDP values are assumed values based on scenarios A and B from the NIES Low Carbon Society Research Project 2050

Interactions between simulations and policy assessments

- The model calculations maintain the overall alignment of the path, and the estimated volume of emissions and economic impact are evaluated.
- The overall review panel / WG examines a specific plan that will enable reductions in each field.



Manufacturing WG

Housing / Building WG

Automobile WG

Industry | Commercial | Residential | Transport

Greenhouse Gases

Energy Supply

Energy Supply WG

[Technology]

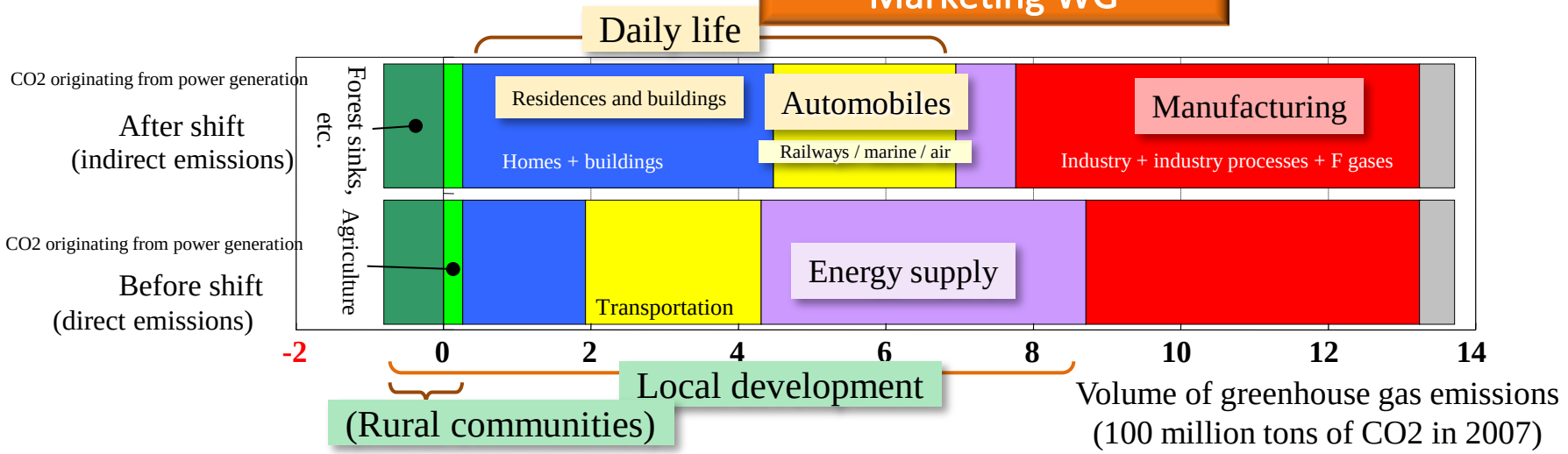
[Society / Economy]

[People]

Macro frame WG

Local Development WG

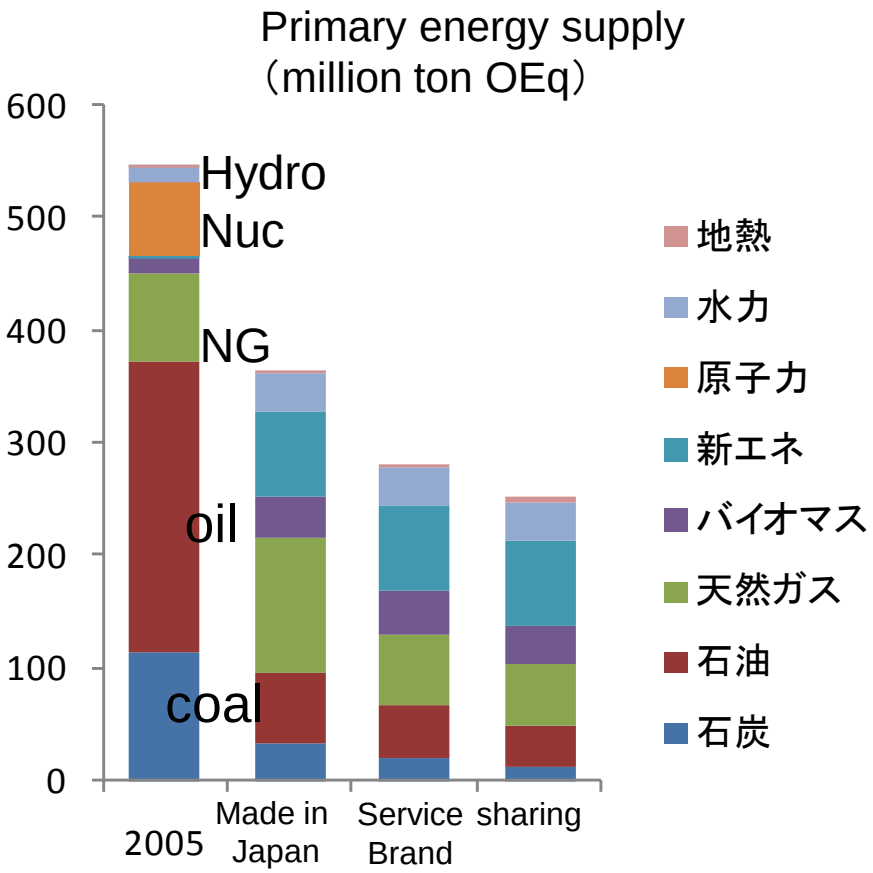
Communications and Marketing WG



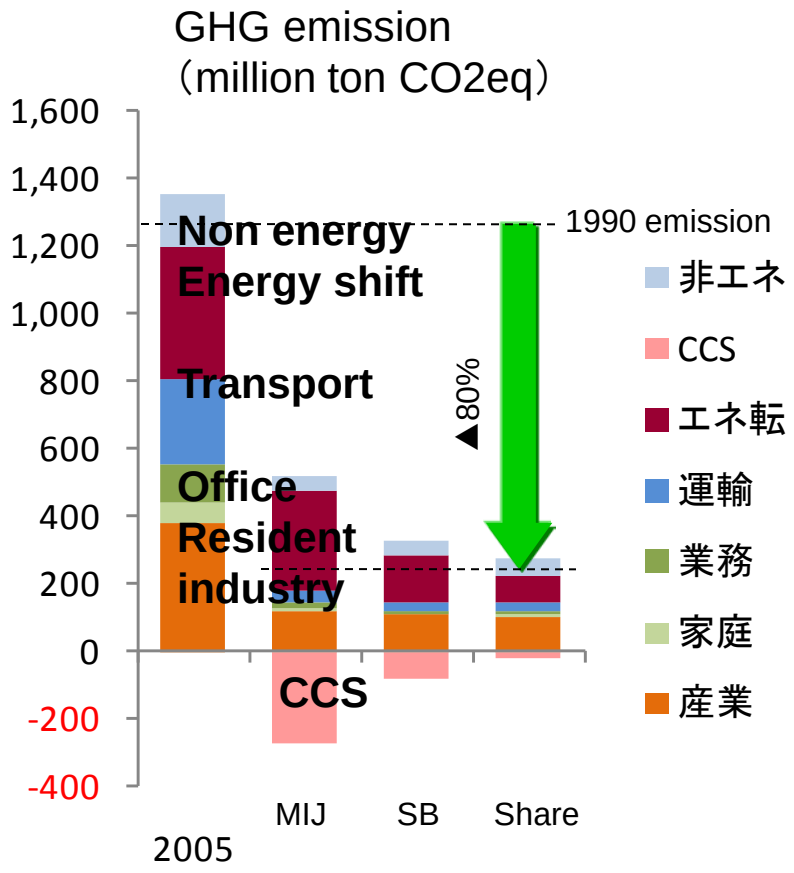

地球温暖化対策に係る
中長期ロードマップ
各WGの現時点での
とりまとめ
平成22年12月21日

Possibility on 80% reduction in 2050

Without nuclear, we have to depend much on renewable energy and CCS (Carbon Dioxide Capture and Storage).
Possibility depend on how we design Japanese future. Service oriented society can achieve 80% reduction with domestic CCS but industry oriented society needs foreign CCS

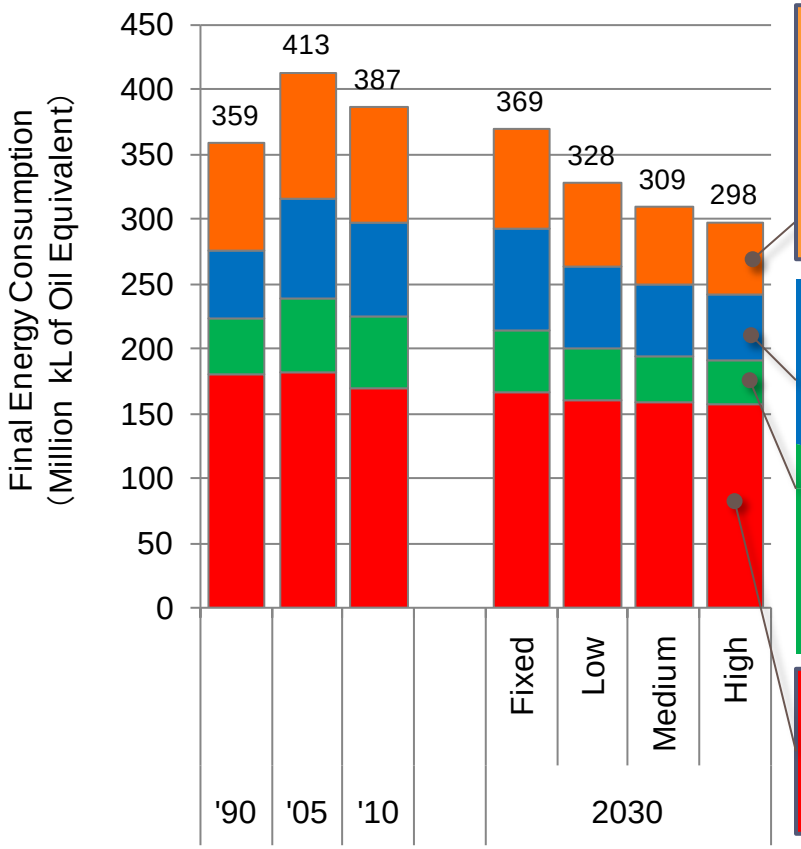


Vision of Society in 2050



Analysis by AIM/Enduse in Japan

Final energy consumption in 2030 (low growth case)



Transport

- EV/HV: 70 to 90% of new car sales
- About 40% improvement of freight vehicle efficiency
- Eco-driving in practice : 15 to 40%(passenger), 25 to 55%(freight)

Commercial / Residential

- Ensure all newly built homes and buildings use advanced insulation and energy saving designs/features
- High-efficiency water heater: 75 to 90% in households, 40 to 90% in commercial building
- Home/Building energy management system
- PV power: 28 Mil. kW in households, 38 to 73 Mil. kW in commercial building

Industry

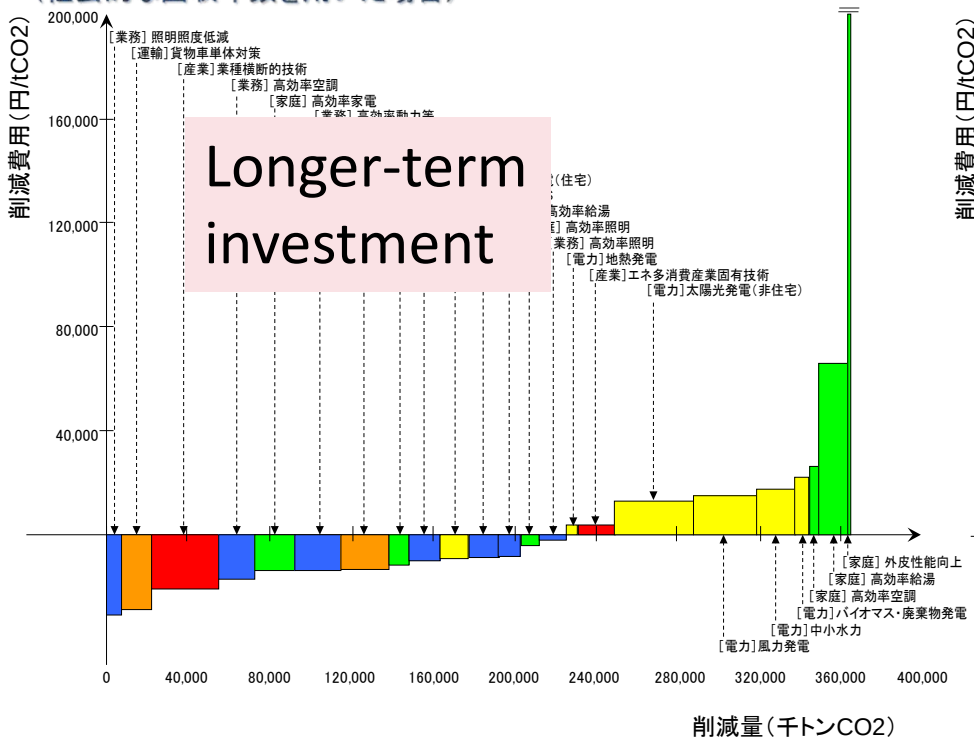
- Commercialization and popularization of best-available-technology
- Fuel conversion to natural gases

Mitigation cost curve in Japan to take aggressive emissions reductions options by 2030

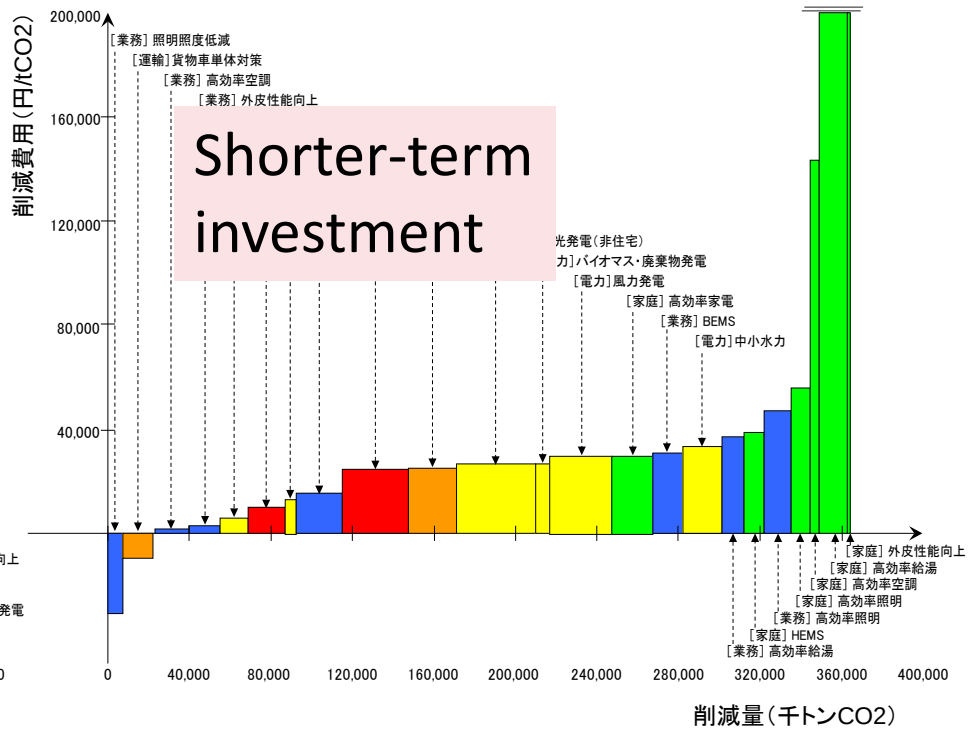
（3）・2030年 高位ケース

われるようにすると、削減費用は大きく変化する。
場合には、家庭部門や運輸部門の対策は削減費用が
運輸部門で原則3年、再生可能エネルギー発電で10年

●政策による後押しなどによって長期の回収年を前提に投資が行われる場合
（社会的な回収年数を用いた場合）



●各主体が短期の回収年を念頭に投資を行う場合
（主観的な回収年数を用いた場合）



産業部門・投資回収年数 12～15年
家庭部門・投資回収年数 8年（*2）
業務部門・投資回収年数 8年
運輸部門・投資回収年数 8年
再エネ発電・投資回収年数 12年
*2 住宅は17年，*3 建築物は15年

産業部門・投資回収年数 3年/10年（*1）
家庭部門・投資回収年数 3
業務部門・投資回収年数 3
物は

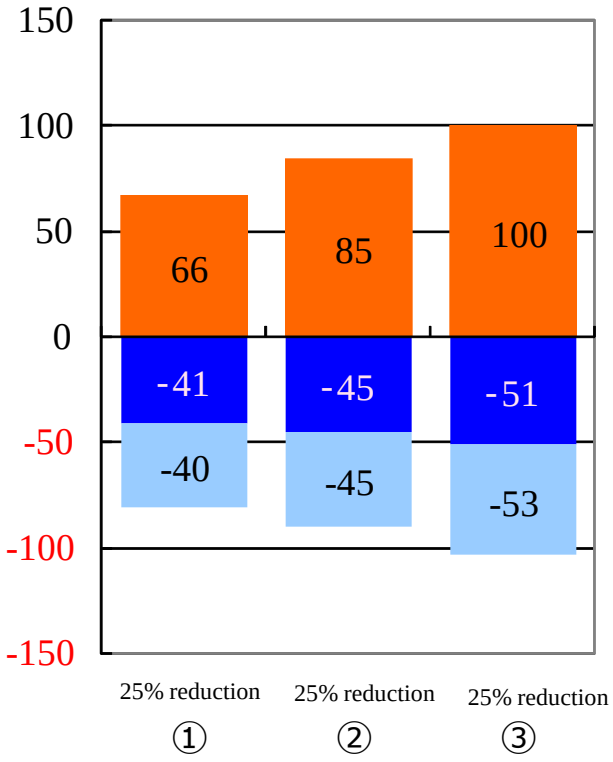
The result by AIM/Enduse[Japan]

※ 上記グラフが示す削減量は固定ケースと対策ケースの差である。本試算に用いたモデル内では、固定ケースと対策ケースでは原子力発電
た
場合には、火力発電の発電電力量が低減すると想定した。そのため、火力発電の排出係数として0.54kgCO2/kWh（使用端）を仮に用いて
力
設備の運用では電力需要の動向に応じてあらゆる電源で対応することから、全電源平均の係数を用いて電力削減によるCO2削減効果を算定する方法もあるため、実際の削減量はモデルの試算とは必

Relationship between low-carbon investment amount and energy reduction expense

- As for the investment amount for global warming, half of the overall investment amount will be collected by 2020 and an amount equal to the investment amount will be collected by 2030 based on energy expenses that can be saved through technologies introduced.

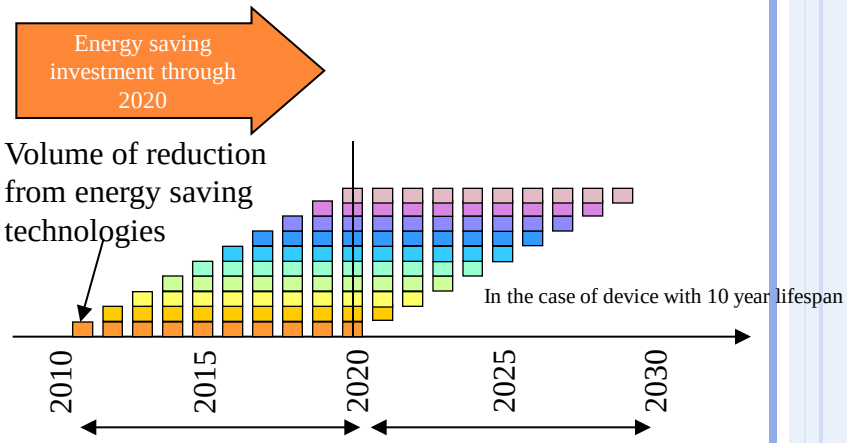
<Low-carbon investment amount and energy reduction expense>



Additional investment ('11 – '20 total)

Energy reduction expense ('11 – '20 total)

Energy reduction expense ('21 – '30 total)

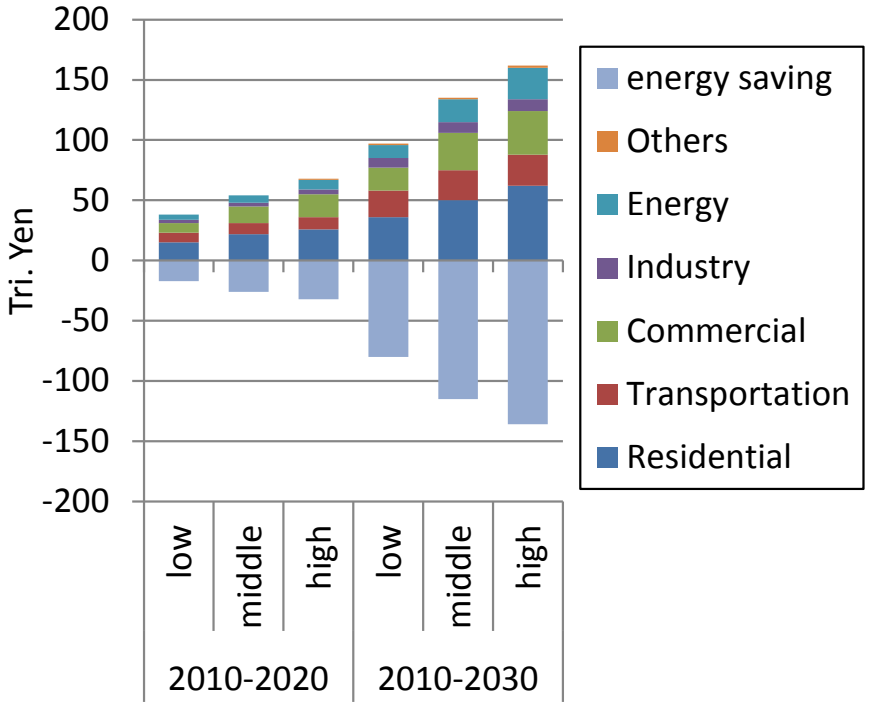


Energy reduction expense from energy saving investment = approx. 51 trillion yen (25% reduction (3))

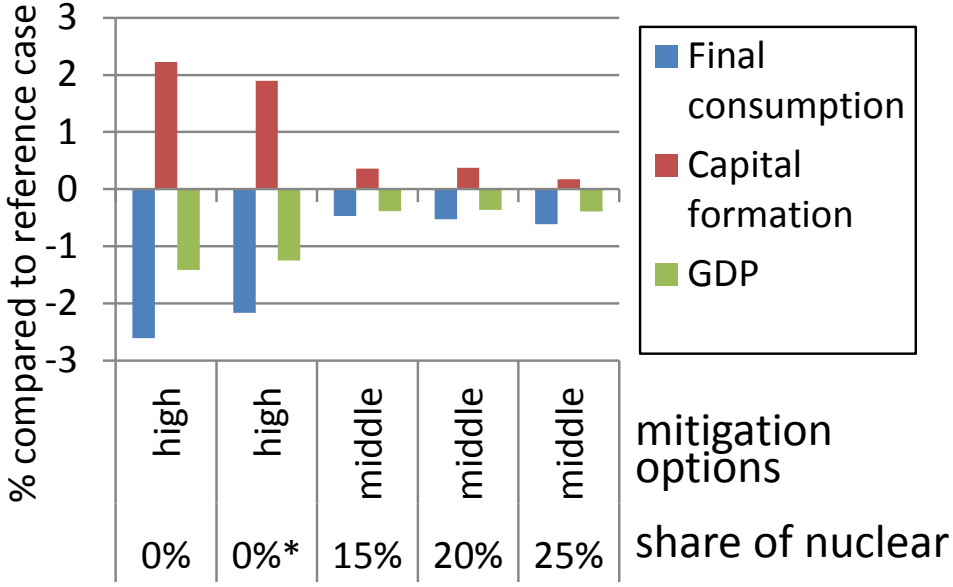
Energy reduction expense from energy saving investment = approx. 53 trillion yen (25% reduction (3))

Simulation results provided in June 2012

For discussion on future energy and mitigation plan after accident at Fukushima dai-ichi nuclear power plant of TEPCO.



Cumulative additional investment by 2020 and 2030
[Results from Enduse]



0%*: Nuclear will be 0% in 2020.

Macro economic impact compared to reference case in 2030,
Low economic growth case
[Results from CGE]

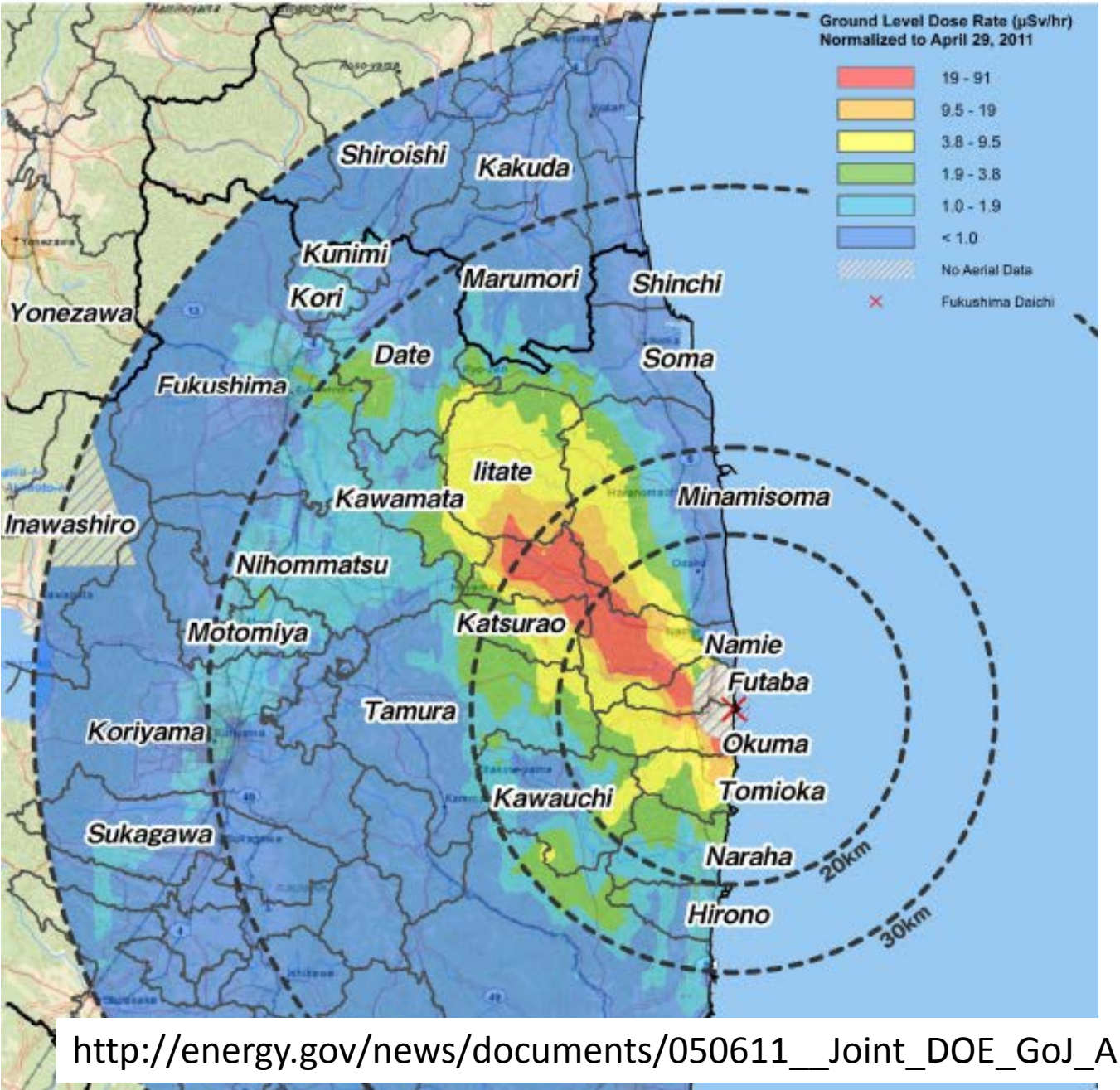
CGE can use any values as parameters, but by using Enduse results, more realistic values are available.

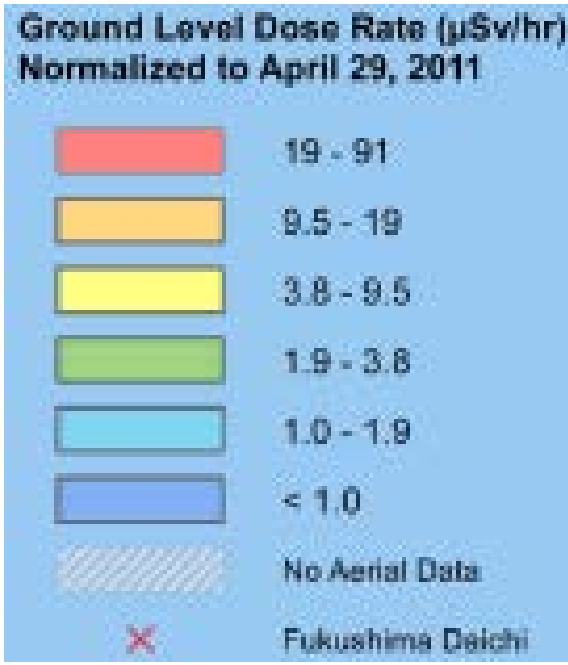
2011.3.11-

Revision of Energy and Climate Change Policy

Aerial Measuring Results

Joint US / Japan Survey Data

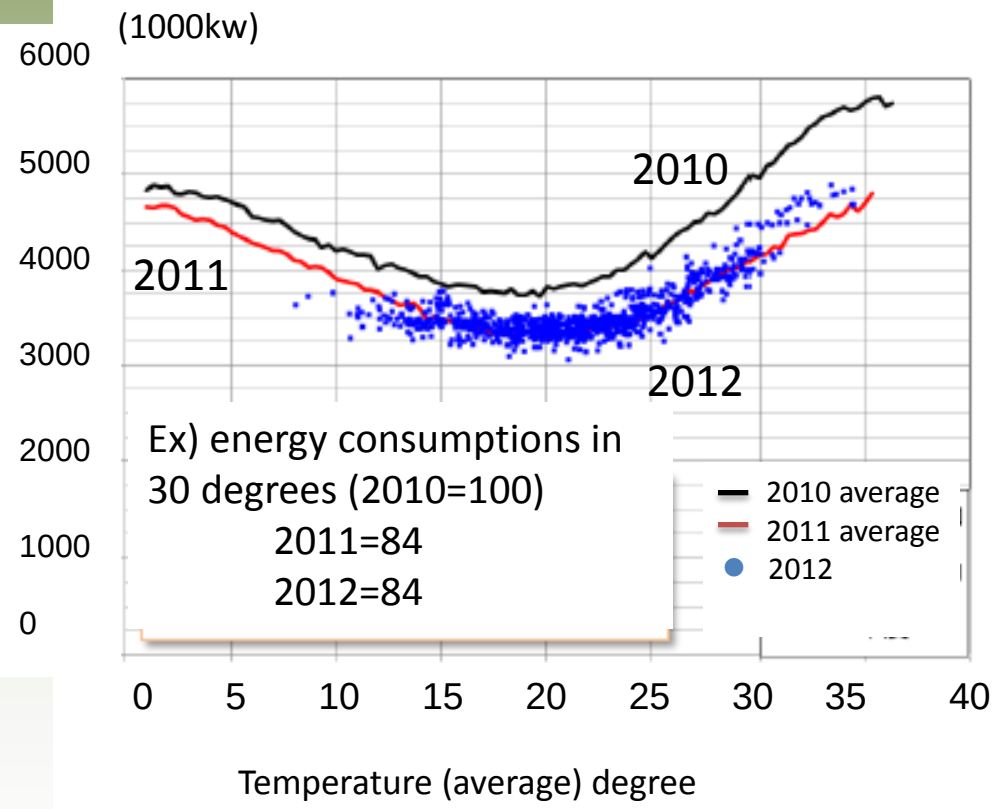




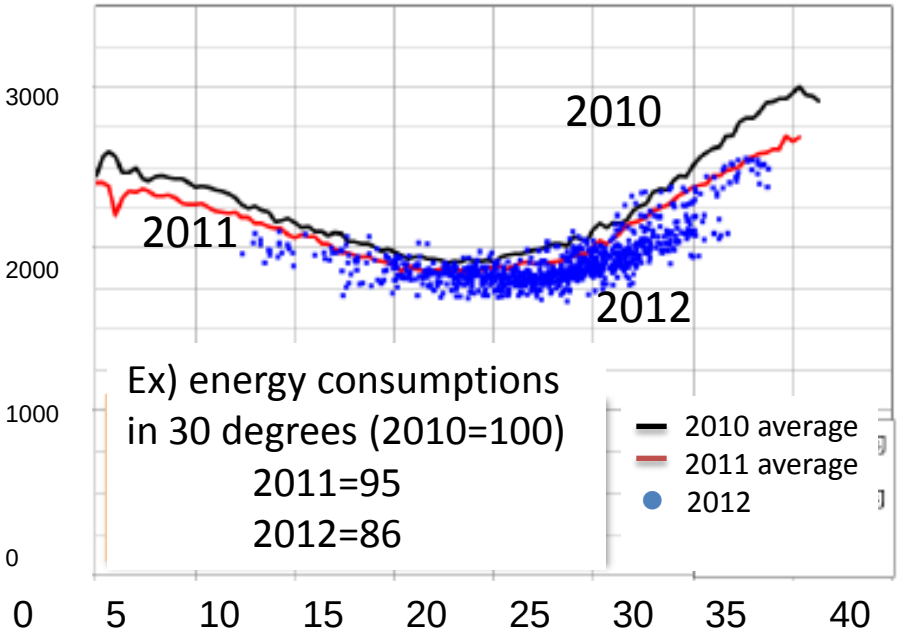
http://energy.gov/news/documents/050611__Joint_DOE_GoJ_AMS_Data_v3.pptx

Post-Fukushima Japan: Response to power deficiency

Energy consumption in **Tokyo electric power company** (9am-21pm)



Energy consumption in **Kansai electric power company** (9am-21pm)



Energy reductions in maximum peak demand in 2011 compared to 2010

Maximum peak demand (kW) - week days from 9:00-20:00

	Tokyo electricity Company *(w/o regard to temp.)*	Tokyo electricity Company *(with regard to temp.)*	Tohoku electricity company *(w/o regard to temp.)*	Kansai electricity company *(w/o regard to temp.)*
Reduction target of peak demand	-15% (2011)	-	-15% (2011)	-10% (2011&2012)
Large electricity customers	-29% (▲600)	-27%	-18%	-9%
Small electricity customers	-19% (▲400)	-19%	-20%	-10%
Household	-6% (▲100)	-11%	-22%	-14%
2011 Total (July-Sept)	-18%	-	-15.8%	-10%
2012 Total (July-Aug)	**Under calculation** (Jul: -6.4% from 2011)	-	**Under calculation** (Jul: +0.1% from 2011)	-11.1% (Jul: -10.6% from 2011)

(10,000kW)

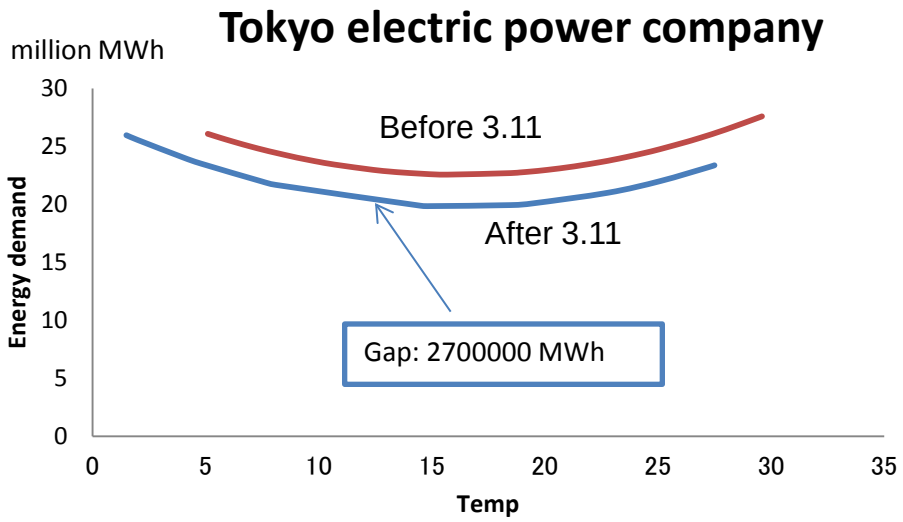
Supply-Demand gaps
Expected shortage of supply was 6.2GW

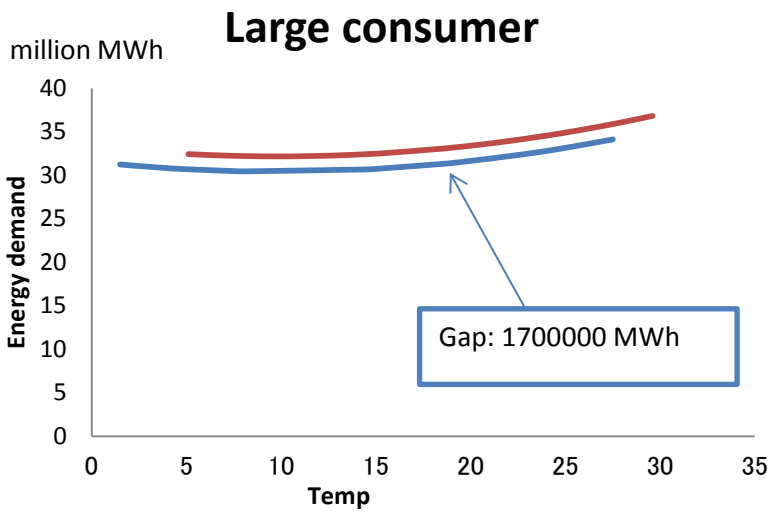
Set up **15% reduction target** in **peak demand**

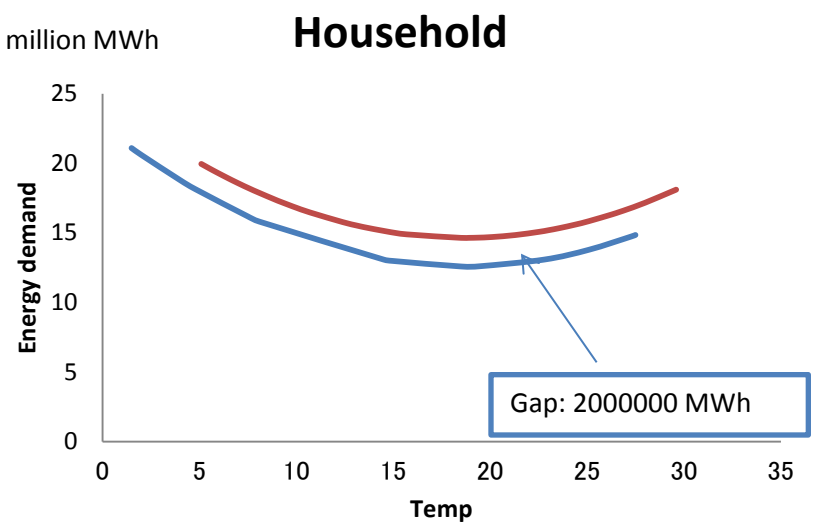
As a result,
Achieved totally **18% (10.77GW)** reductions compared to 2010 summer

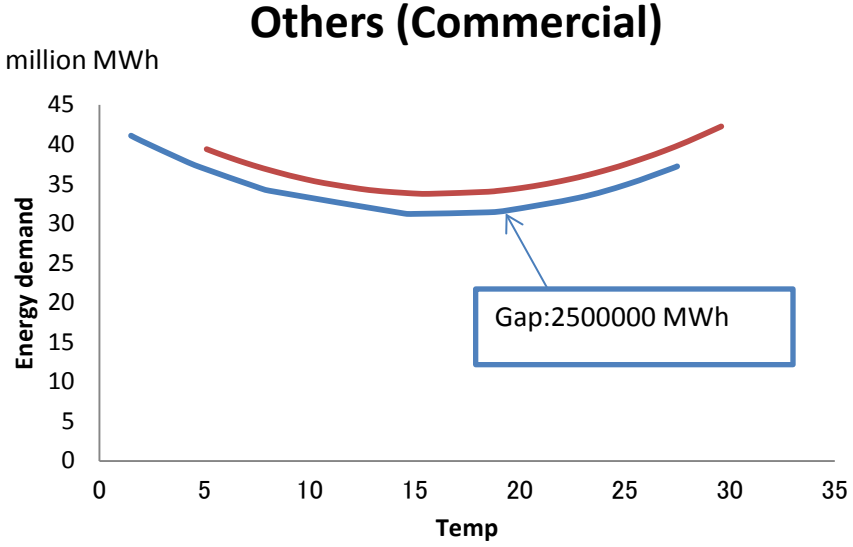
Source: IGES 2011 using data from METI etc

Response to power deficiency by sector









After 3.11 Before 3.11

Source: IGES 2011 using data from METI

Demand measures of summer in 2011

Large consumer

- L/c voluntarily develop and implement a plan to reduce energy use during a peak demand (Such as shift adjustment of operation and business)
- Gov. invoked Article 27 of the Electricity Business Act (Limit electricity use)

Small consumer

- Gov. provided a list of energy-saving measures as examples (energy-saving of lighting, air conditioning, OA (office automation))
- Gov. promoted s/c to develop and announce voluntary energy conservation action plan (Provided a format)
- Gov. operated door-to-door visits and briefings

Household

- Gov. provided the list of energy-saving measures for households
- Gov. called for the implementation of energy saving through media etc
- Gov. distributed education materials about “energy-saving“ to elementary and junior high schools

Cross-cutting

- Gov. conducted energy-saving public campaign through various media
- Visualization of electric power supply and demand data (Electricity Forecast)
- Gov. announced the info of the tight power supply and demand

Source: METI 2012

April 2012 in Fukushima

Demand side

$$\text{Satisfaction Level} \times \frac{\text{Service input}}{\text{Satisfaction level}} \times \frac{\text{Energy Consumption}}{\text{Service input}} \times \frac{CO_2\ \text{Emission}}{\text{Energy Consumption}} = CO_2$$

- Satisfaction Level: Reconsider how much satisfaction we can get thorough energy
- Service input / Satisfaction level: How to increase service level with Less service input
- Energy Consumption / Service input: Energy saving technology
- CO_2 Emission / Energy Consumption: Clean energy supply technology

Supply side

$$\text{Secondary energy} \times \frac{\text{Primary Energy}}{\text{Secondary Energy}} \times \frac{CO_2\ \text{emission}}{\text{Primary Energy}} = CO_2\ \text{Emissions}$$

- Primary Energy / Secondary Energy: Efficient energy conversion tech
- CO_2 emission / Primary Energy: Low CO2 energy imput

Examples of QOL improvement

Effect to prevent disease

● Impact of High insulation building

disease	rate (%) before	after
アレルギー性鼻炎	28.9	21.0
アレルギー性結膜炎	13.8	9.3
アトピー性皮膚炎	8.6	3.6
気管支喘息	7.0	2.1
高血圧性疾患	6.7	4.5
関節炎	3.9	1.3
肺炎	3.2	1.2
糖尿病	2.6	0.8
心疾患	2.0	0.4

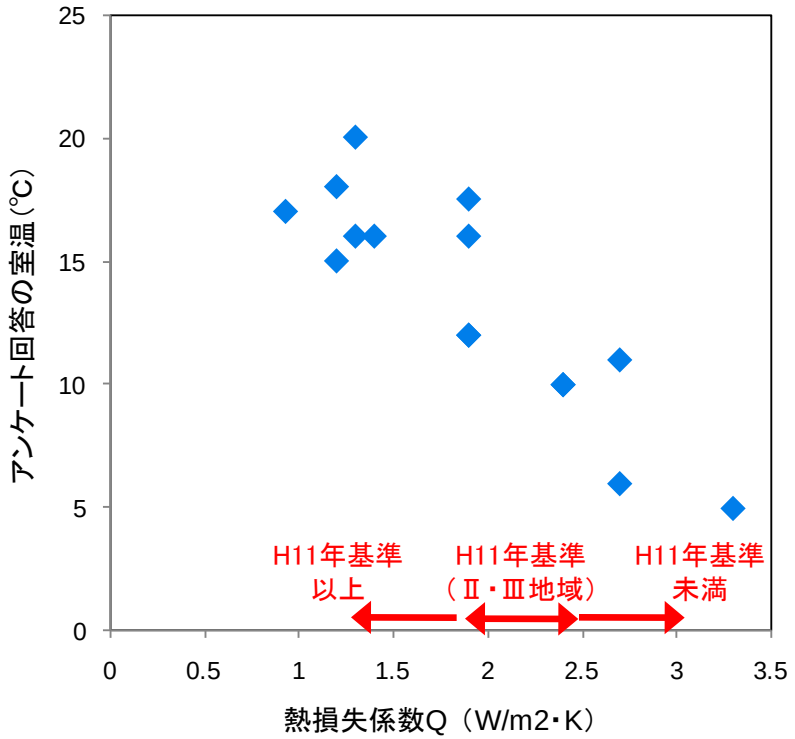
※アンケート調査等に基づくものであり、医学的検証は必ずしも十分でない

（出典）伊香賀俊治、江口里佳、村上周三、岩前篤、星旦二ほか：健康維持がもたらす間接的便益(NEB)を考慮した住宅断熱の投資評価、日本建築学会環境系論文集、Vol.76、No.666、pp.735-740、2011.8

このスライドは住宅・建築物WGとりまとめ資料を元に作成

Effect to temperature level

● Temperature without warming devices after East Japan earthquake (2011.3.11)

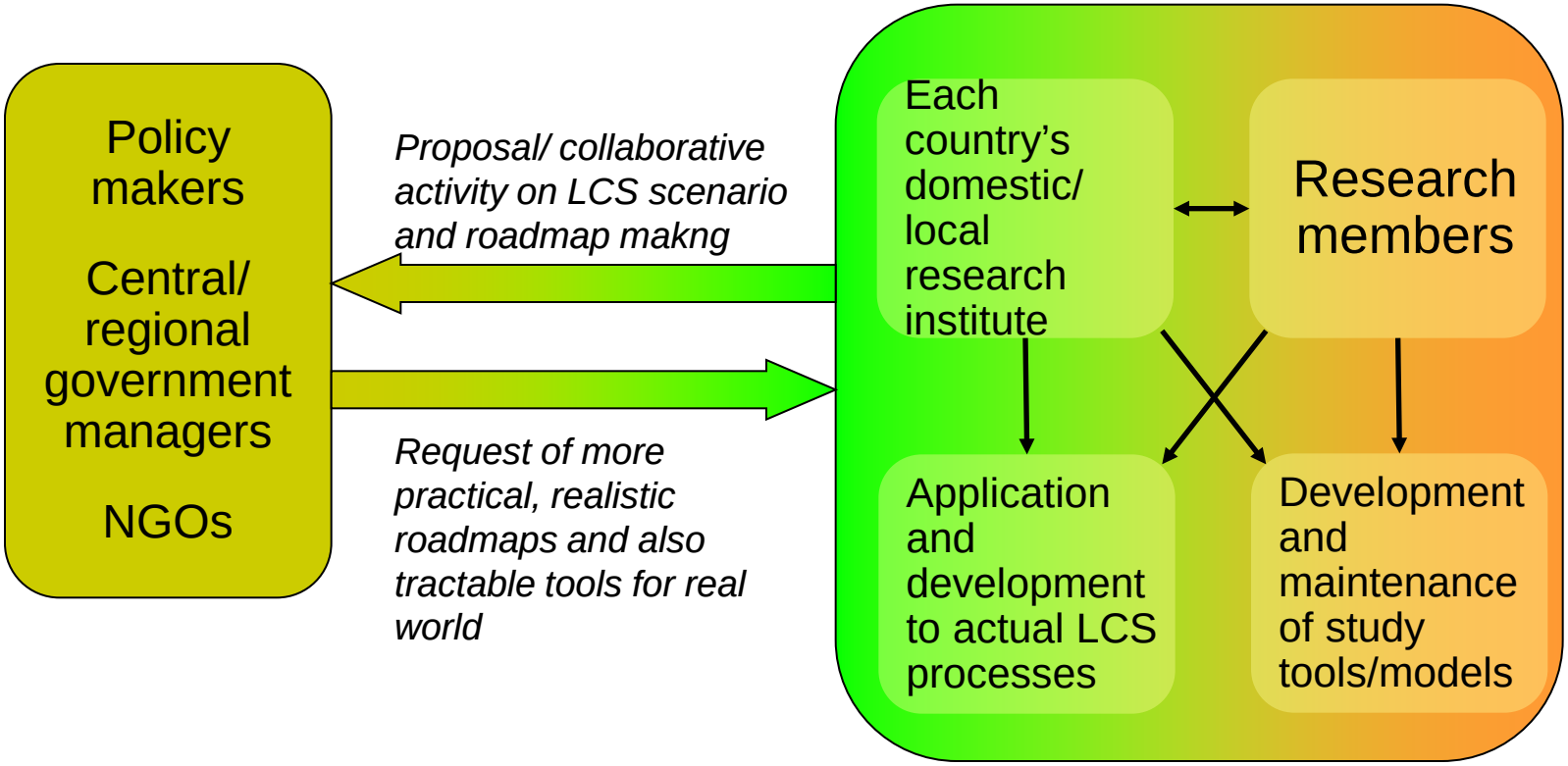


※1：アンケート結果一覧をもとに作成。室温の回答に幅がある場合は、平均値を採用。なお、H11年基準未満の住宅のQ値は、H4年基準レベルと仮定。

※2：青森、岩手、宮城の3県において、3月に実施した調査の結果。グラフには、調査戸数54件のうち、停電後1～5日間の室温に関して定量的な回答があったもののみを記載。なおアンケート回答より、外気温は-5～8℃程度と推測

（出典）南雄三,（2011）,「ライフラインが断たれた時の暖房と室温低下の実態調査」,（財）建築環境・省エネルギー機構 CASBEE-健康チェックリスト委員会資料 より作成

Expectations on Cambodia and Japan: "How to deploy LCS study to real world?"

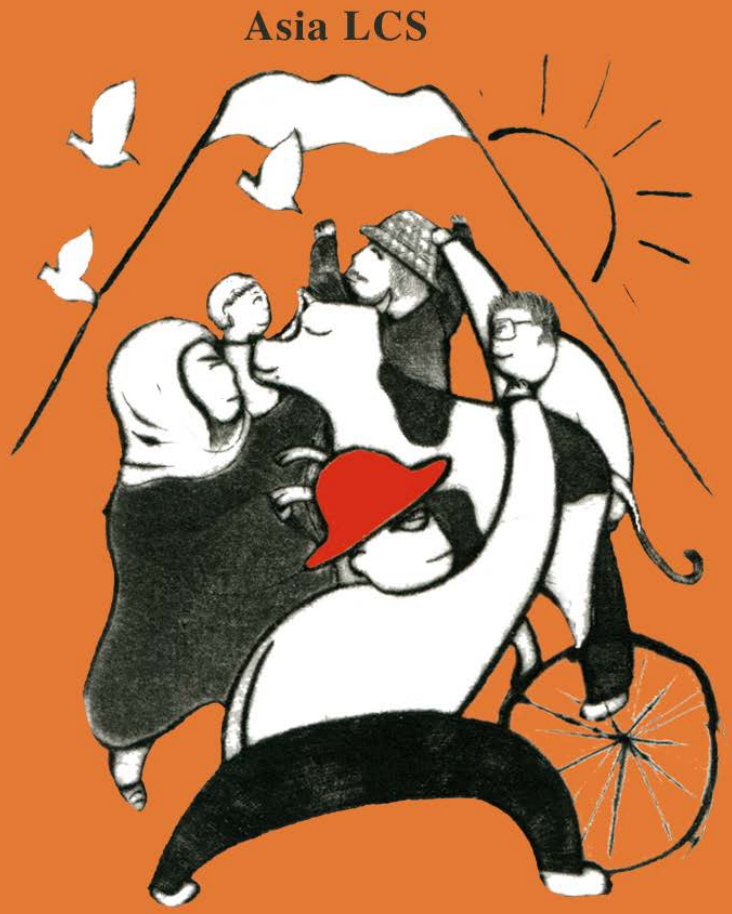


LCS is Risk Management

- We always face to risks if we are alive.
- Global warming is one of risks in our daily life, but it might become one of the huge/ biggest risks in some future…
- Overshoot (expect future technology development) / Early Action (Stern Review)
- Short-term Sweet (Benefit) / Long-term Legality
- Neo Liberalism / Eco Modernization -> Smart Regulation
- Crisis = 危(danger) + 機(chance)
- 創(create) 新(something new) = Innovation
- Sense of Urgency for Good Design of our Society

Sustainable
Low-Carbon Asia
comes from
design,
imagination
and
co-working…

Let’s work together!



藤野　純一
Junichi FUJINO
fuji@nies.go.jp