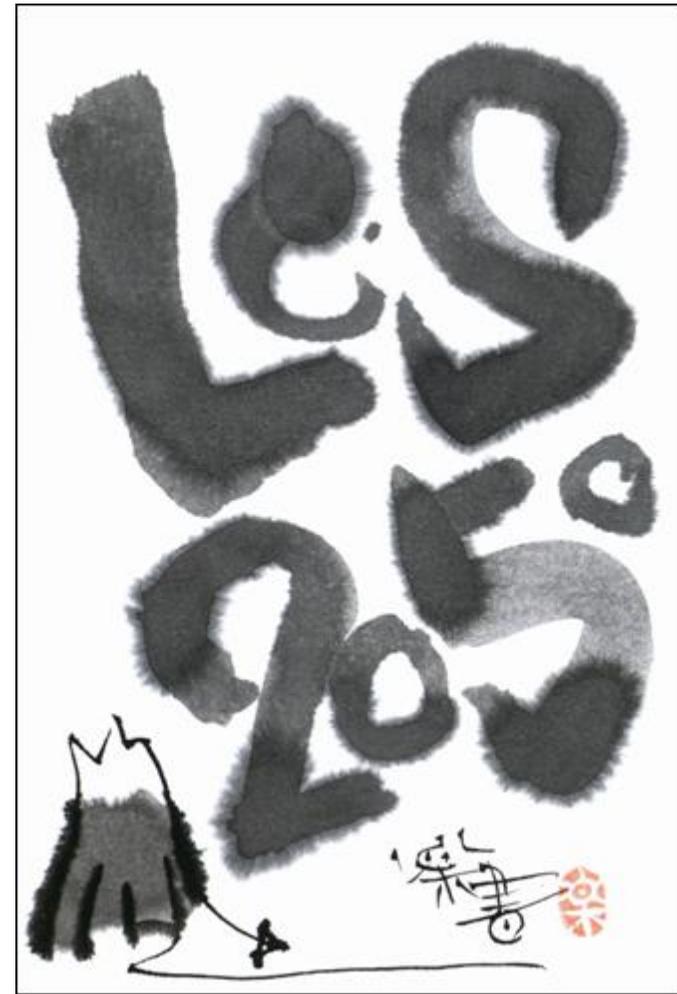


# Energy and Electricity System toward LCS

- 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](mailto:fuji@nies.go.jp))

NIES (National Institute for Environmental Studies), Japan

ParisTech side event

27th November 2012, COP18/MOP8, Doha Qatar

# LCS study by AIM team

- 1990 start AIM (Asia-Pacific Integrated Model) project
- 2000 provide IPCC/SRES A1B maker scenario
- 2004.4-2009.3 “Japan LCS research project” coordinated by AIM/NIES funded by MOEJ and provide 70% CO2 cut scenario by 2050
- 2006.2-2008.3 “Japan-UK joint LCS research project” submitted “call for action” to G8 Japan summit
- 2009.4-2014.3 “Low-Carbon Asia research project” coordinated by AIM/NIES funded by MOEJ
- 2010.4-2015.3 SATREPS “Development of Low Carbon Society Scenarios for Asian Region” especially focused on Iskandar and Malaysia funded by JST/JICA

Thanks to all AIM friends,  
generous support by MOEJ,  
and all of you



15<sup>th</sup> AIM International Workshop on 20-22  
February 2010



Asian Modeling Meeting at Tsukuba on 17-18  
September 2009



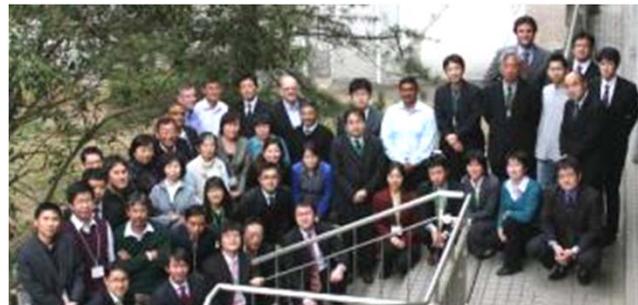
1st AIM International Workshop on  
1-2 February, 1996



17<sup>th</sup> AIM International Workshop, 17-19, February  
2012



AIM Training Workshop on 27-31 October  
2008



14<sup>th</sup> AIM International Workshop on 14-15 February  
2009



16<sup>th</sup> AIM International Workshop on 19-21 February  
2011



AIM Training Workshop on 16-20 October 2006

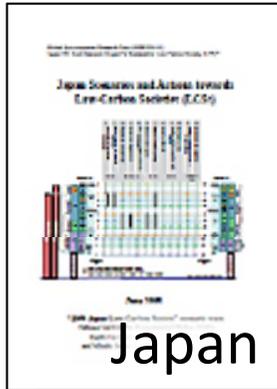


AIM Training Workshop on 2-14  
August 2010

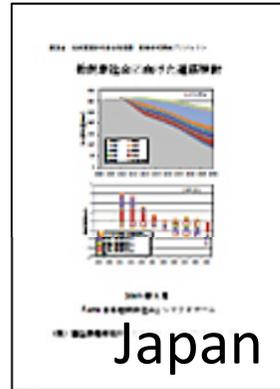


AIM Training Workshop on 22-26 October 2007

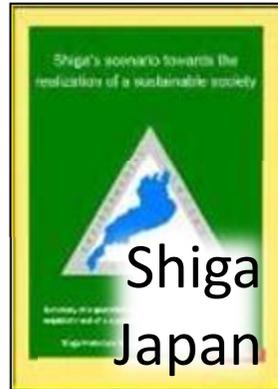
# Low-Carbon Society Scenarios in Asia using AIM



Japan



Japan



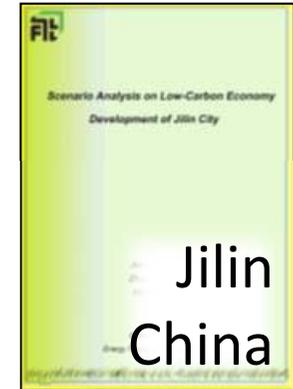
Shiga  
Japan



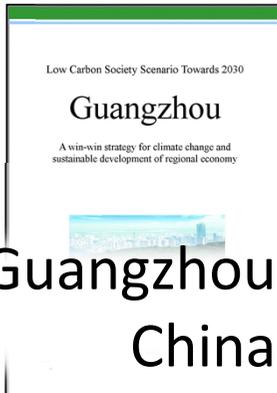
Shiga  
Japan



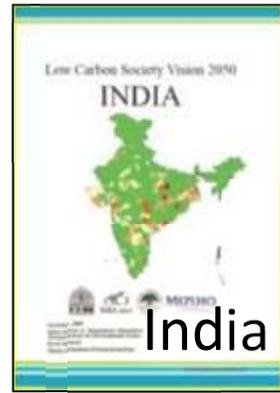
Kyoto  
Japan



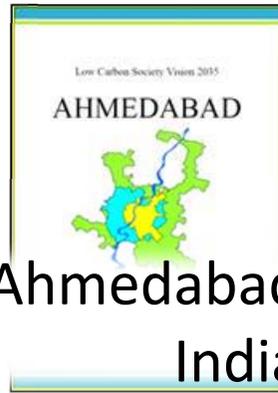
Jilin  
China



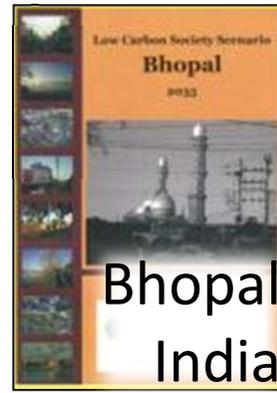
Guangzhou  
China



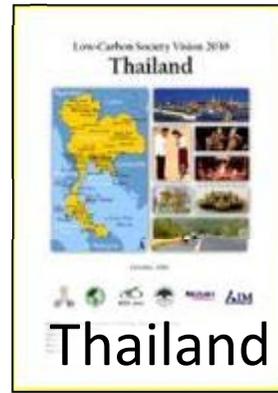
India



Ahmedabad  
India



Bhopal  
India



Thailand



Indonesia



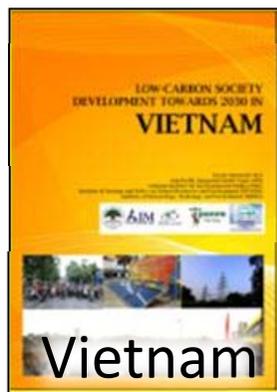
Iskandar  
Malaysia



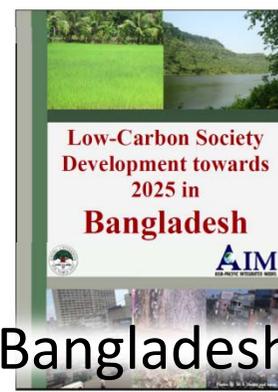
Putrajaya  
Malaysia



Cyberjaya  
Malaysia



Vietnam



Bangladesh



<http://2050.nies.go.jp>

# Low Carbon Actions in Asia

## Modeling to Bridge Science and Policy

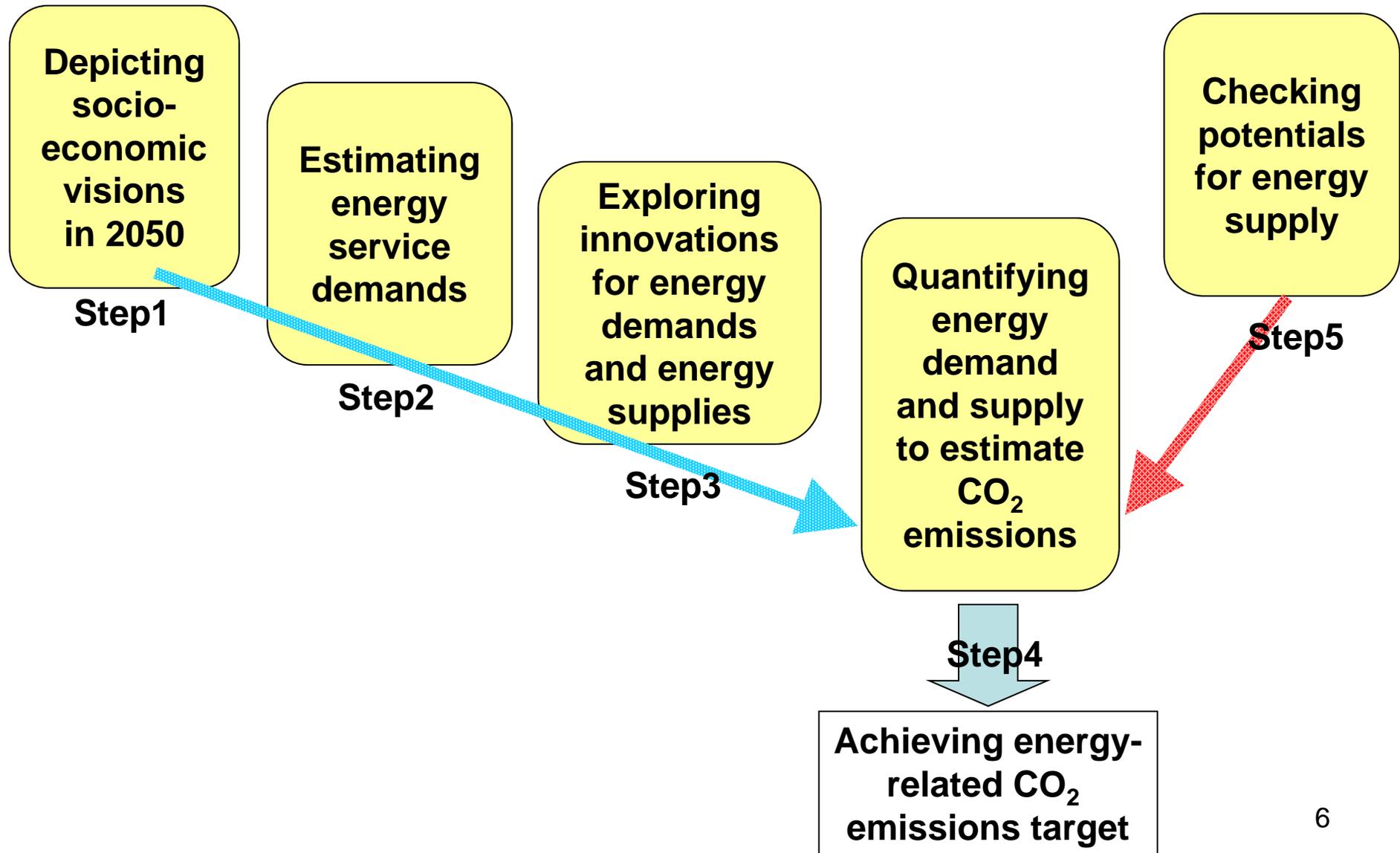
DOHA 2012  
UN CLIMATE CHANGE CONFERENCE  
COP18·CMP8

A side event at COP18, Doha, Qatar

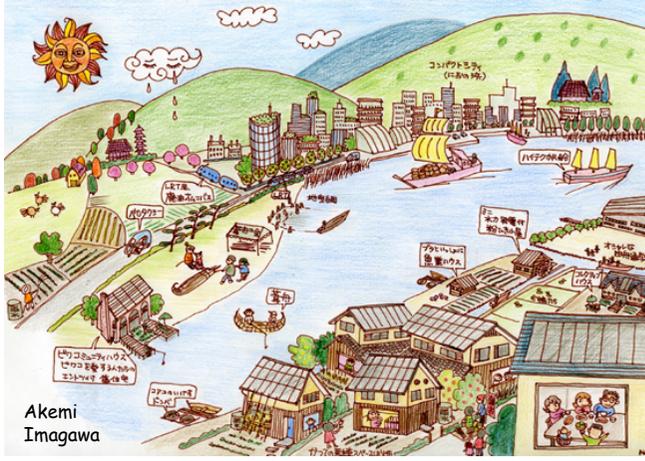
- Date** : 30<sup>th</sup> November 2012 (Friday)  
**Time** : 11:30 - 13:00  
**Venue** : Side event Room 1  
**Organizers** : National Institute for Environmental Studies (NIES, Japan)  
Universiti Teknologi Malaysia (UTM, Malaysia)

We have developed a methodology to create quantitative scenarios and roadmaps towards low carbon societies in Asia. The event will present our latest scientific findings and feedback from policy-makers, mainly on 1) Ten actions towards Low-Carbon Asia, 2) Iskandar Malaysia Low Carbon Society Blueprint, 3) Asian challenges to develop sustainable low carbon society based on scientific approach and policy initiatives.

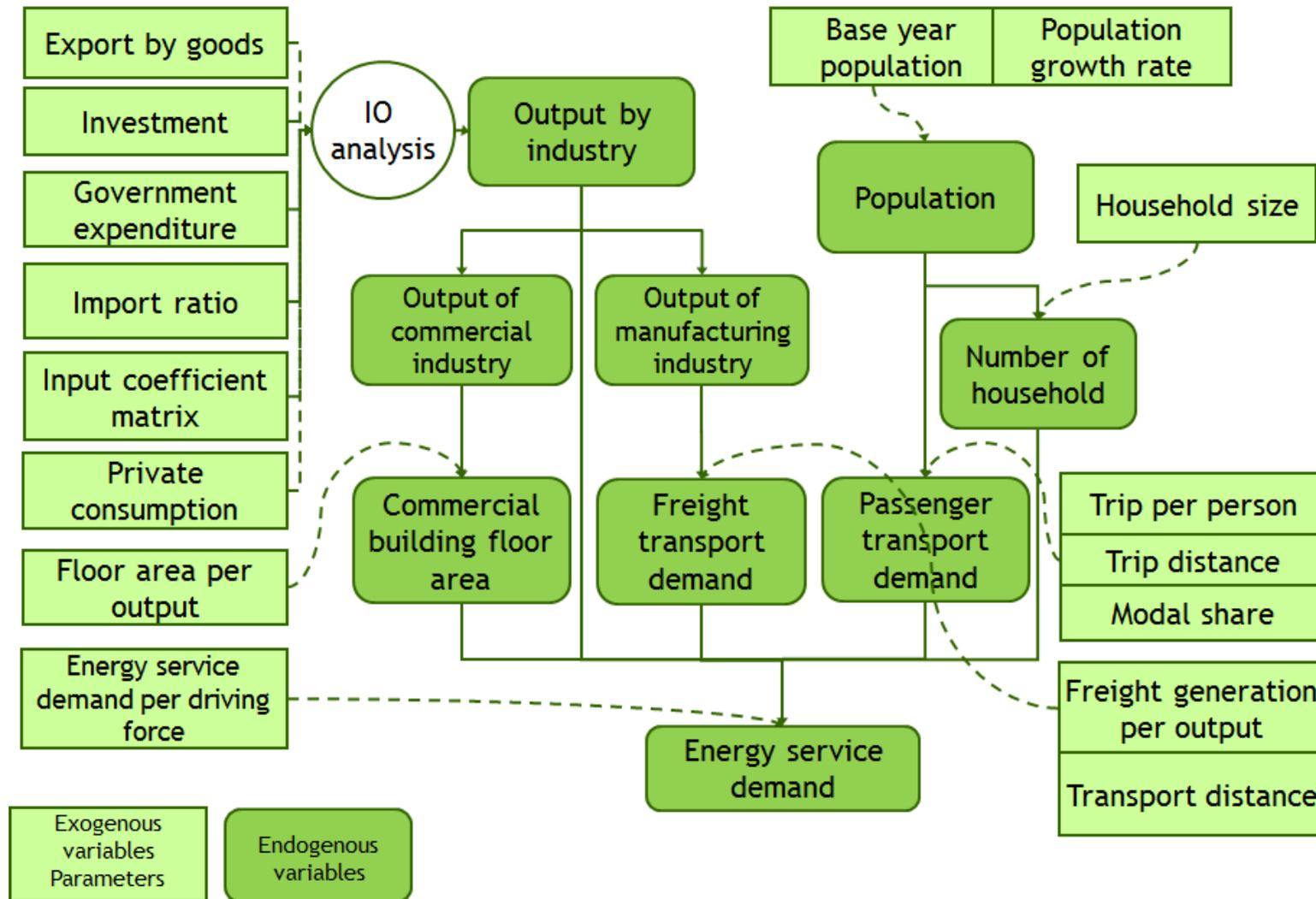
# Scenario Approach to Develop Japan Low-Carbon Society (LCS)



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

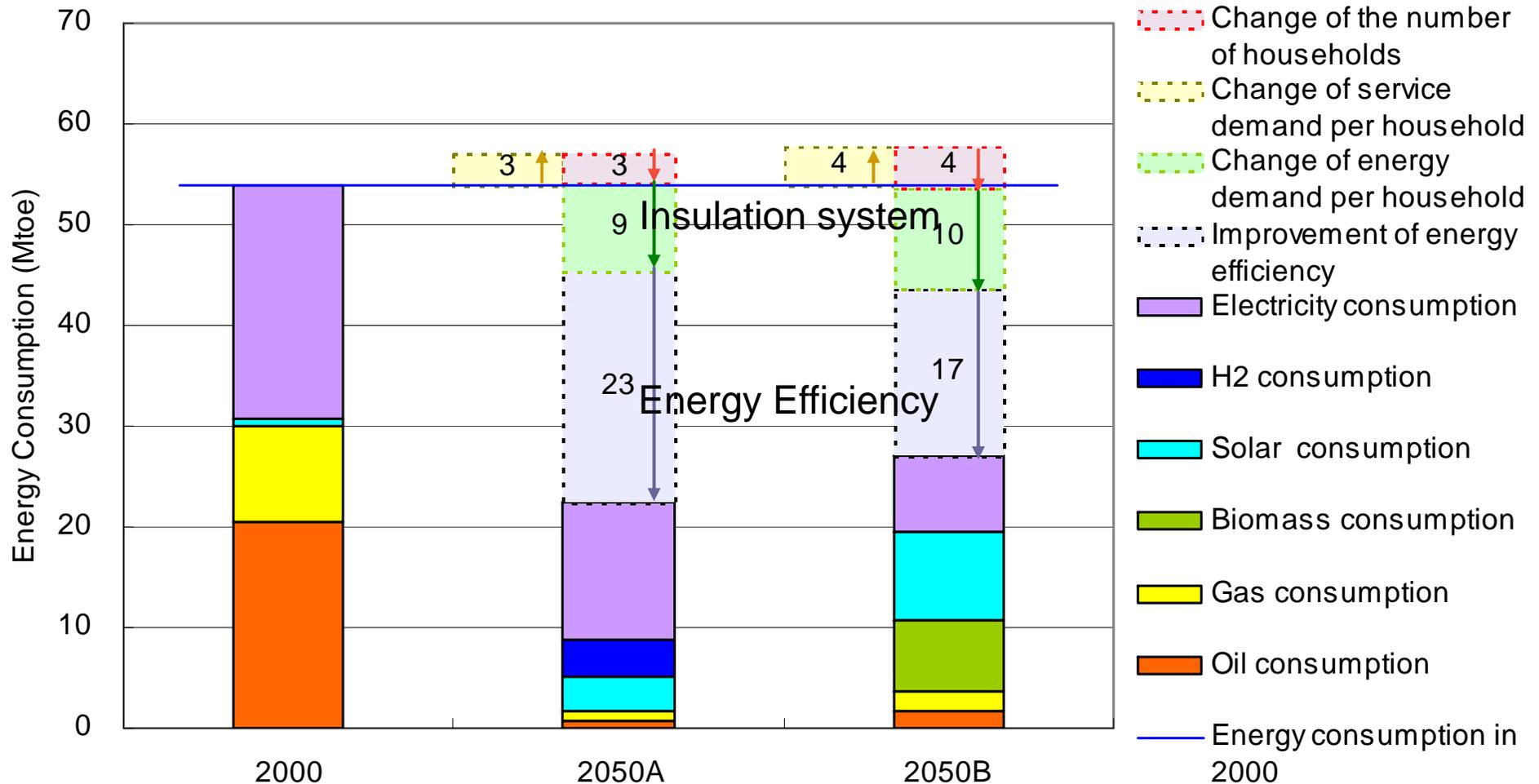
Vision A	Vision B
Vivid, Technology-driven	Slow, Natural-oriented
Urban/Personal	Decentralized/Community
Technology breakthrough Centralized production /recycle	Self-sufficient Produce locally, consume locally
Comfortable and Convenient	Social and Cultural Values
2%/yr GDP per capita growth	1%/yr GDP per capita growth
	 <p data-bbox="1122 1385 1200 1426">Akemi Imagawa</p>

# Example of AIM's socio-economic part



# 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

# Japan's targets in the contexts of climate change

## GHG emissions:

→ -6% by 1990 compared to the 1990 level

*the Kyoto Protocol*



→ -25% by 2020 compared to the 1990 level

-80% by 2050 compared to the 1990 level

*the United Nations Summit on Climate Change*



## II. What is the Mid- and Long-term Roadmap?

### (5) Review Conducted with Cooperation of Multiple Experts & Specialists

Japanese low carbon policy making process involves over 100 experts & specialists from a wide range of fields

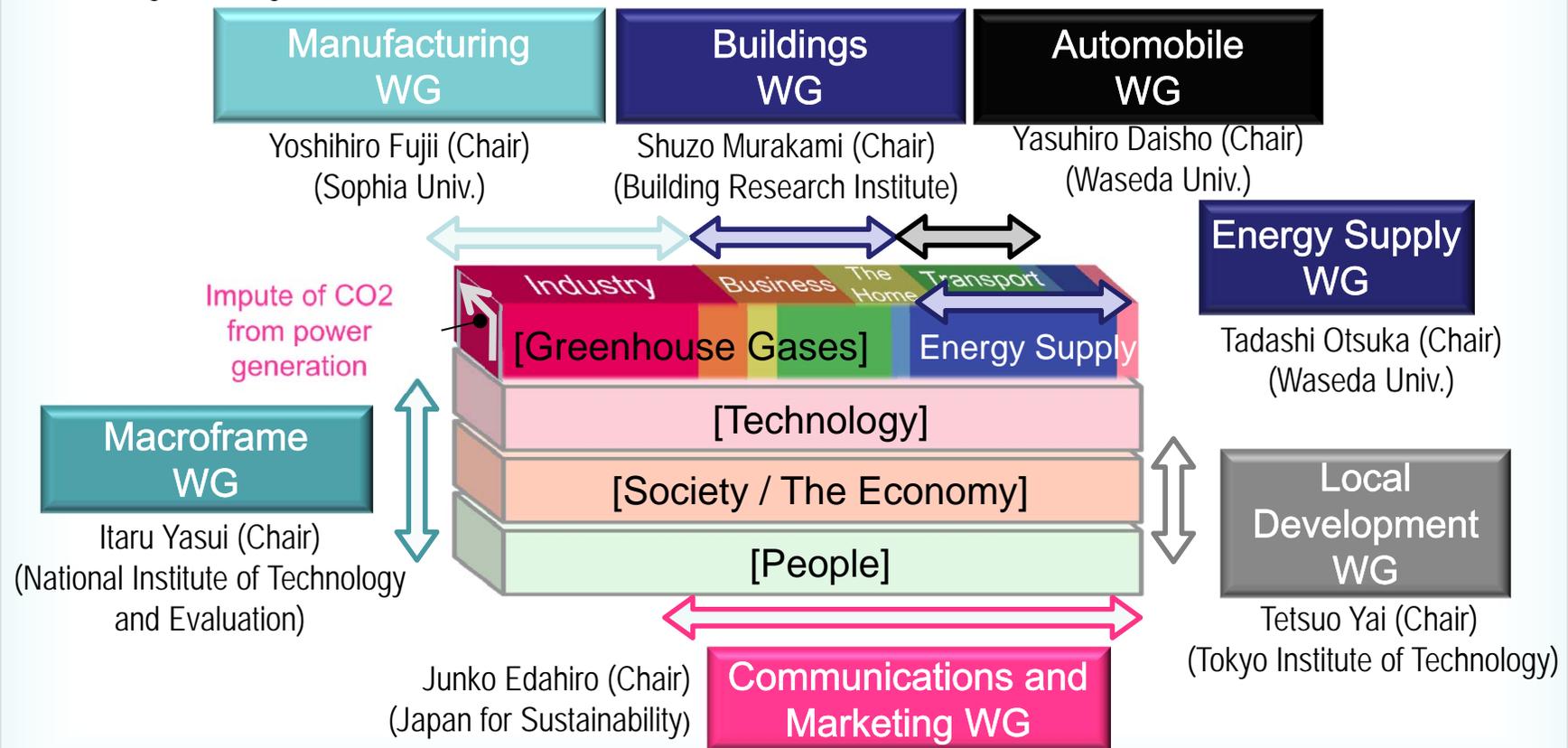
Mid- and Long-term Roadmap Subcommittee, Global Environmental Committee, Central Environmental Council



Chair Shuzo Nishioka (IGES)

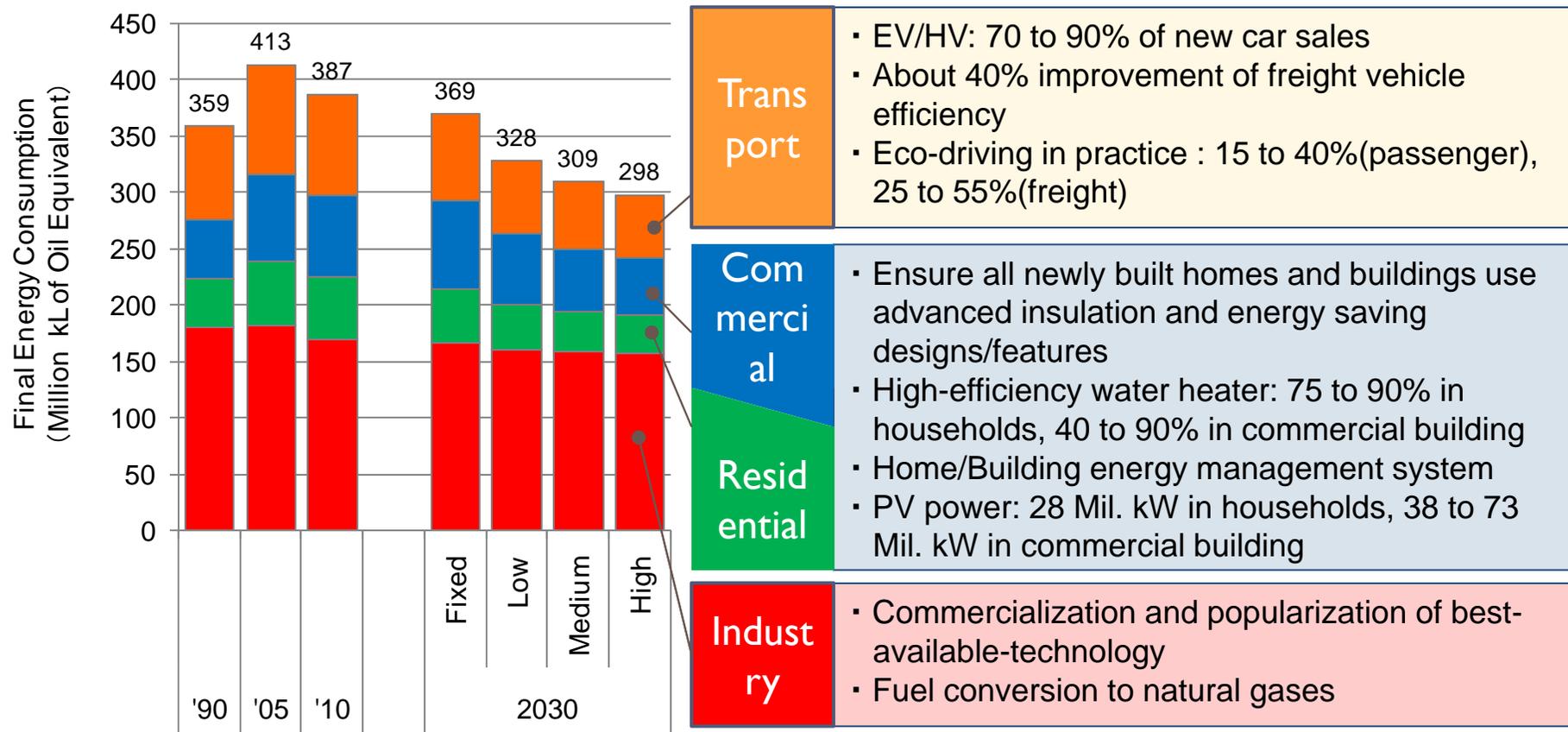
#### Working Groups for the Mid- and Long-term Roadmap for Global Warming Countermeasures

Reviews conducted from a specialist and technological standpoint concerning policies and measures to achieve mid- and long-term targets(101 members / 49 sessions)



# Analysis by AIM/Enduse in Japan

Final energy consumption in 2030 (low growth case)

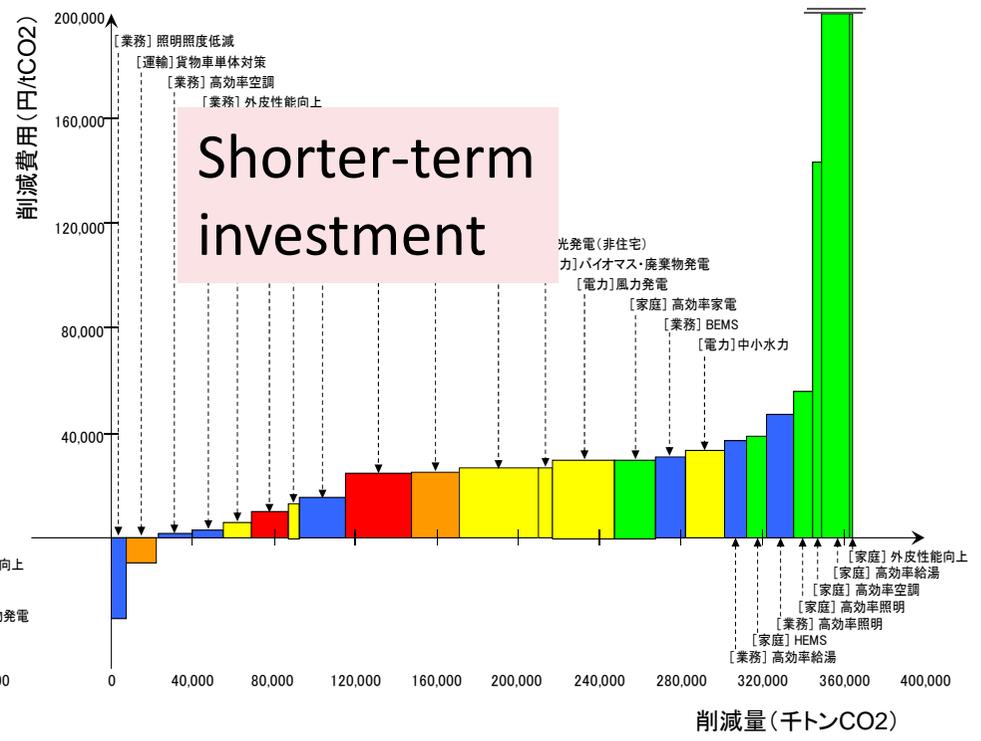
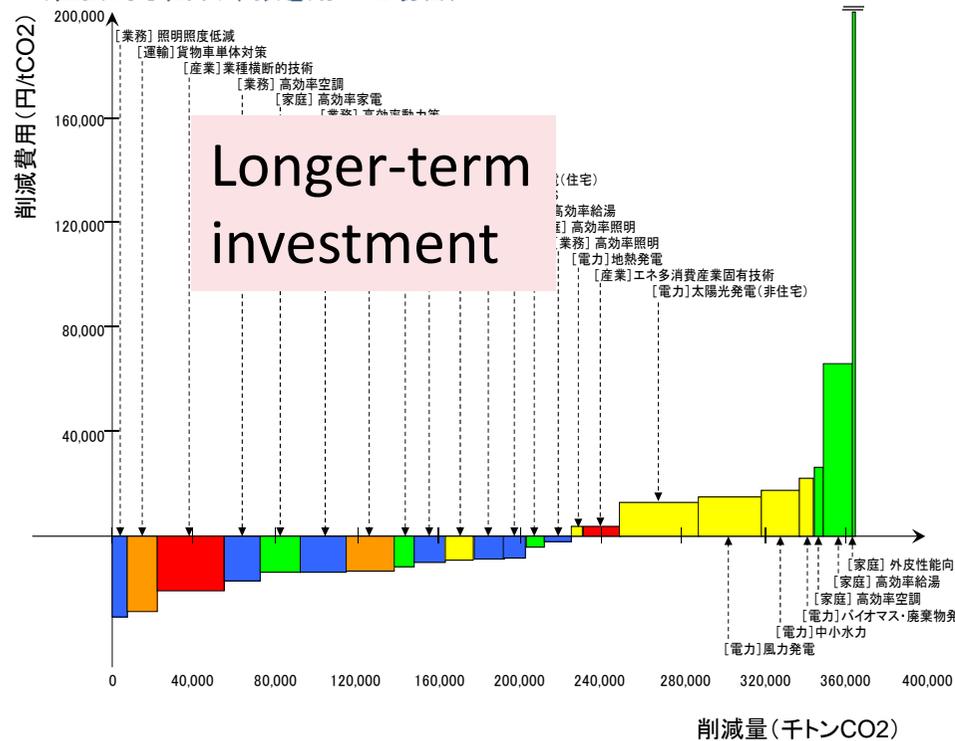


# Mitigation cost curve in Japan to take aggressive emissions reductions options by 2030

## (3)・2030年 高位ケース

られるようにすると、削減費用は大きく変化する。易場合には、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
- 運輸部門・投資回収年数 8年
- 家庭部門・投資回収年数 8年 (\*2)
- 再エネ発電・投資回収年数 12年
- 業務部門・投資回収年数 8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年
- 業務部門・投資回収年数 3年

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は削減しない。また、削減費用が大きい場合には、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)を仮に用いて試算した。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ずしも一致しない。

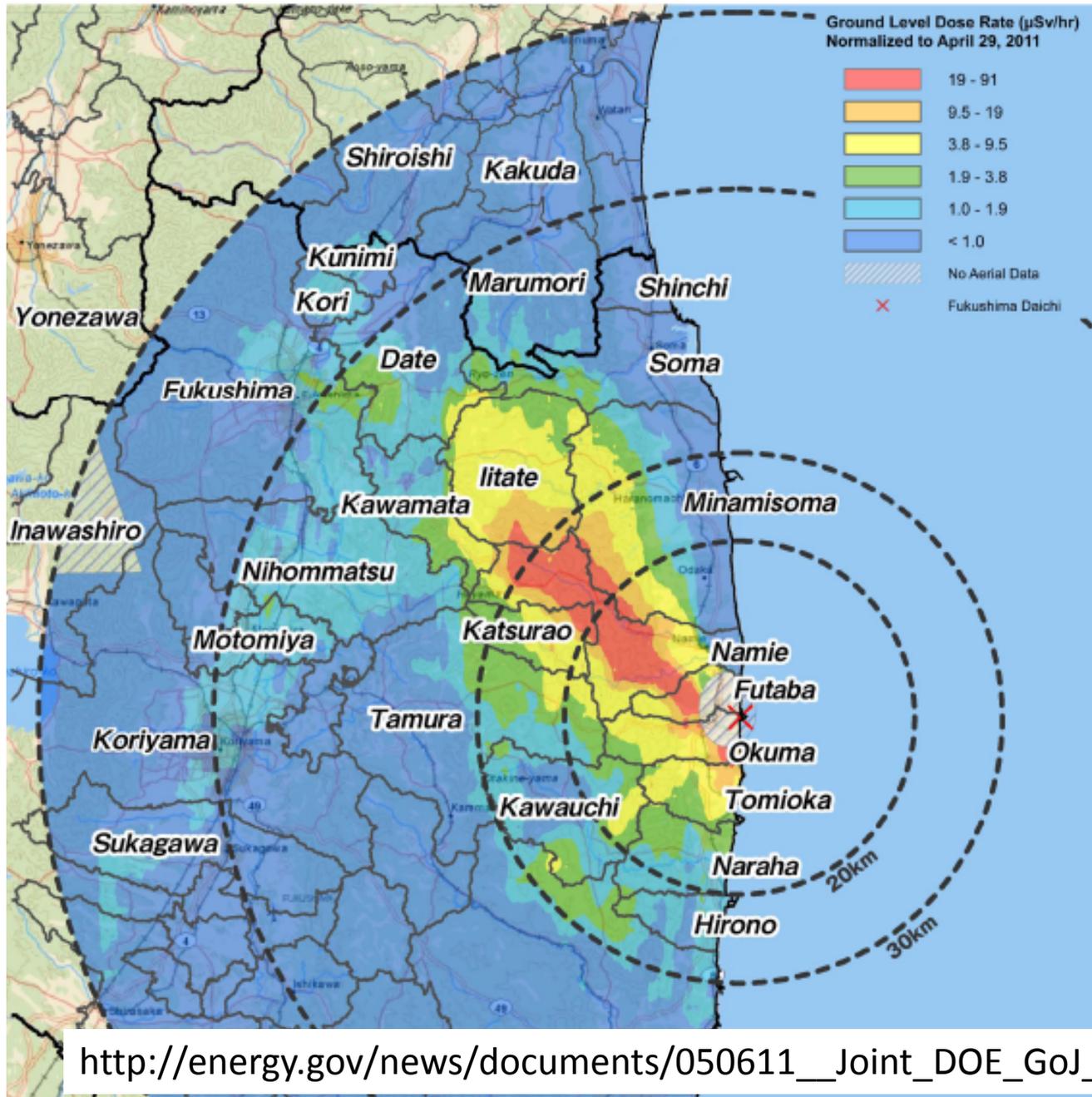
地球温暖化対策に係る  
中長期ロードマップ  
各WGの現時点での  
とりまとめ

平成22年12月21日



# Aerial Measuring Results

Joint US / Japan Survey Data



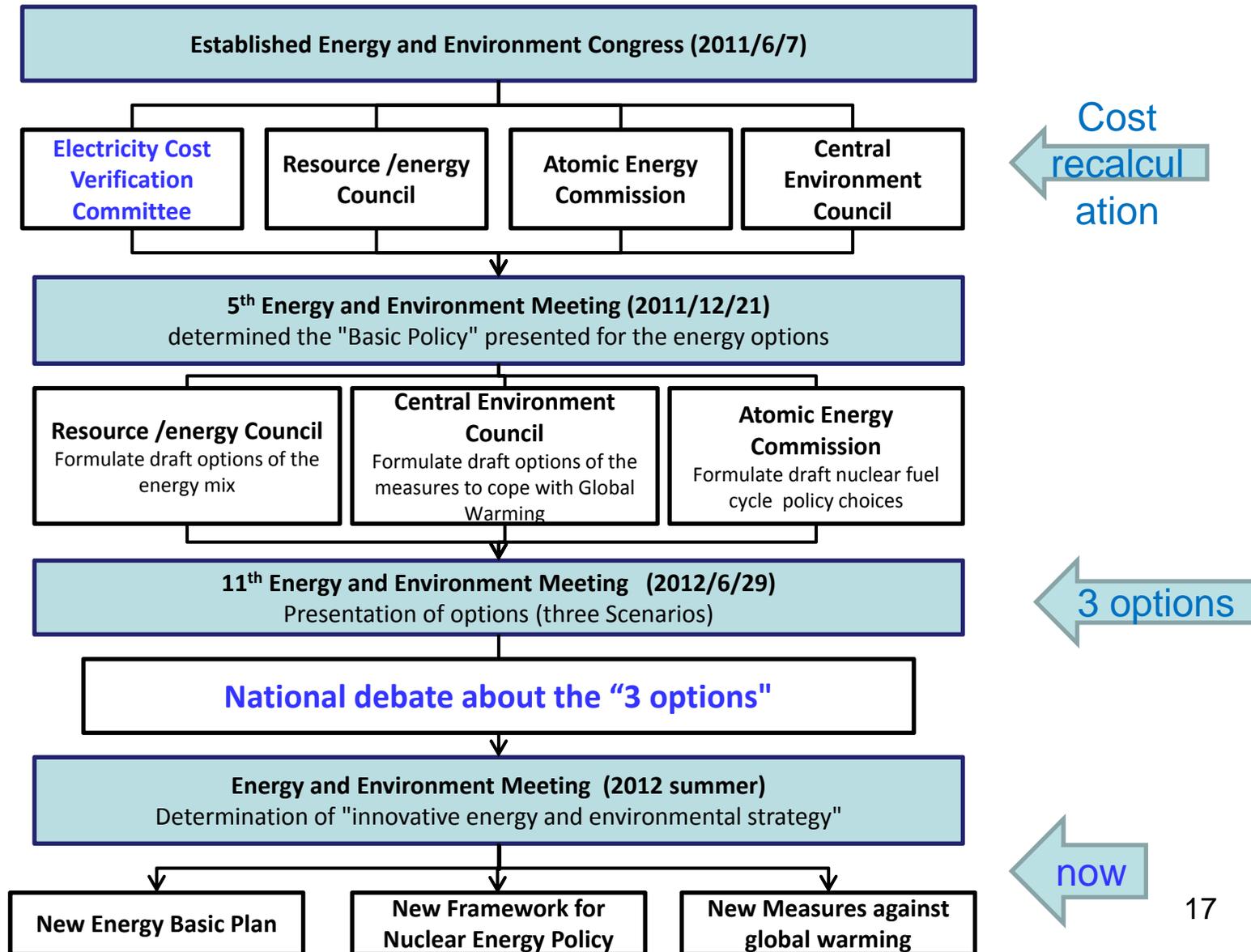
[http://energy.gov/news/documents/050611\\_\\_Joint\\_DOE\\_GoJ\\_AMS\\_Data\\_v3.pptx](http://energy.gov/news/documents/050611__Joint_DOE_GoJ_AMS_Data_v3.pptx)



April 2012 in Fukushima

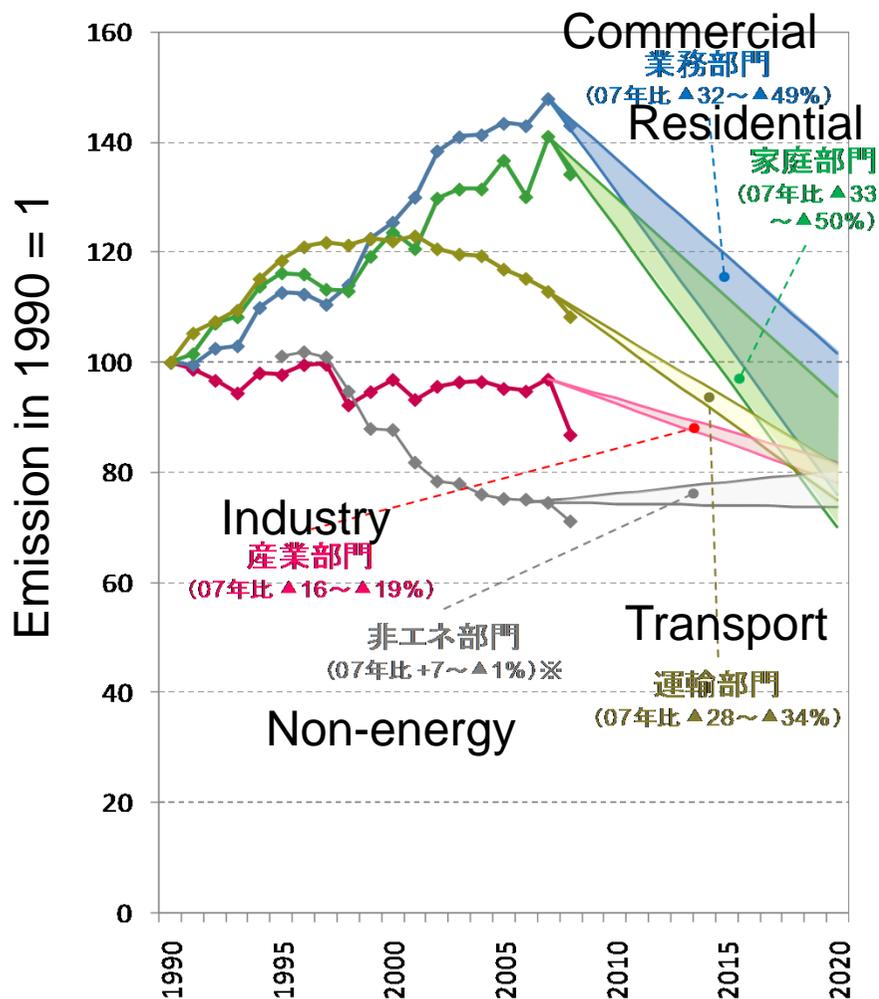
# Re-examination & Nation-wide participatory process started

## The First Participatory Process for New Energy Plan



# Historical and projected GHG emissions

## GHG emissions trends



## Reduction rate in 2020

to 2007	▲ 15%		▲ 20%		▲ 25%	
Industry	▲16%	▲10% ▲5%	▲17%	▲10% ▲7%	▲19%	▲11% ▲8%
Residential	▲33%	▲19% ▲14%	▲40%	▲24% ▲17%	▲50%	▲31% ▲19%
Commercial	▲32%	▲19% ▲13%	▲40%	▲25% ▲15%	▲49%	▲31% ▲18%
Transport	▲28%	▲27% ▲1%	▲31%	▲30% ▲1%	▲34%	▲32% ▲1%
Non-energy	7%	7% 0%	1%	1% 0%	▲1%	▲1% 0%

to 1990	▲ 15%		▲ 20%		▲ 25%	
Industry	▲18%	▲13% ▲5%	▲19%	▲13% ▲6%	▲22%	▲14% ▲8%
Residential	▲6%	14% ▲20%	▲16%	8% ▲23%	▲30%	▲3% ▲27%
Commercial	1%	20% ▲19%	▲11%	11% ▲22%	▲25%	2% ▲27%
Transport	▲19%	▲18% ▲1%	▲22%	▲21% ▲1%	▲25%	▲23% ▲2%
Non-energy	▲20%	▲20% 0%	▲25%	▲25% 0%	▲26%	▲26% 0%

Left: total reduction

Right: upper: reduction within the sector

lower: reduction due to energy sector

# New Decision on Energy and Environment:

14/09/2012 by Energy-Environment Minister's meeting

	Present State	Basic Energy plan (Old) 6/2010	New Decision by Energy/Env't. Ministers Meeting 14/09/2012	Policy in new decision
<b>year</b>	2010	2030	2030	
<b>Energy Consumption Mil, kl</b>	390		318 19% saving	
<b>Total Electricity bil. kWh/year</b>	1100	1020	1000 10% saving	
<b>Nuclear Dependency Share in Elec</b>	26%	45% Major Base-load	2030 Zero in 2030's	Realize as soon as possible
<b>Nuclear Waste</b>		recycle	Recycle/ direct disposal	Still undecided
<b>Renewable Energy Bil. kWh</b>	110 w/o Hydro 25	220 20% of power	300 w/o Hydro 190 19% of power	Maximize by mobilizing all the policy resources
<b>Fossil Fuel</b>	65% of power	35% of Power Coal/Gas/Oil as adjustment role	Coal: as major base-load LNG shift	Keeping appropriately balanced mixture
<b>GHG Reduction rate From 1990</b>	6%	2020 GHG (25%) 2030 CO2 30% 2050 GHG 80%	2020 CO2 5-9% 2030 CO2 ~20% 2050 CO2 80%	80% fixed by 4 <sup>th</sup> Environment .Basic Plan

# Three scenarios in 2030

	2010	Zero scenario	15% scenario	20-25% scenario	Current energy basic plan
<b>Nuclear</b>	26%	0% (▲25%)	15% (▲10%)	20-25% (▲5-▲1%)	45%
<b>Renewable energy</b>	10%	35% (+25%)	30% (+20%)	30-25% (+20-+15%)	20%
<b>Fossil fuel</b>	63%	65% (present level)	55% (▲10%)	50% (▲15%)	35%
<b>Non-fossil fuel</b>	37%	35% (present level)	45% (+10%)	50% (+15%)	65%
<b>Electricity output</b>	1.1T kWh	1T kWh (▲10%)	1T kWh (▲10%)	1T kWh (▲10%)	1.2T kWh
<b>Final energy consumption</b>	390 M kl	300 M kl (▲85M kl)	310 M kl (▲72M kl)	310 M kl (▲72M kl)	340 M kl
<b>CO2 emission (compared to 1990)</b>	▲0.3%	▲23% (▲21%)	▲23% (▲22%)	▲25% (▲25%)	(▲30%)

※ ( ) is CO2 from energy sources

# Promoting participatory decision in energy/environmental planning

- In the process of creating “options” for the "national debate", progressed with scientific review and improved the dissemination of scientific information to the public.
- Public participation in the decision-making process was attempted for the first time by providing “options” to the public.
- Conventional Basic Energy Plan had been developed by industry and experts under the Advisory Committee for Natural Resources and Energy. Energy security has a strong opinion.
- This time, after reviewing electricity costs (nuclear and RE) and nuclear waste (direct disposal / fast reactor), the discussion was summarized by Atomic Energy Commission [safety] and Central Environment Council [low-carbon]. Additionally the "Secretariat [Cabinet Office] of "energy and environment Conference (chaired by the Minister in charge of national strategy) provided options and aggregated the pros and cons by nation against the options. (see table on right)
- **Cabinet office concluded “At least, more than half support less nuclear dependent society”**

**3 alternative Scenario  
(nuclear ratio and GHG reduction from 1990)**

<b>Nuclear in electricity %</b>	<b>path</b>	<b>GHG 2020</b>	<b>GHG 2030</b>
① 0	As early as P	- 7%	-23%
② 15	40y life time	-9%	-23%
③ 20-25	(BaU)	-10 - 11%	-25%

**Nation wide surveys**

<b>Survey Method</b>	<b>Number of comments</b>	<b>Result ① / ③ %</b>
Town meeting (11)*	100+	68/16 Applicant
Public comment*	7,000	90/ 3
Org-comment*	Industry, NGO	
Deliberative Poll	300 Before text Before discussion After discussion	34/ 14 42/ 15 47/ 13
Voluntary meetings		
Media Poll	1000 × 10survey	29/ 17 ~ 43/ 11

\* government lead

# グリーン政策大綱（骨子）

## Green Energy Guideline

—グリーンエネルギー革命の胎動から成長へ—

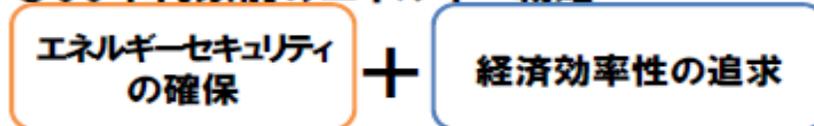
国家戦略室

National Policy Unit

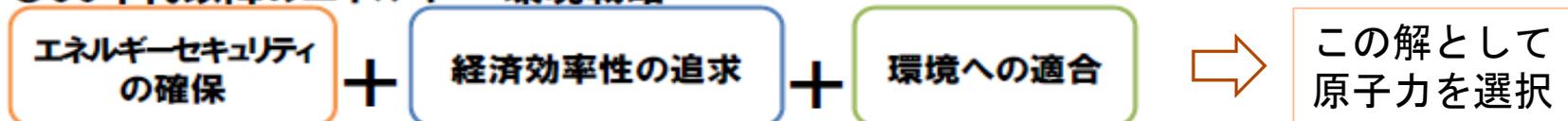
# 3 E + S の要請を解くグリーンエネルギー革命

## Energy Security+Economy Efficiency+Environment+Security

### ○90年代以前のエネルギー戦略

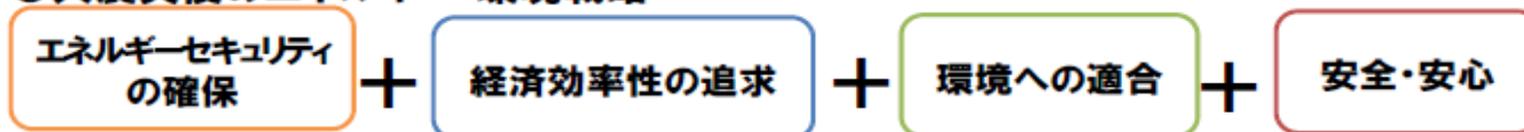


### ○90年代以降のエネルギー・環境戦略



- 輸入資源の安定的な確保
- 資源の対外依存の低下  
(電源構成の多様化、省エネ)

### ○大震災後のエネルギー・環境戦略



4つの要請という難解な「多次元連立方程式」の解を探さなければならない。

⇒ 完ぺきな解はない中で、エネルギー源の多様性を維持しながら、中長期的には、広範な地域に新たな産業を生み、地域活性化につながり、エネルギー安全保障を高め、地球温暖化対策にも有効となる、グリーンエネルギー革命の実現が重要。

# 先導的5分野を支える基盤

自然の恵みの  
最大活用

世界最高水  
準の省エネの  
さらなる深化

スマートコミュニティ等  
による需給一体管  
理・効率化

エネルギー利  
用の幅を広げ  
る蓄電池

世界をリー  
ドするグリー  
ン部素材

## 電力システム改革

電力市場における  
競争促進

- －全ての国民に「電力選択」の自由を
- －デマンドレスポンスなどの導入促進

送配電部門の中立化・広域化

- －再エネ、コジェネを含むあらゆる事業者に対し、送配電網を中立・公平に開放
- －送配電網の広域運用を実現し、再エネの不安定性を緩和
- －再エネを含む広域的な供給力を有効に活用するため、地域間・地域内の送電網を増強

## 低炭素ライフスタイルの促進

低炭素型のライフスタイル、  
消費の奨励

- －スーパークールビズ／ウォームビズ
- －スマートムーブ
- －環境コンシェルジュ
- －節電・省エネ広報の推進
- －エコドライブ

## 共通インフラ的な政策

税制のグリーン化

低炭素金融

- －環境分野への投資に対する円滑なファイナンスの促進
- －投融資等の判断に際して、環境等の要素を評価基準として取り入れる仕組みの促進

情報提供基盤の整備

- －定期的に政府のグリーンウェブサイトにグリーン化の進展状況を公開

エネルギー安定供給体制の整備

- －安定的かつ安価な化石燃料等の確保及び供給

## 国際的取組

国際的な枠組みづくり

- －二国間オフセット・クレジット制度の推進
- －グリーン分野での国際協力

官民合同での海外展開

- －システムの国際展開
- －国際標準化

# 自然の恵みの最大活用

## to use natural resources at most

電力市場における競争促進 to promote competitiveness in electricity market

- 全ての国民に「電力選択」の自由を free choice of electricity by citizen
- デマンドレスポンスなどの導入促進 demand response

送配電部門の中立化・広域化 to make transparent and wider distribution grid

- 再エネ、コジェネを含むあらゆる事業者に対し、送配電網を中立・公平に開放 to open distribution grid for every energy provider
- 送配電網の広域運用を実現し、再エネの不安定性を緩和 to widen distribution grid to soften instability of renewables
- 再エネを含む広域的な供給力を有効に活用するため、地域間・地域内の送電網を強化 to strengthen inter and intra electricity grid to use renewable energy efficiently

# 固定価格買取制度の状況(FIT)

- 8月末までの導入量は、認定ベースで年度内の導入見込量の半数を超過しており、順調に導入が進んでいる

By this August

<2012年度における再生可能エネルギーの導入状況(8月末時点)>

	2011年度時点における導入量	4月～8月末までに 運転開始した設備容量	8月末までに 認定を受けた設備容量	年度末までの 導入予測
太陽光（住宅）	約400万kW	60.0万kW ※	30.6万kW (前月末比+16.2万kW)	+約150万kW (直近の年間導入量から4割増)
太陽光（非住宅）	約80万kW	5.5万kW	72.5万kW (前月末比+42.5万kW)	+約50万kW (資源エネルギー庁把握情報より)
風力	約250万kW	1.2万kW	26.2万kW (前月末比+14.0万kW)	+約38万kW (直近の年間導入量から5割増)
中小水力 (1000kW以上)	約935万kW	0.1万kW ※	0万kW	+約2万kW (資源エネルギー庁把握情報より)
中小水力 (1000kW未満)	約20万kW	0.3万kW ※	0.1万kW (前月末比+0.1万kW)	+約1万kW (直近の年間導入量から5割増)
バイオマス	約210万kW	1.2万kW ※	0.6万kW (前月末比+0.6万kW)	+約9万kW (直近の年間導入量から5割増)
地熱	約50万kW	0万kW	0万kW	+0万kW
合計	約1,945万kW	68.3万kW	130.0万kW	+約250万kW

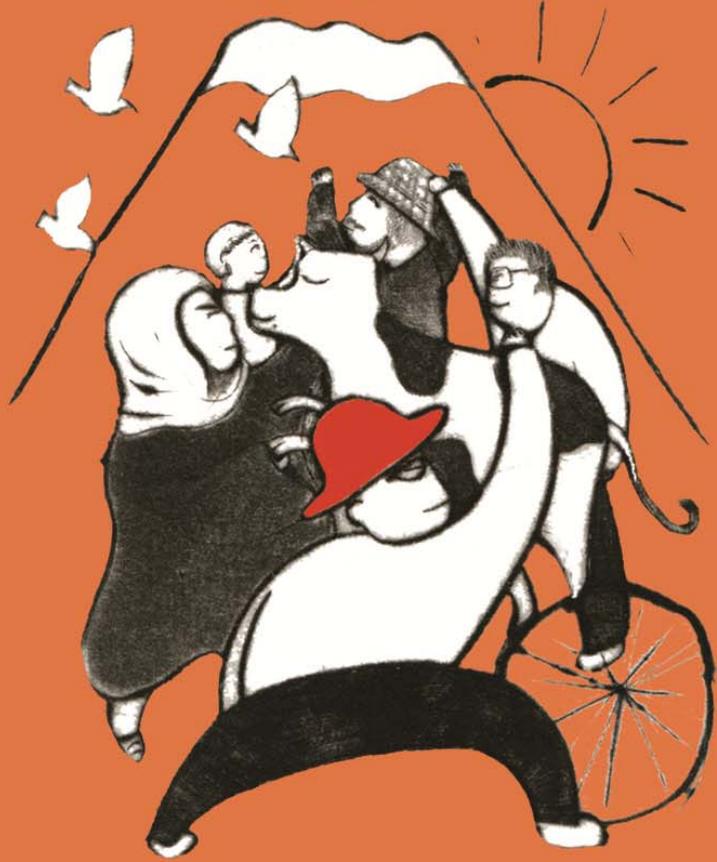
※ 4月から8月末までに運転開始した設備欄には、4月～6月末までに運転開始した旧制度に基づく設備も含まれているため、7月に開始した固定価格買取制度において8月末までに認定を受けた設備容量よりも大きくなっているものがある。

※大規模なものは認定から運転開始までに時間を要するものがあり、必ずしも年度内に運転開始されるとは限らない  
(出典)資源エネルギー庁資料

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

Let's work together!

Asia LCS



藤野 純一

Junichi FUJINO 

[fuji@nies.go.jp](mailto:fuji@nies.go.jp)