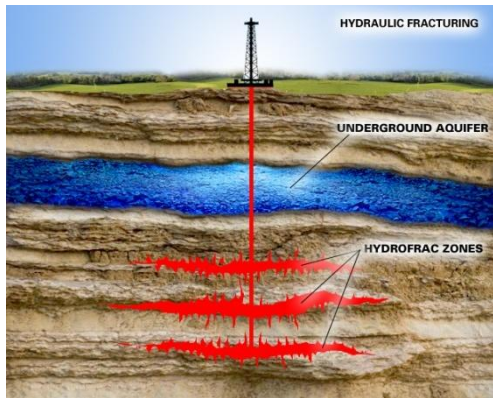


# Shale Gas Revolution & Japan's Energy & Climate Challenges



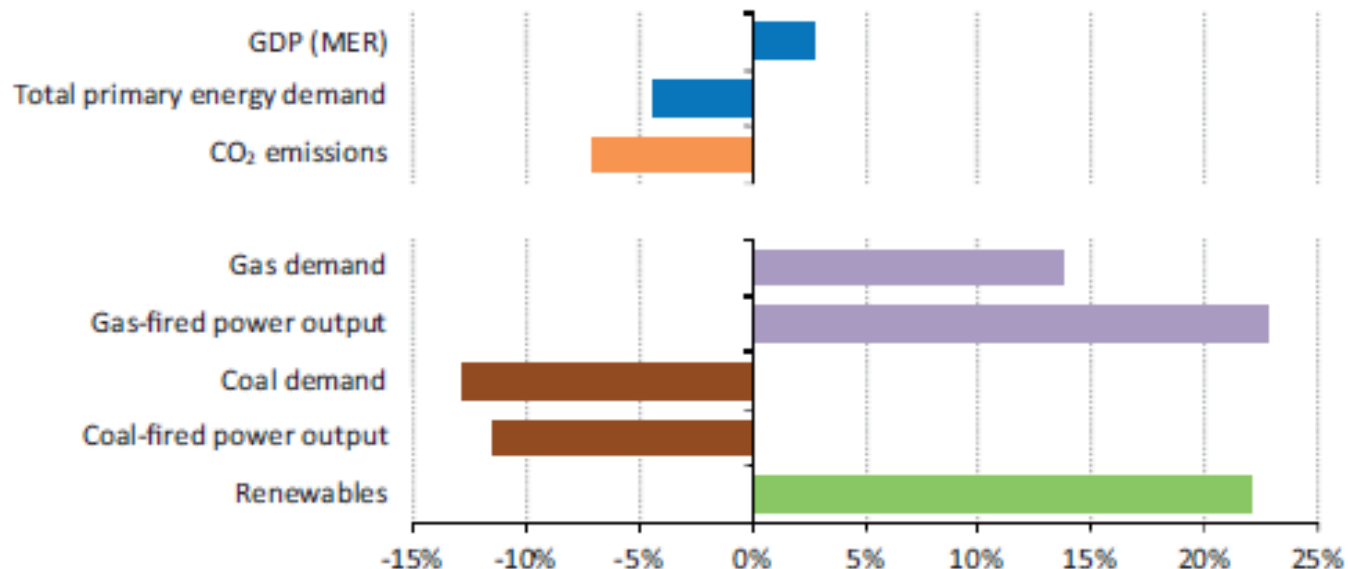
July 2013  
Jun ARIMA  
Director General  
JETRO London



# Unconventional Oil and Gas Production: Global Implication (1)

- US: largest oil producer in mid-2020s, net oil exporter in 2030 => Switch in direction of international oil trade to Asia
- Shale gas revolution in the US
  - => Less energy cost, less GHG Emissions: double dividends
  - => Less coal use in US, coal export to EU (high gas price and low carbon price)
  - => Competitiveness gap between US and EU

% Changes in Economic/Energy Indicators in the US (2006-11)



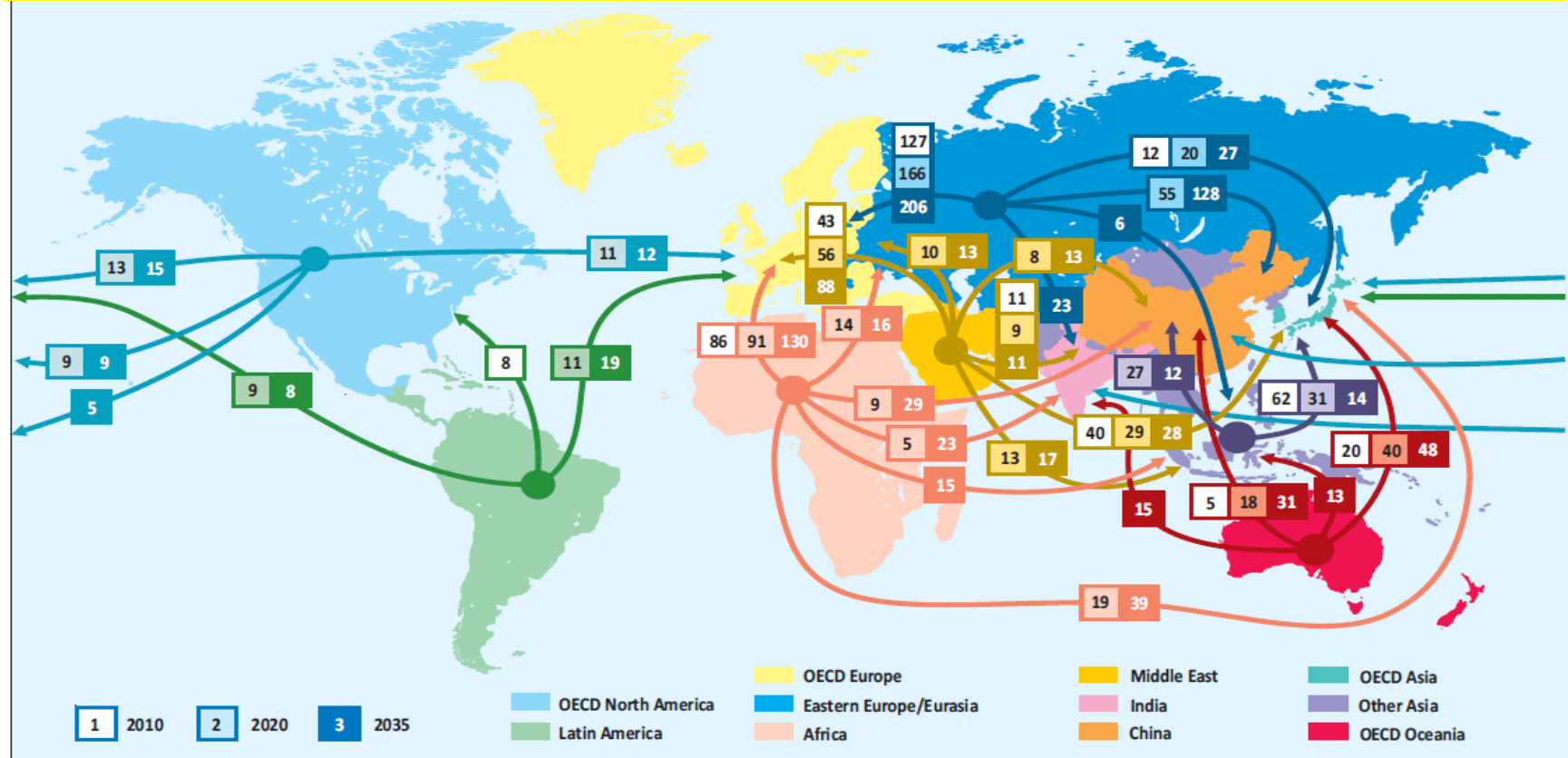
Note: MER = market exchange rate.

Source: IEA World Energy Outlook 2012

## Unconventional Oil and Gas Production: Global Implication

- 

**Inter-regional Gas Trade Flow in 2010-30 in the New Policy Scenario (bcm)**



This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

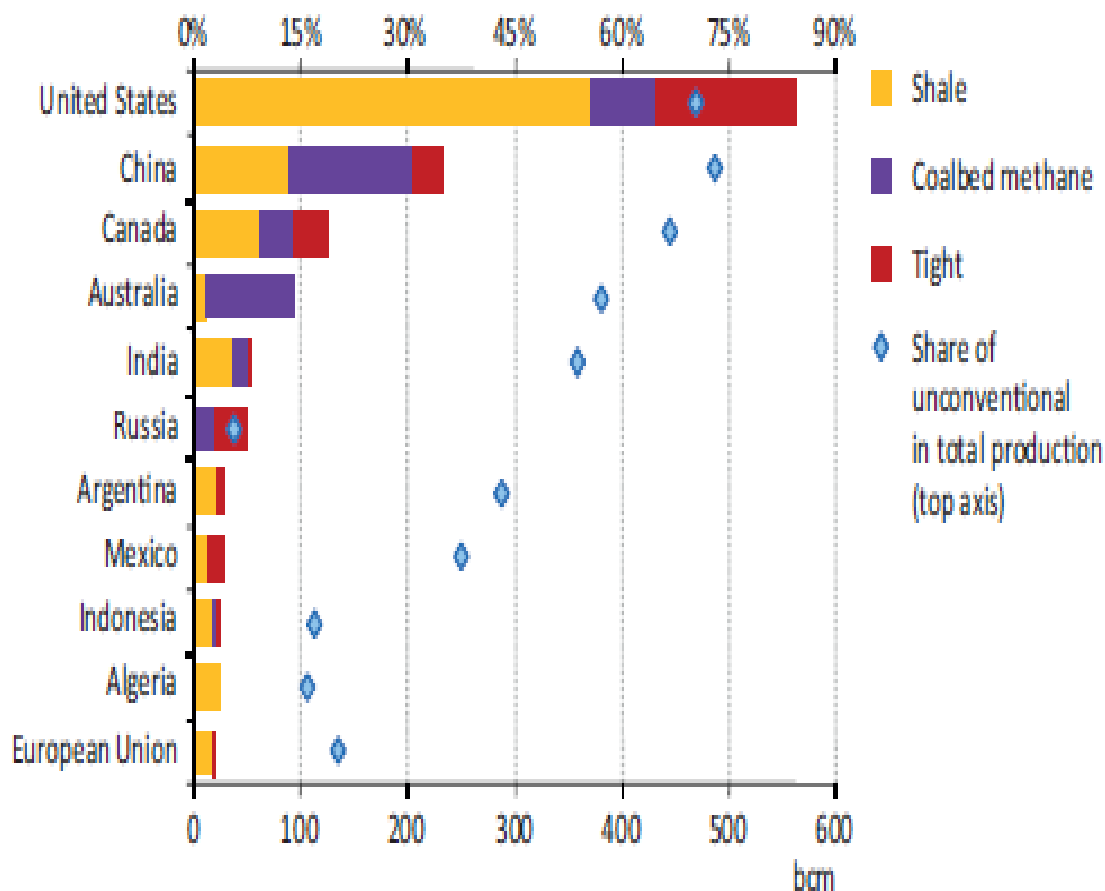
Note: Trade volumes less than 5bcm are not shown.

Source: IEA World Energy Outlook 2012

# Unconventional Oil and Gas Production: Global Implication (3)

- Global share gas production depends on social acceptability in each country (e.g., environmental concern on fracking).

## Unconventional Gas Production in Leading Countries in the New Policy Scenario 2035



Source: IEA World Energy Outlook 2012

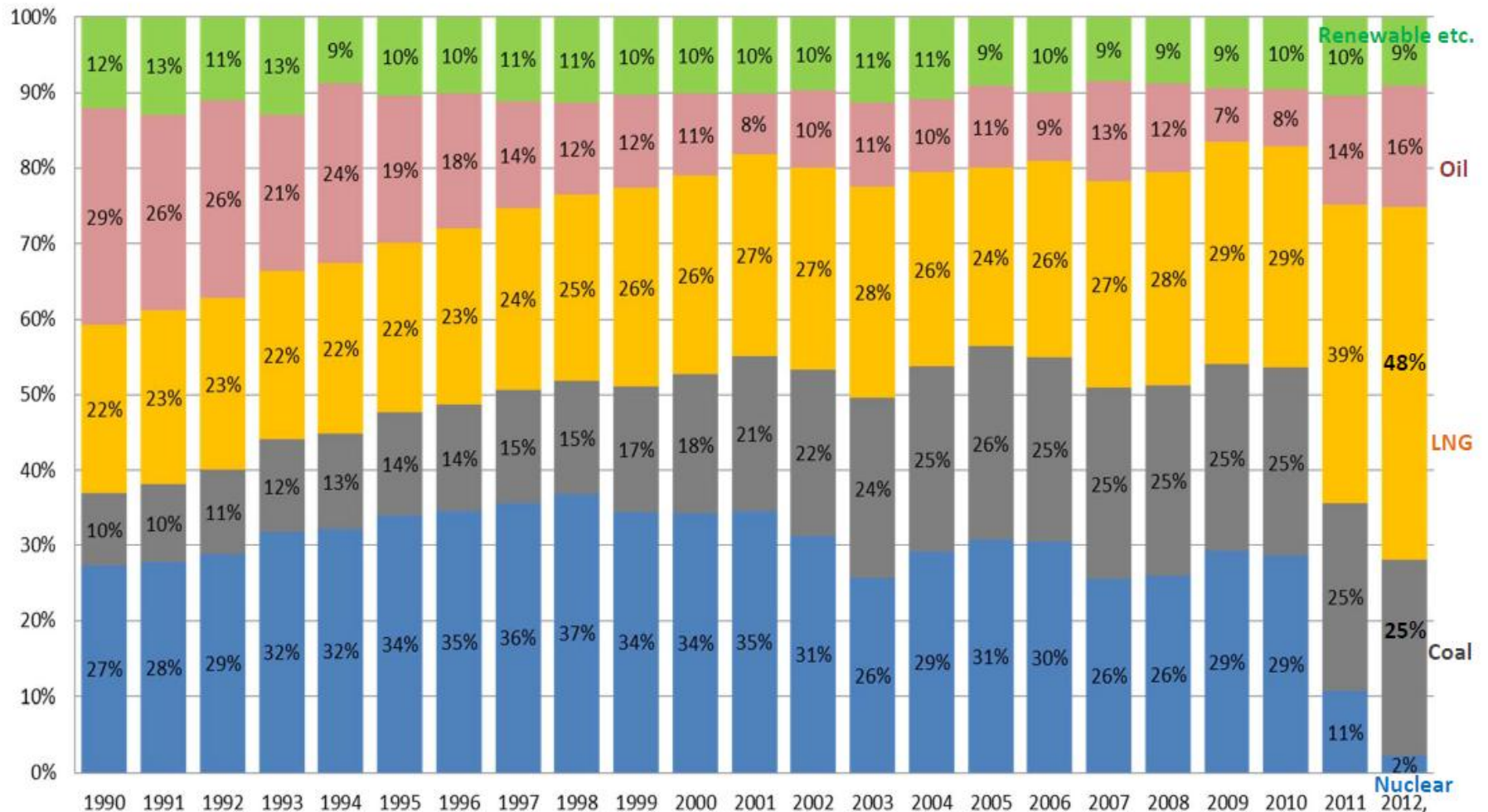
## Top 10 Countries with Technically Recoverable Shale Gas Resources

	Country	tcf
1	China	1,115
2	Argentina	802
3	Algeria	707
4	US	665
5	Canada	573
6	Mexico	545
7	Australia	437
8	South Africa	390
9	Russia	285
10	Brazil	245
	World Total	7,299



# Current Energy Mix in Japan

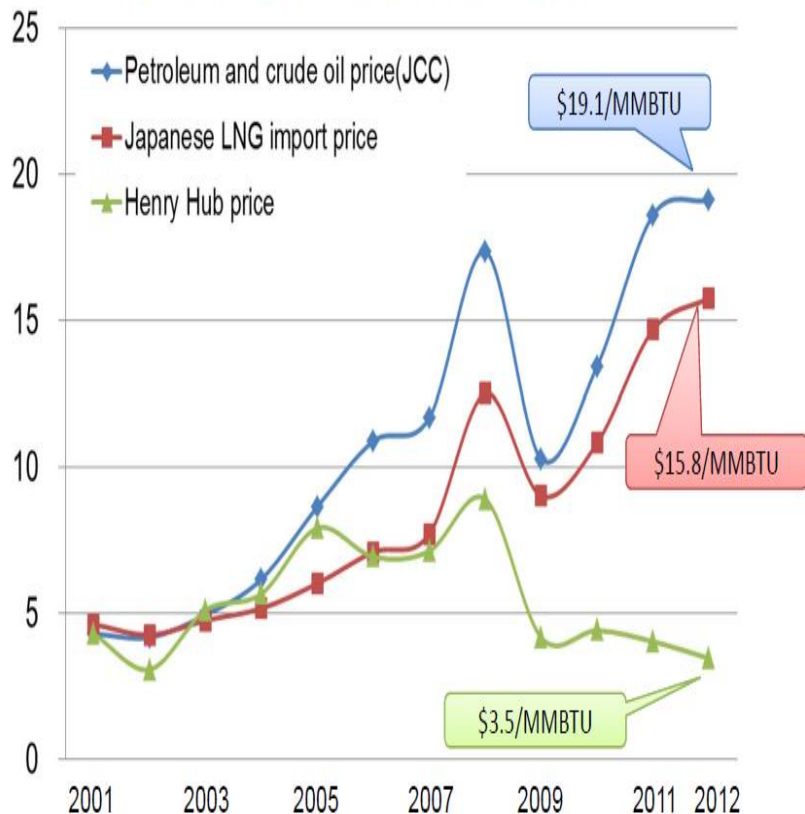
## Electricity Generation by Fuel



Source: Compiled by METI based on "Outline of Electric Power Development in FY 2010" etc.

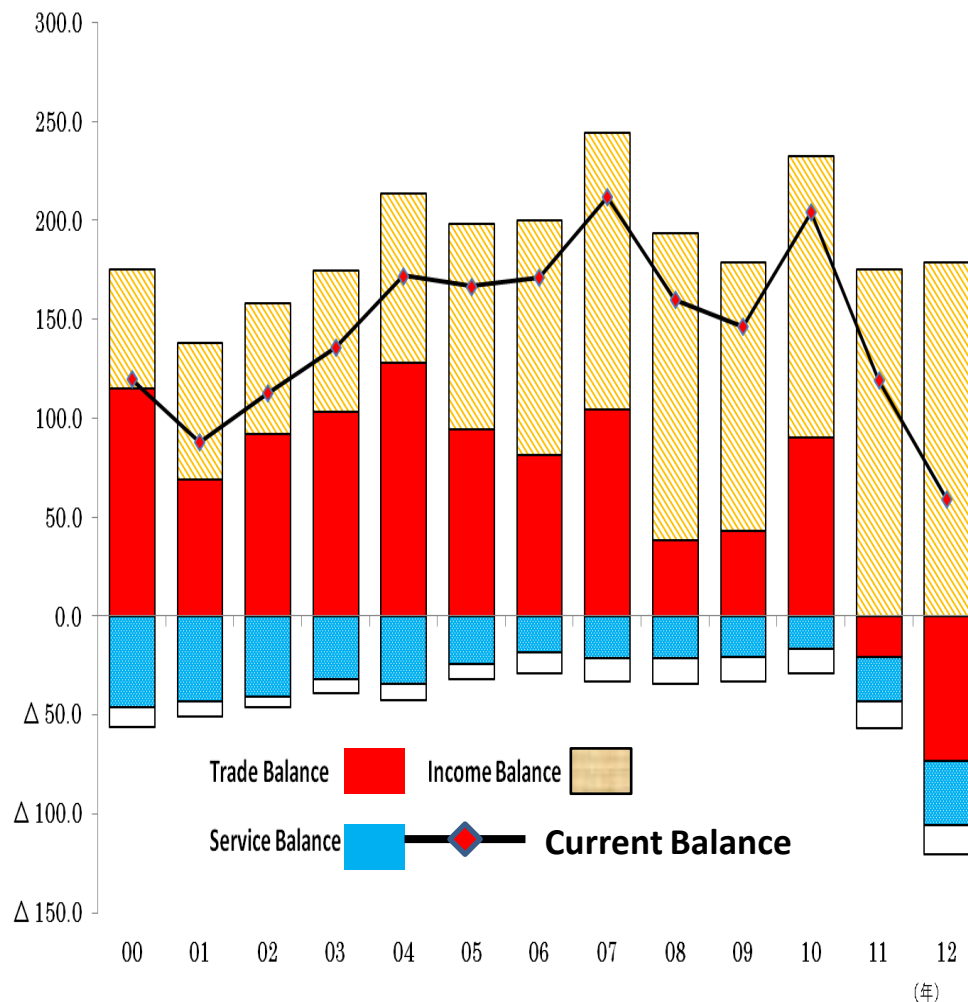
# Soaring Gas Import Cost and Trade Deficit

Natural Gas price trend (unit: US dollar/MMBTU)



Source: METI

Billion \$



Source: Statistics from BOJ, Ministry of Finance

# Current Energy Policy

## - Overcoming energy constraints with cost reduction -

### Production/Procurement

#### Diversify Power Supply

- Max introduction of RE
- Restart Nuclear Power
- High Efficiency Thermal Power (Coal, LNG)

#### Diversify Fuel Supply Sources

- Procure Low-cost LNG
- Develop Domestic Energy (Methane Hydrate)

### Distribution

#### Electricity Market Reform

##### Full Market Liberalization (Generation, Retail)

- Unbundling
- Nation-wide TSO

#### Strict Tariff Assessment

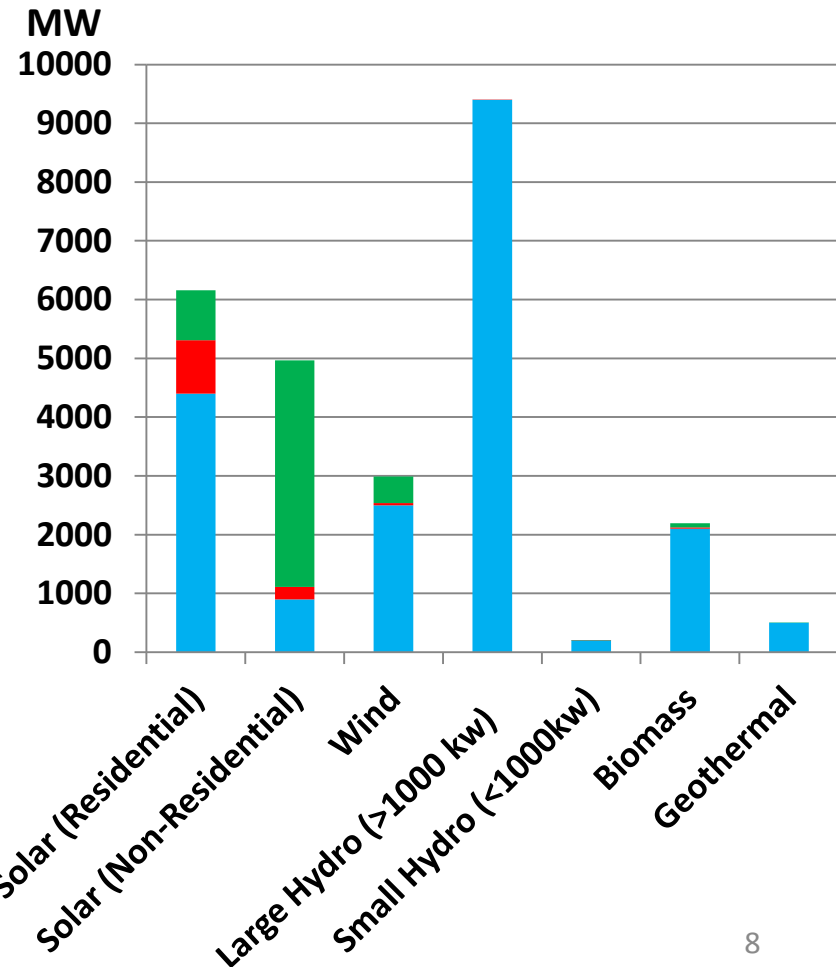
### Consumption

- Energy efficiency in industry
- Top Runner for building/housing
- Demand Side Management

# Rapid Expansion of RE with FIT

## ◆ Introduction of Fixed Feed In Tariff (FIT) from July 2012

PV (>10 kW)	42.00 JPY/kwh (20 years)	=> 37.80JPY/kwh (from April 2013)
PV (<10 kW)	42.00 JPY/kwh (10 years)	=> 38.00JPY/kwh (from April 2013)
Wind (> 20 kW)	23.10 JPY/kwh (20 years)	
Wind (< 20 kW)	57.75 JPY/kwh (20 years)	
Geothermal (> 15MW)	27.30 JPY/kwh (15 years)	
Geothermal (< 15MW)	42.00 JPY/kwh (15 years)	
Small Hydro (1-30MW)	25.20 JPY/kwh (20 years)	
Small Hydro (0.2-1MW)	30.45 JPY/kwh (20 years)	
Small hydro (<0.2MW)	35.70 JPY/kwh (20 years)	





# Reducing Energy Cost

## Reducing Gas Procurement Cost

- ◆ Diversify LNG supply sources to US, Russia etc (e.g., Shale gas LNG import from the US from 2017)
- ◆ JPY 1 trillion loan guarantee for cheaper LNG projects
- ◆ Review the price formula in the LNG Producers and Consumers Conference
- ◆ Joint Study with EU, Korea, India on gas pricing
- ◆ Development of Methane Hydrate



## New and Additional Coal Fired Power Plants

- ◆ Shorten EIA period for coal-fired power plants with cutting edge technologies.



## Restart of Nuclear Power Plants

- ◆ New safety standards from July 2013
- ◆ Application of 12 reactors expected.



# Electricity Market Reform

## Step 1 (-2015)

- ◆ Nation-wide Transmission Operation



## Step 2 (-2016)

- ◆ Retail Liberalization
- ◆ Securing Generation Capacity
- ◆ Hour-ahead Market



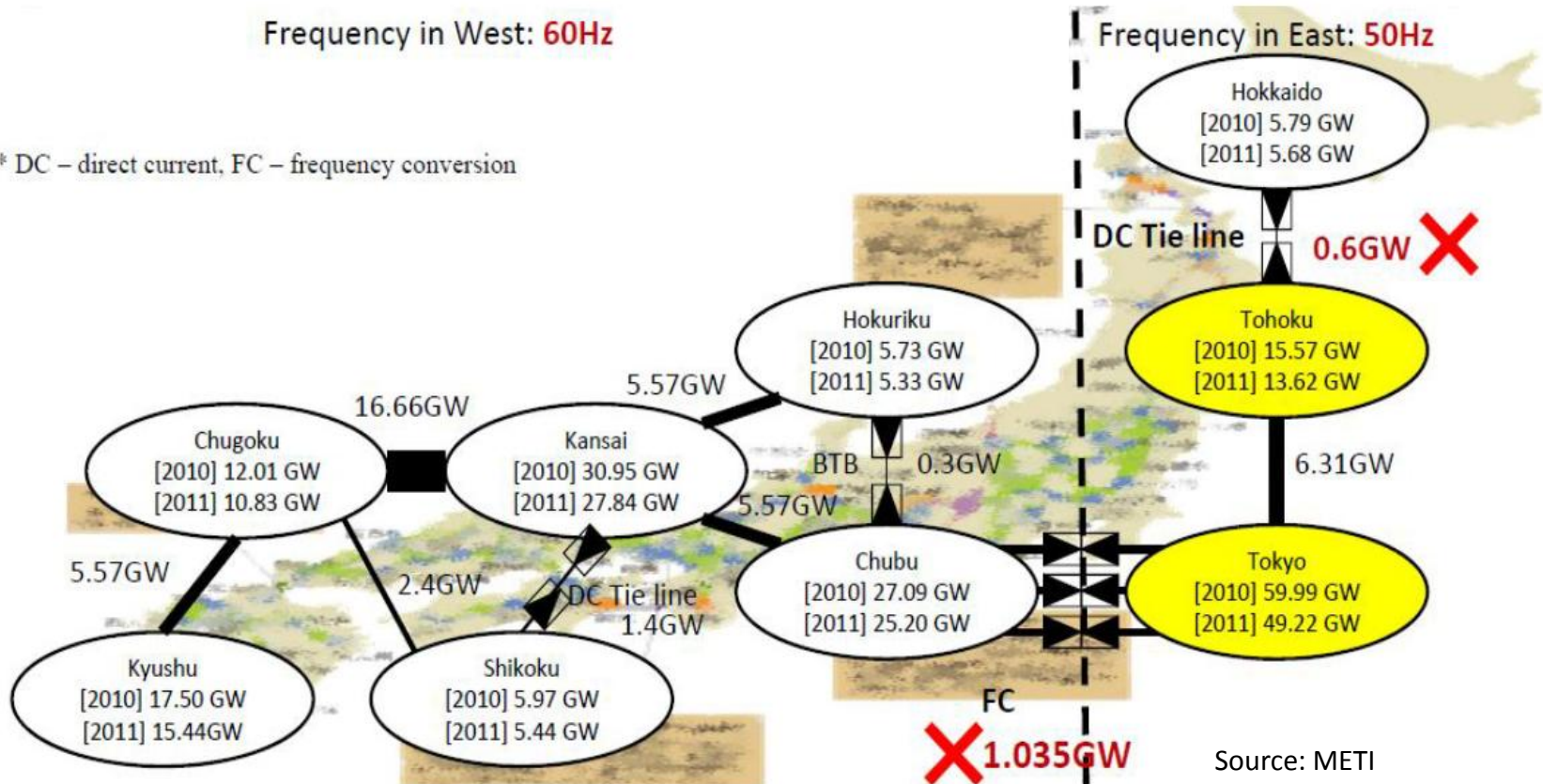
## Step 3 (2018-2020)

- ◆ Abolish Price Regulation
- ◆ Legal Unbundling

Frequency in West: 60Hz

Frequency in East: 50Hz

\* DC – direct current, FC – frequency conversion

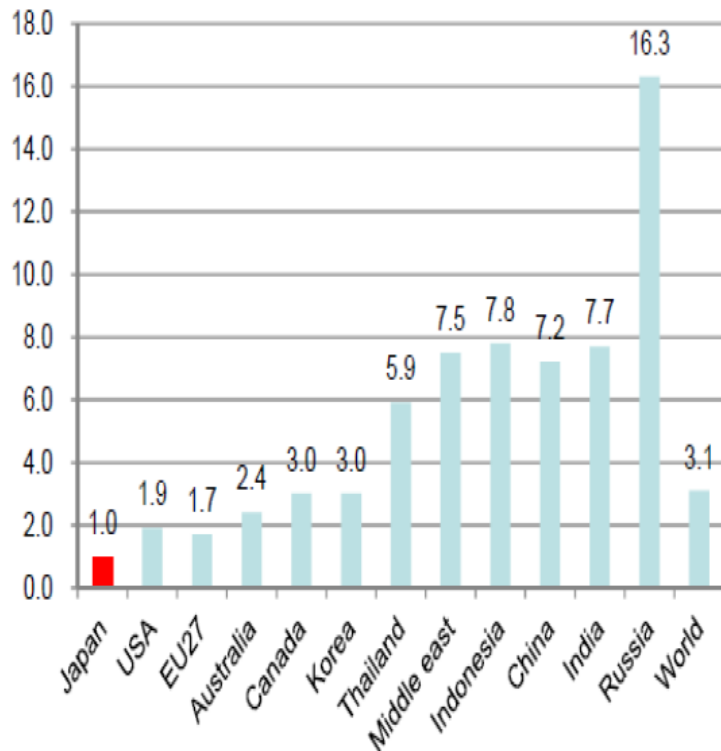


Source: METI

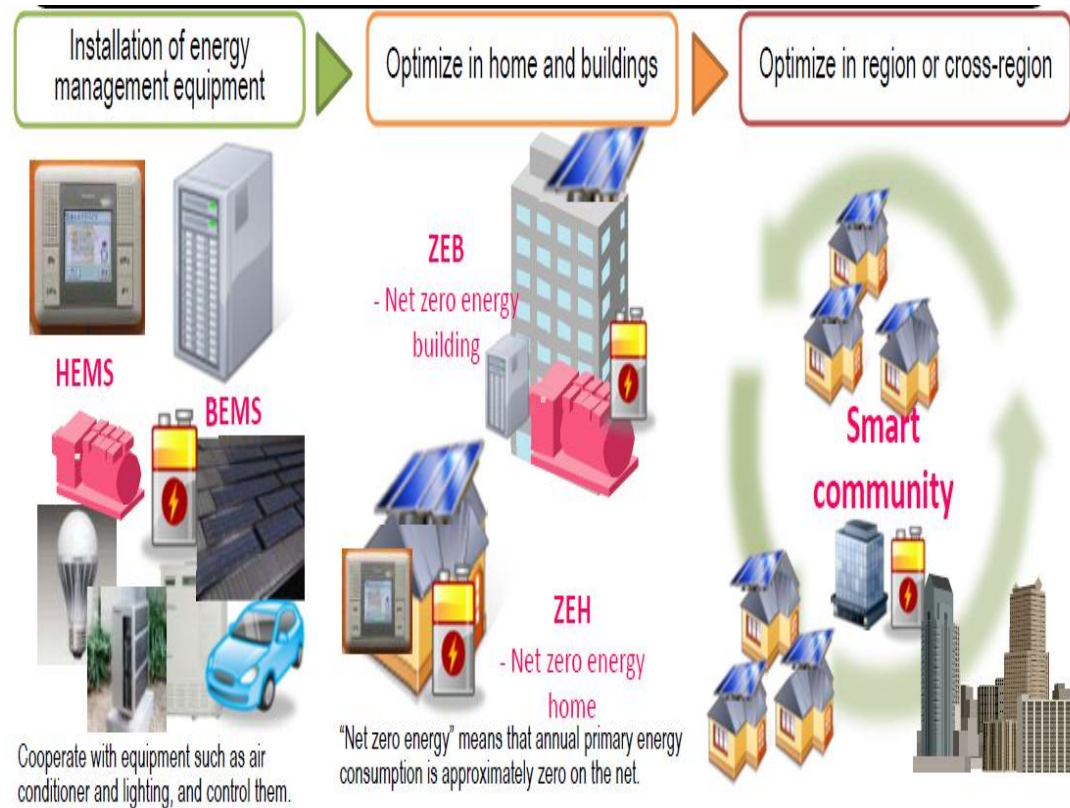
# Energy Management

- ◆ Despite its already high energy-efficiency, Japan needs more improvement.
- ◆ Holistic energy management (individual equipments => system => house and building => region (smart community))

Primary energy supply per GDP unit of each country (2009)  
(Index : Japan=1.0)



Calculated according to IEA statistics

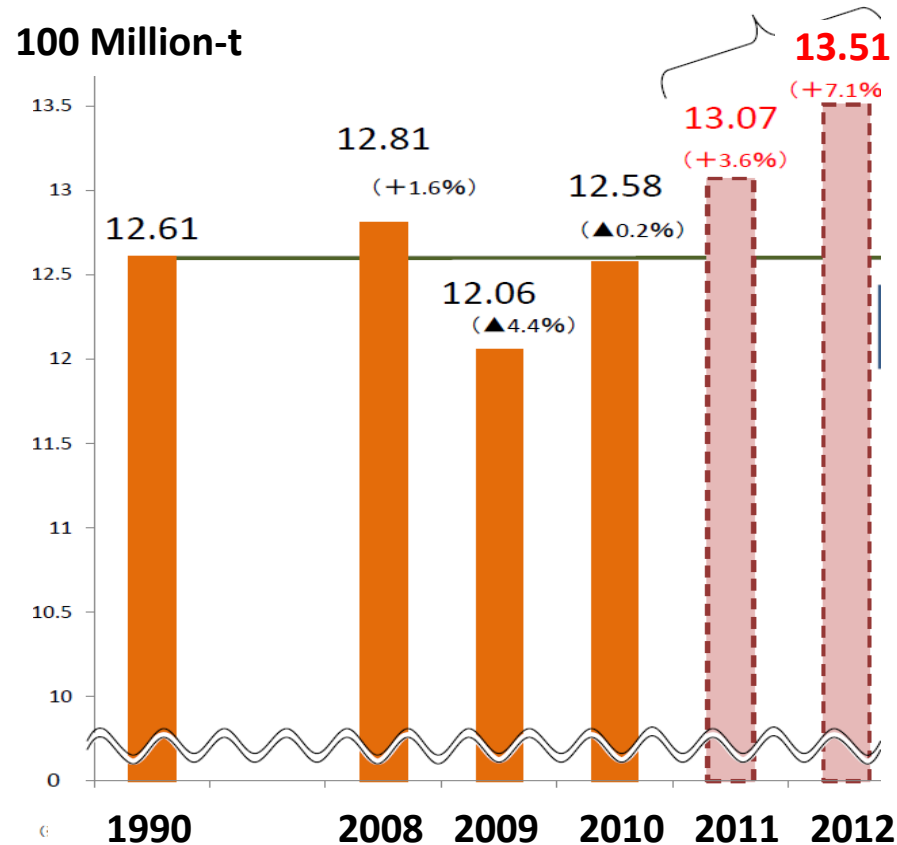




# Japan's Contribution to Global GHG Emissions Reduction

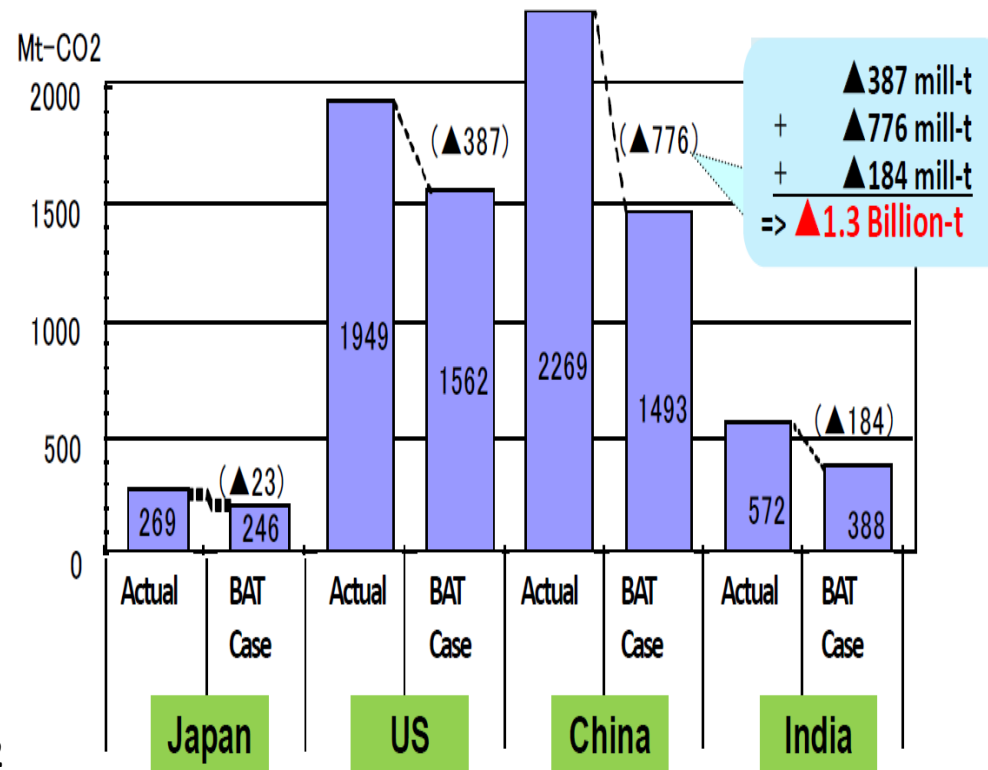
- ◆ Increasing GHG emissions due to nuclear stoppage, but Kyoto target will be met with sinks/Kyoto mechanisms. Zero-based review of ▲25% target 2020
- ◆ Export of Japan's technology will reduce global GHG emissions

## Japan's GHG Emissions



Source: Ministry of Environment

**What if Japan's most advanced CCT is used in coal-fired plants in US, China and India?**



Source: Institute of Energy Economics Japan

# Summary

- **Overcoming energy constraints ensuring cost reduction in production/procurement, distribution and consumption**
- **Massive outflow of national wealth for expanded import of LNG is big challenge for Japanese economic recovery.**
- **All the energy sources (RE, LNG, coal, restart of nuclear) and supply sources (e.g., shale gas import from US) need to be mobilized.**
- **Electricity sector reform (e.g., nationwide transmission operation, retail liberalization) will be promoted. Sufficient generation capacity is essential for effective competition.**
- **Holistic energy efficiency (system => entire building/house => region) will be promoted.**
- **Energy challenges will create new business/market opportunities in Japan (<= Growth Strategy 14 June 2013)**