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# Bioenergy Applications in Japan

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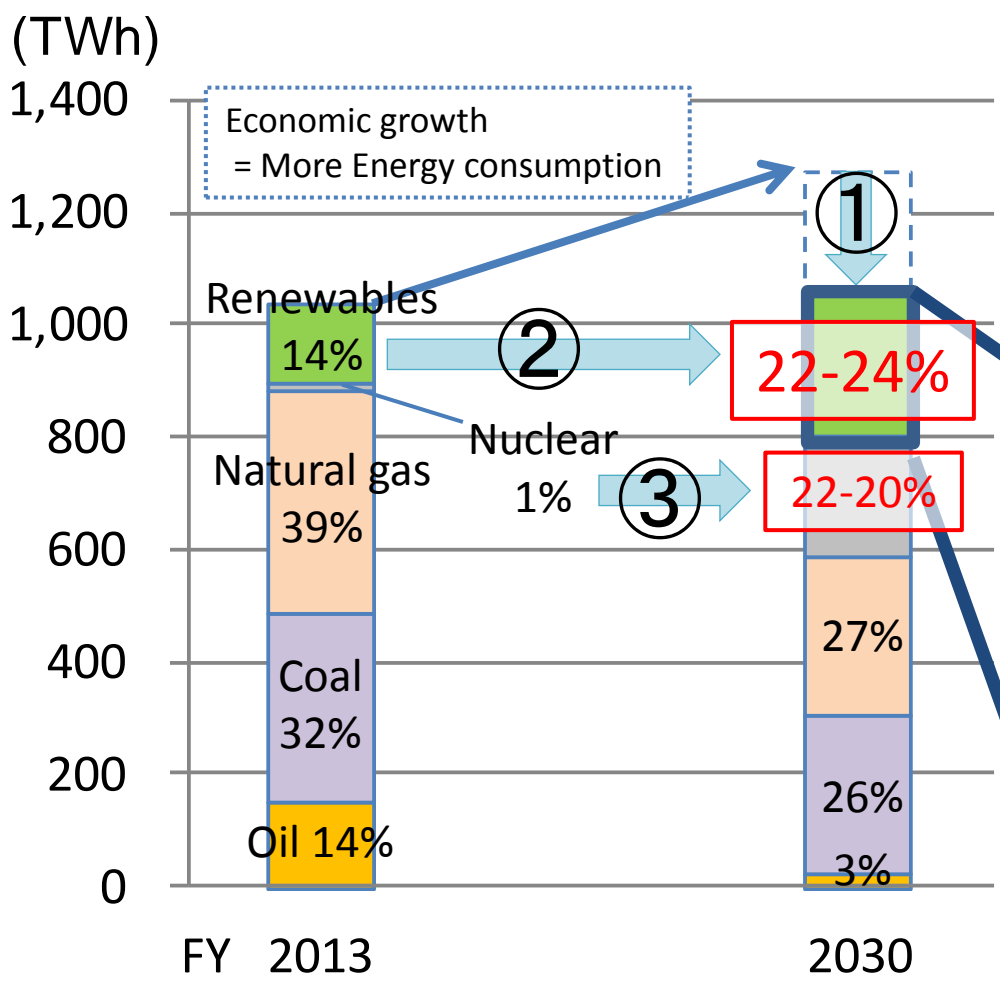
# ◆ Biomass Electricity

◆ Biofuel

◆ R&D in Japan

# “Long-Term Energy Supply and Demand Outlook” (2015-2030) was established in July, 2015

## Generation Mix for 2030



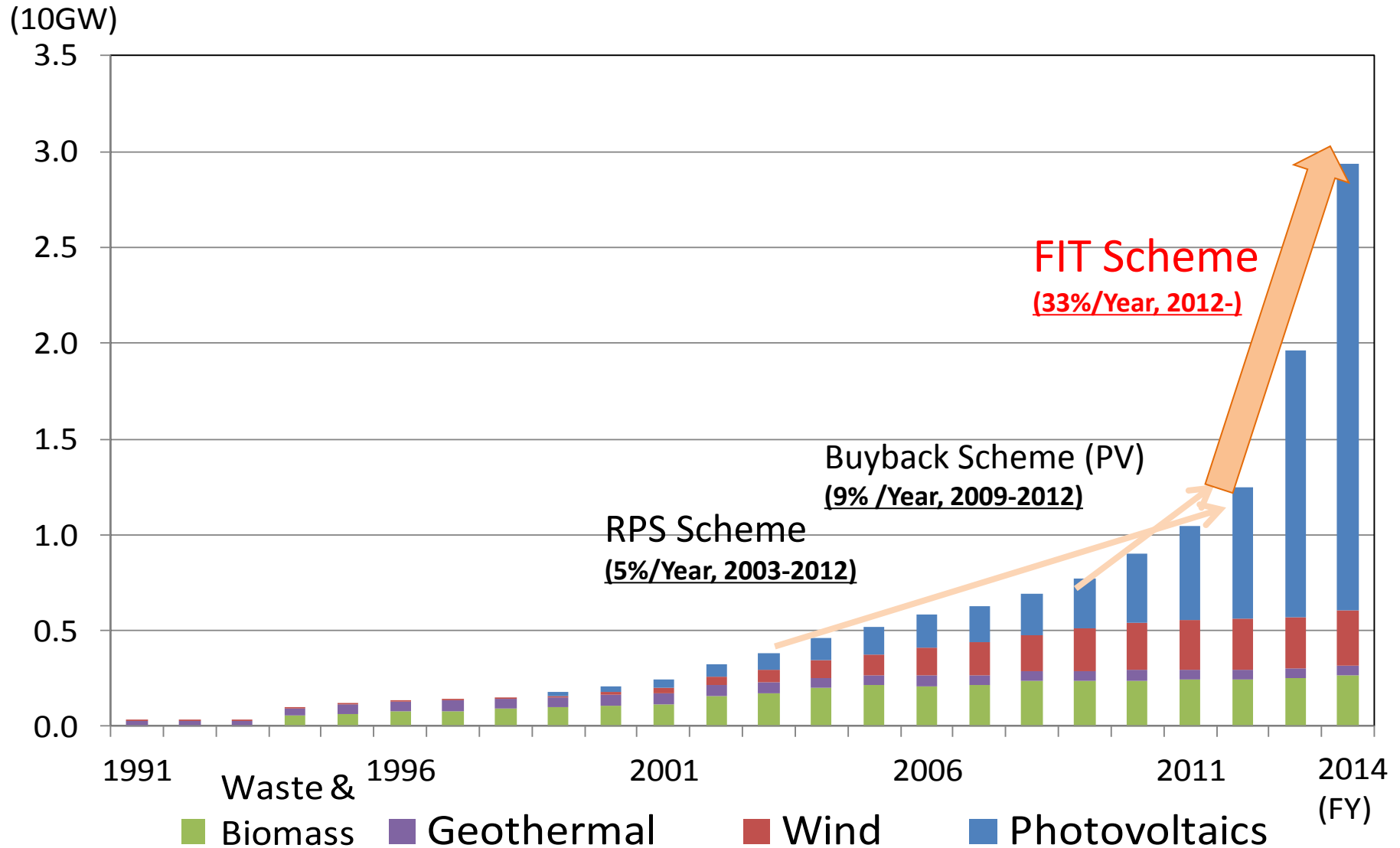
## Direction

1. Energy independence	<b>25%</b>
2. Generation cost reduction	<b>Lower than 2015</b>
3. CO <sub>2</sub> emission reduction	<b>-26%</b> from 2013 (INDC)

- 3 measures:**
- ① Energy Saving
  - ② Renewable
  - ③ Nuclear

Source: METI

# Installed Capacity of Renewable Electricity



# FIT Tariff in Japan (FY2016)

		Purchase prices (JPY/kWh) (tax excluded)						Purchase period		
		FY2012	FY2013	FY2014	FY2015		FY2016			
					Apr.- Jun.	Jul.- Mar.				
Solar	Less than 10 kW	42	38	37	33		31	10 years		
	when output control system are required				35				33	
	Less than 10 kW (+ energy storage system)	34	31	30	27		25			
	when output control system are required				29		27			
	10 kW or more	40	36	32	29	27	24	20 years		
Wind	Onshore	Less than 20 kW	55	55	55	55		55	20 years	
		20 kW or more	22	22	22	22		22		
	Offshore	/			36	36		36		
Geothermal	Less than 15,000 kW		40	40	40	40		40	15 years	
	15,000 kW or more		26	26	26	26		26		
Hydro	Fully new facilities	Less than 200 kW	34	34	34	34		34	20 years	
		200-1,000 kW	29	29	29	29		29		
		1,000-30,000 kW	24	24	24	24		24		
	Utilize existing headrace	Less than 200 kW	/			25	25			25
		200-1,000 kW	/			21	21			21
		1,000-30,000 kW	/			14	14			14
Biomass	Wood (general), agricultural residues		24	24	24	24		24	20 years	
	Forest residues	Less than 2,000 kW	32	32	32	40		40		
		2,000 kW or more				32		32		
	Wood waste from buildings		13	13	13	13		13		
	Municipal waste		17	17	17	17		17		
	Biogas		39	39	39	39		39		

Source: METI

# New “Biomass Utilization Promotion Basic Plan” in Sep, 2016

## ➤ Target in 2025

- Annual biomass utilization of 26 million ton CO<sub>2</sub>e
- Formulating local “Biomass Utilization Promotion Plan” of all the 47 prefectures and selected 600 cities
- Creation Biomass Market of the 500 billion yen scale in Japan

➤ Not only Electricity but also Heat utilization will be increased

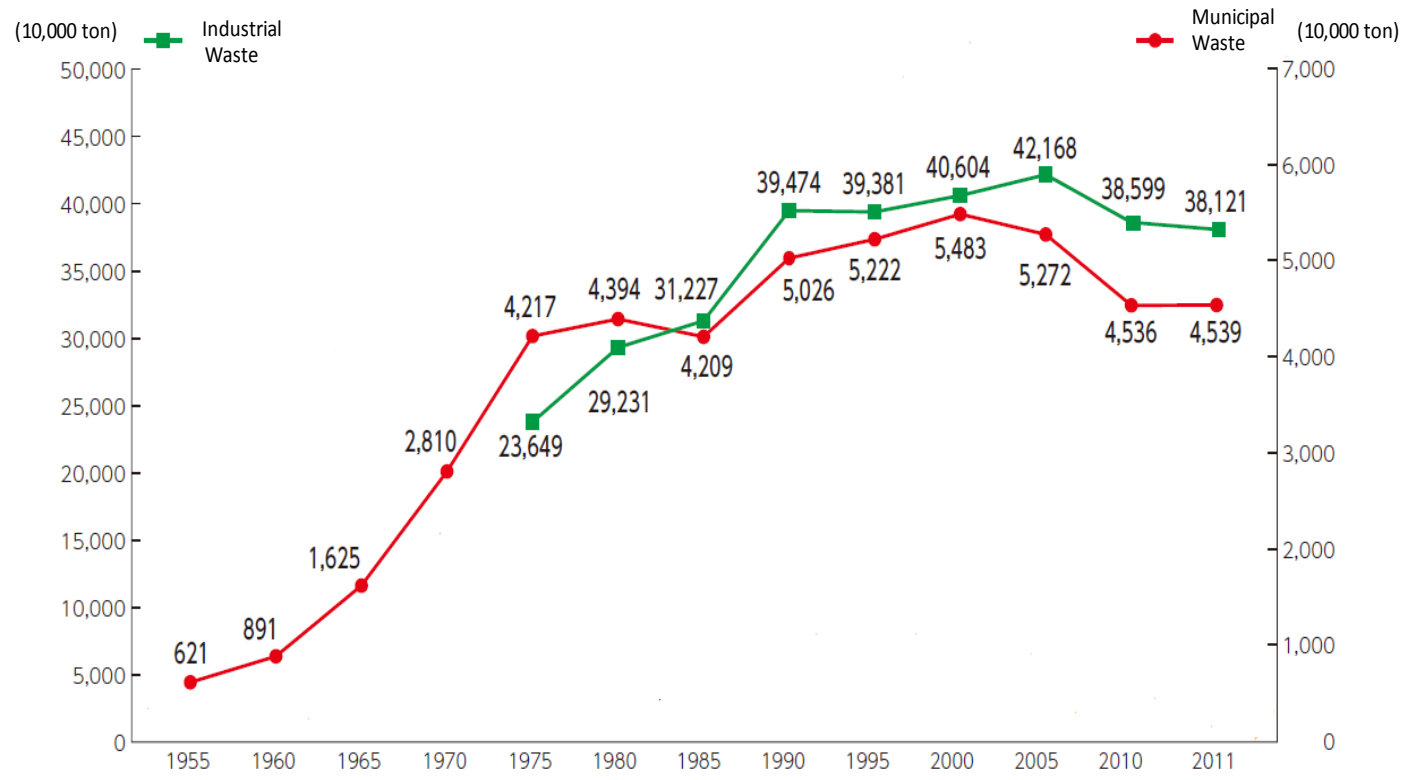
Target of biomass utilization incl. reuse, recycle and energy

Kind of Biomass	Current Annual Waste Generation as of March, 2016 (Million Ton)	Current Utilization as of March, 2016 (%)	Utilization Target in 2025 (%)
Annual Waste	81	87	90
Sewage	78	63	85
Black Liquor	13	100	100
Paper	27	81	85
Food Waste	17	24	40
Waste wood at Factories	6.4	97	97
Waste wood at Construction	5	94	95
Non Food part of Agricultural Crop	13	32	45
Waste wood at Forest	8	9	30

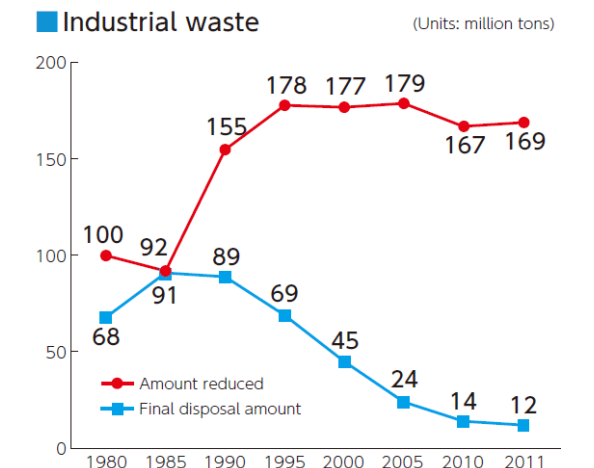
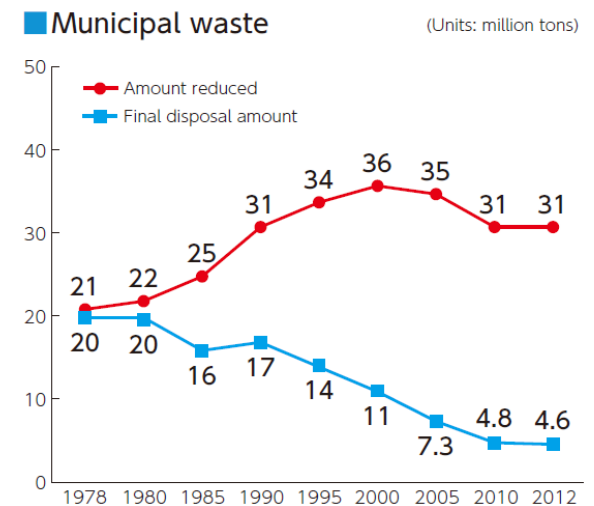
Source: MAFF

# Waste to Energy in Japan

■ Japan focuses on Incinerator type of “Waste to Energy” from the view point of Land Fill shortage  
 (About 90% reduction in MSW, about 70% reduction in Industrial Waste)



Source: MOE



◆ Biomass Electricity

◆ Biofuel

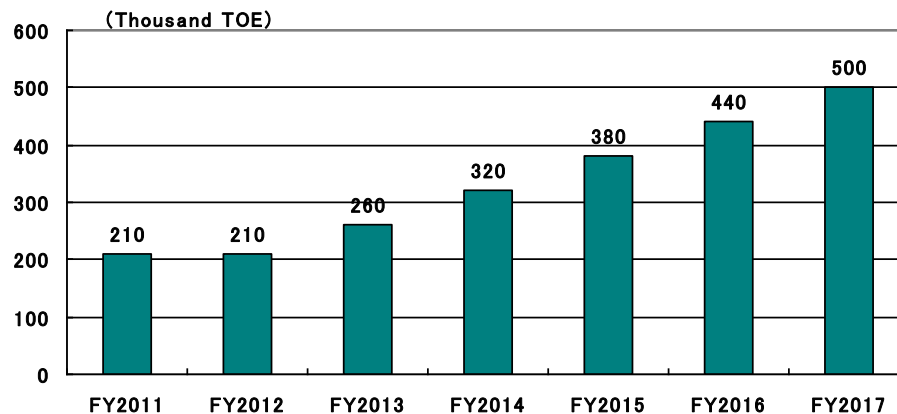
◆ R&D in Japan



# Biofuel for Road Transport

## ➤ Law regarding Advanced Energy Supply Structures (2010 Nov)

- Law regarding promote the effective utilization of raw materials of fossil energy and use of non-fossil energy sources (Law regarding Advanced Energy Supply Structures) was passed in July 2009. Related ministerial order including ethanol introduction target was in effect in November 2010
- LCA of GHG emission of ethanol should be less than 50% of baseline gasoline
- Both of ETBE and direct blend (E3) are accepted.
- Mandate of biofuel usage from 2011 --- Mandate volume after FY2017 is still not decided
- Biofuel gasoline are sold at 3,220 SS (as of Sept, 2016) of total 33,500 SS (as of Mar. 2014)
- 98% of biofuel is imported as of 2014
- Hybrid cars sold in 2013 was 1 million among total new cars sold was 3.26 million (Incl. buses and trucks)
- Gasoline Sales was 58.3 million kl in 2000, 61.5 million 2004 (peak) and 52.9 million kl in 2014



Source: METI

# Biofuel for Aviation

## ➤ Demonstration Flight by Japanese Airlines

### ■ Japan Airlines : JAL (January, 2009)

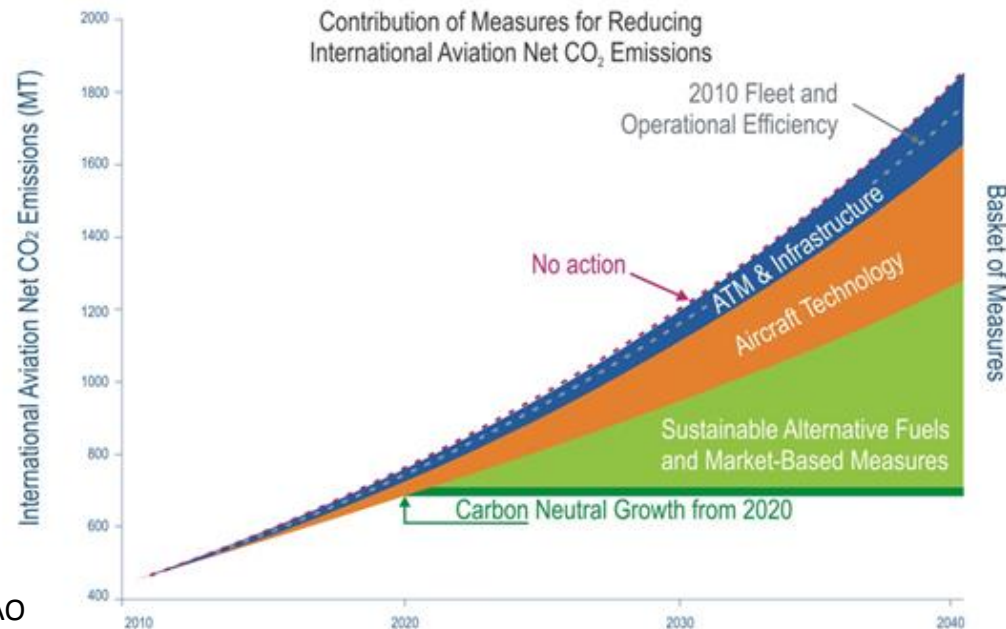
- ✓ Using 50% of biofuel consist of “non edible” oil, such as Camelina, Jatrofa and Micro Algae for domestic demonstration flight from Sendai to Tokyo/Haneda.
- ✓ 1<sup>st</sup> demonstration for Japanese airline and 4<sup>th</sup> flight in the world

### ■ All Nippon Airways : ANA (April, 2012)

- ✓ Using 15% of biofuel from Used Cooking Oil for delivery flight from US WA to Haneda/Japan.
- ✓ 1<sup>st</sup> Transpacific flight using biofuel

## ➤ Global Market-Based Measures of International Civil Aviation Organization (ICAO)

- Utilization of biofuel is one of the measures for CO<sub>2</sub> emission reduction in aviation field
- Starting to supply Aviation Biofuel from 2020 is under consideration



Source: ICAO

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# ◆ Bioenergy technology development in NEDO (1)

## ➤ NEDO

New Energy and Industrial Technology Development Organization (NEDO) is in a wide variety of areas as one of the largest public research and development management organizations in Japan. It was established as a semi-governmental organization in 1980 to promote the development and introduction of new energy technologies.

## ➤ NEDO R&D project for biomass

### 1. FY 2010- FY 2016 : Strategic technology development project of next generation biomass energy utilization

Technology Development of the next generation biofuel such as BTL and Microalgae which target is commercialized around 2030

### 2. FY2013 - FY2016 : Useful element technology development project for biofuel production

In order to develop technology of cellulosic ethanol, (1) agricultural technologies for biofuel dedicated plant, and (2) saccharification and fermentation technologies are targeted to develop

# ◆ Bioenergy technology development in NEDO (2)

- NEDO R&D project for biomass
- 3. **FY 2014- FY 2020 :Pilot project of development for locally independent system of biomass energy**
  - (1) demonstration project for locally independent system based on technology guideline of biomass utilization facilities and requirement condition as a system.
  - (2) Development of the technology found through the Feasibility Study and the Demonstration Project
- 4. **FY2016 - FY2019 : Integrated development pilot project of cellulosic ethanol production system**
  - In order to realization of commercial production of cellulosic ethanol , (1) research on excellent technologies and Feasibility Study in terms of the cost, GHG reduction and energy balance,
  - (2) Pilot plant of pre-commercialized stage if the above FS is good

**Thank you for your attention!**