

Post Fukushima -Japan's Energy and Climate Challenges-

November 2012

Jun ARIMA

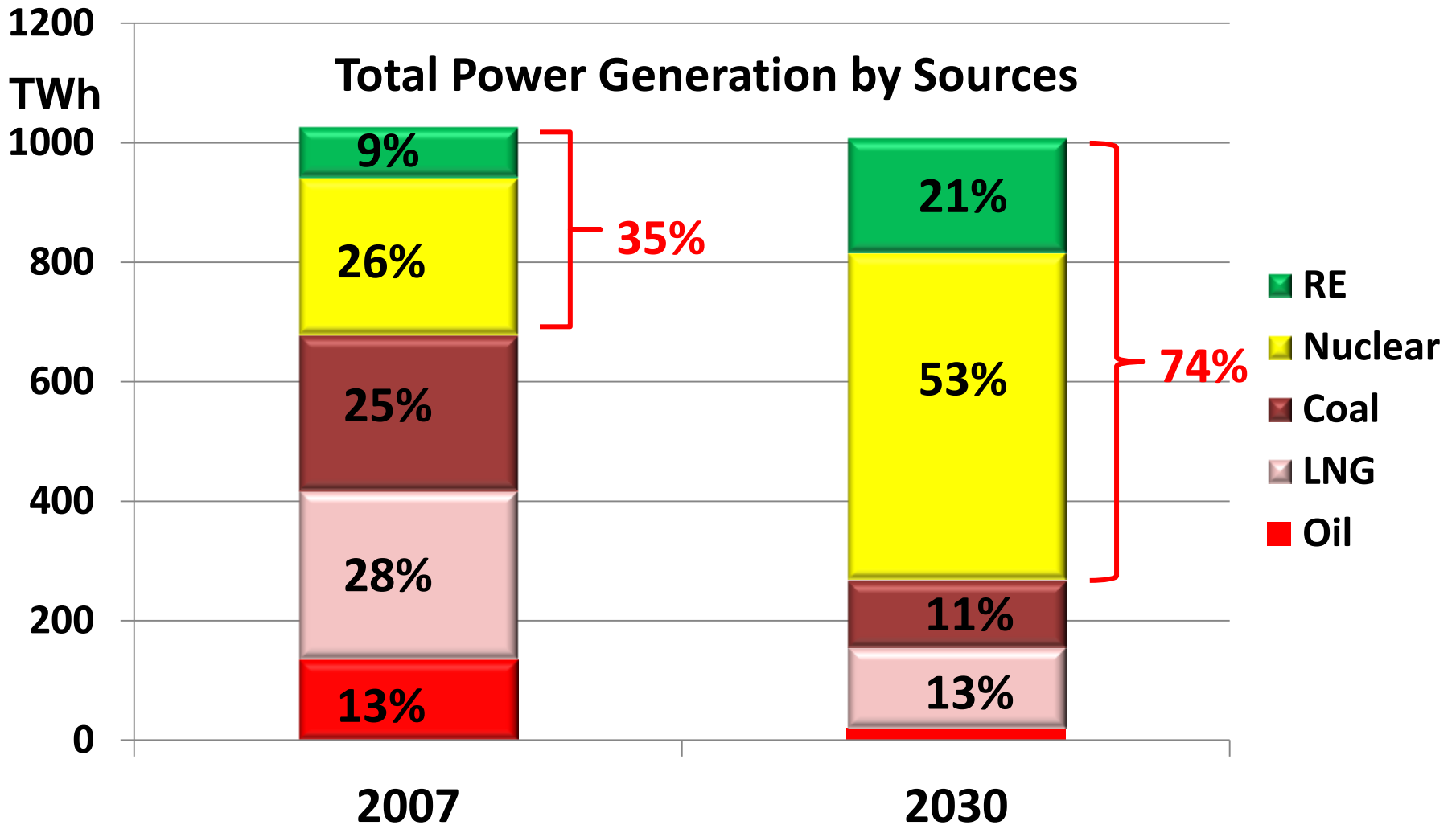
Director General, JETRO London

Japan's Energy Policy: Boundary Conditions

- **Very Low Energy Self Sufficiency (18% including Nuclear, 4% excluding Nuclear: US 78%, China 93%, UK 73%)**
- **High Dependence on Middle East (Oil 87%, LNG 28%)**
- **Already High Energy Efficiency (TPES/GDP: Japan 1, EU 1.7, US 1.9, China 7.2)**
- **Very Ambitious GHG Emissions Reduction Target (▲25% below 1990 by 2020, MAC \$476/t-CO₂)**
- **No International Grid Connection.
Weak Interregional Grid Connection**

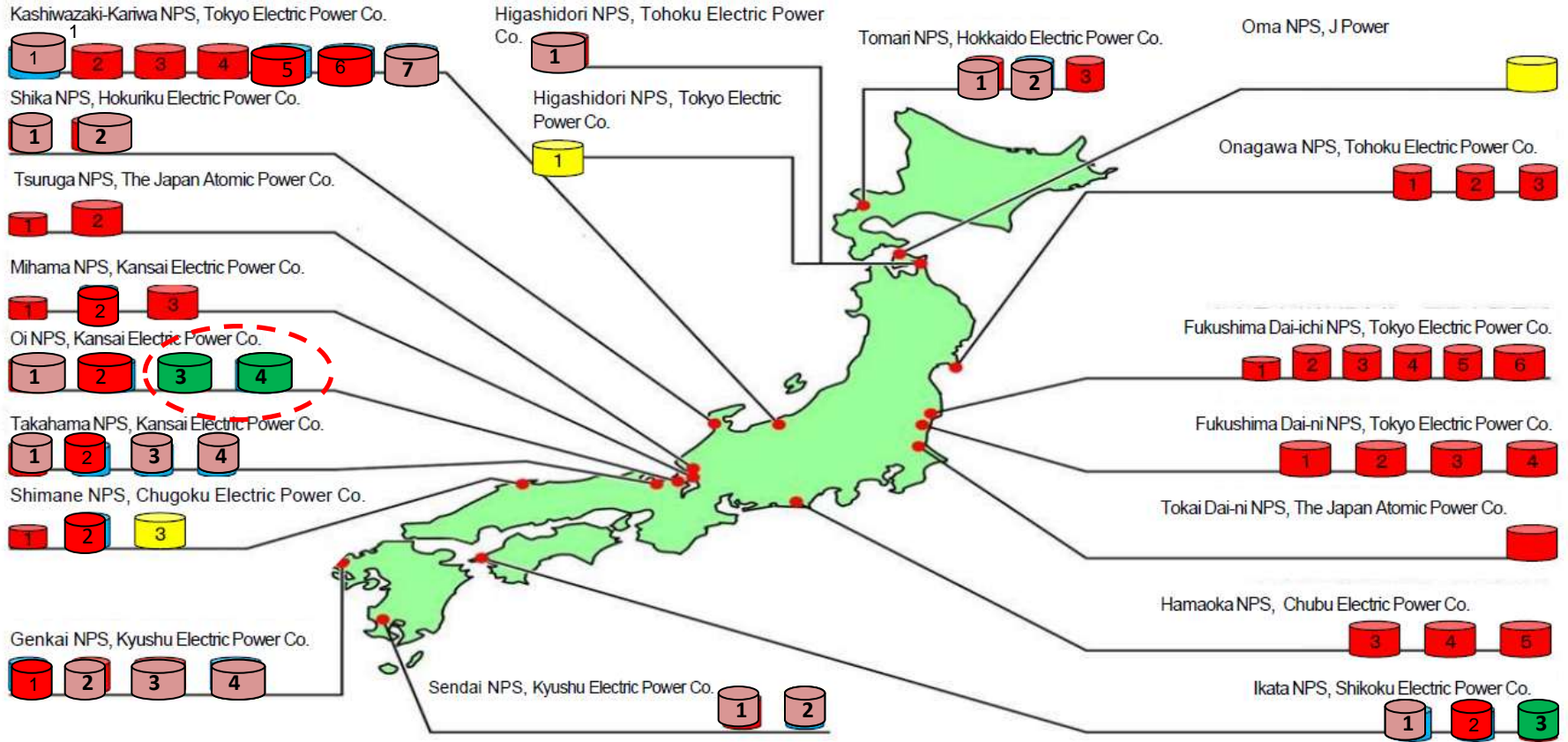



Basic Plan for Energy (June 2010)





Energy related CO₂: ▲30% from 1990 in 2030, ▲80% from 1990 in 2050


Stoppage of Nuclear Power Plants (Aug 2012)




 Under NISA inspection towards reoperation

 Passed NISA inspection

 Running

 Shut down

 Under construction

	May 2012	No. Of Stations	Total Output (GW)
Running		2	2.36
Shut Down		52	46.60
Total		54	48.96

Japan has lost all nuclear power on 5 May 2012, but 2 reactors have come back on 3 August 2012.

Implication of “Nuclear Free Japan”

- ◆ **Clear and Present Danger : Outflow of National Wealth**
 - **Additional cost for fuel import of more than 3.1 trillion yen (\$38 billion) for 2012 FY**
 - **Trade Deficit (1ST time since 1980) in 2011 will continue and deteriorate Japan’s macroeconomic balance**

- ◆ **Unstable Power Supply and Surge of Power Prices**
 - **72.8% of Manufacturing Industry could Reduce Production**

- ◆ **Irreversible Impact**
 - **Loss of nuclear technology and relevant human resources**
 - **Loss of bargaining power in energy procurement**
 - **Negative impact on Diplomacy and National Security**

- ◆ **Surging CO2 Emissions**
 - **14% increase of CO2 emissions above 1990 level**

Boom for Renewable Energy

FIT Purchasing Price and Period (from July 2012)

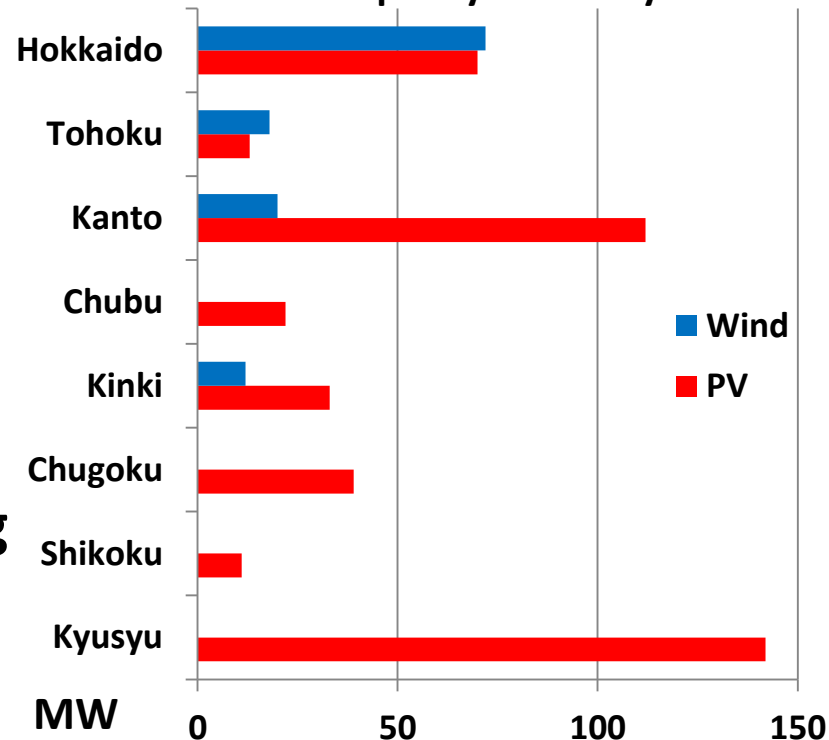
PV (>10 kW)	42.00 JPY/kwh (20 years)
PV (<10 kW)	42.00 JPY/kwh (10 years)
Wind (> 20 kW)	23.10 JPY/kwh (20 years)
Wind (< 20 kW)	57.75 JPY/kwh (20 years)
Geothermal (> 15MW)	27.30 JPY/kwh (15 years)
Geothermal (< 15MW)	42.00 JPY/kwh (15 years)
Small Hydro (1-30MW)	25.20 JPY/kwh (20 years)
Small Hydro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



Strong Interest in Local Communities (e.g Fukushima Prefecture)

Regulatory Reform for facilitating development of RE (e.g. National Park Law etc)

Certified Capacity since July 2012

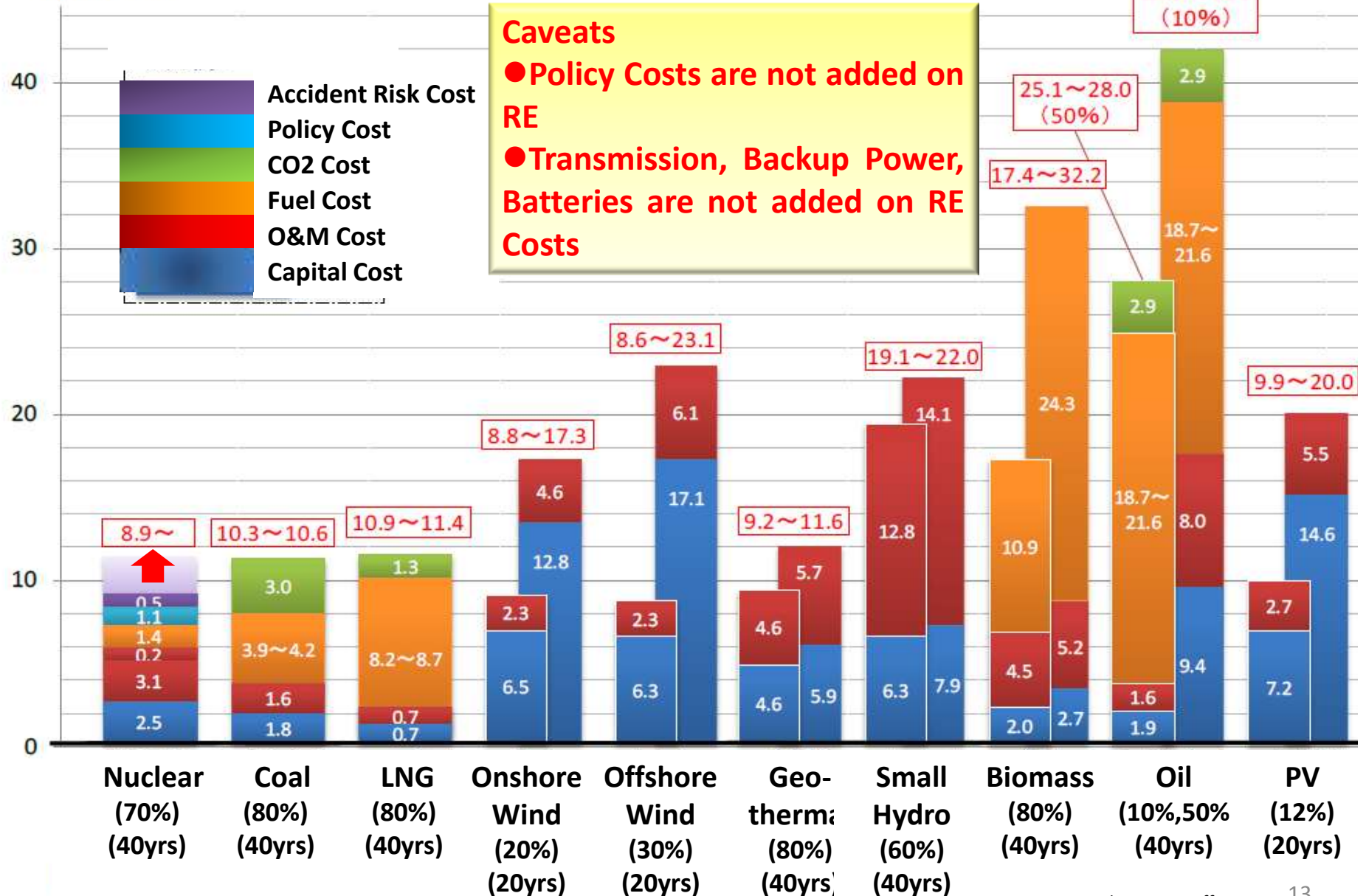


Replacing Nuclear with Renewable is NOT EASY

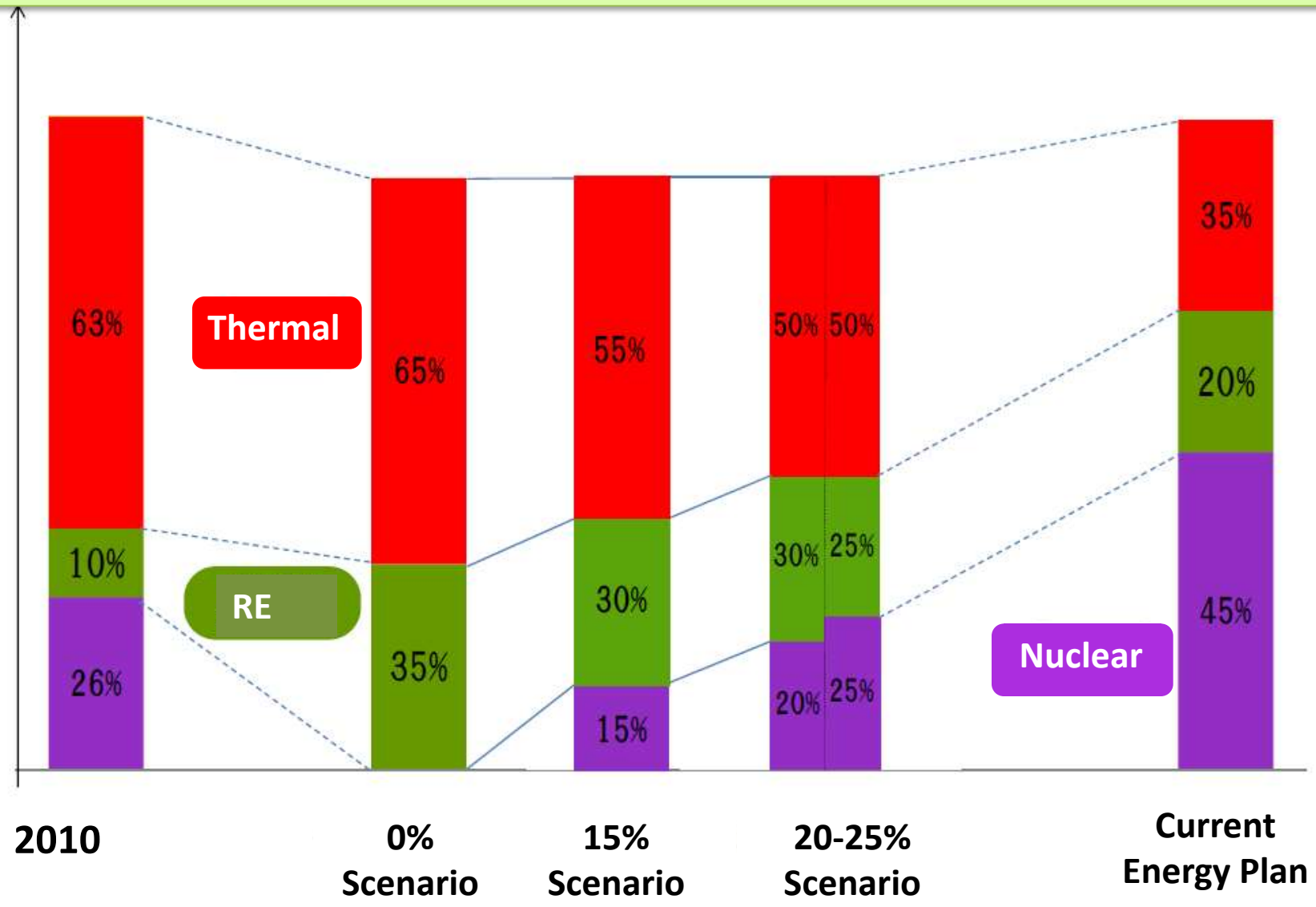
	Load Factor	Power Generation (TWh)	To Replace 1GW Nuclear (GW)	Space for Replacing 1GW Nuclear
PV (1GW)	12%	1.05	6.67	1,200 Ball Parks
Onshore Wind (1GW)	20%	1.75	4.00	4,400 Ball Parks
Offshore Wind (1GW)	30%	2.63	2.67	
Small Hydro (1GW)	80%	7.01	1.00	
Geothermal (1GW)	70%	6.13	1.14	
Nuclear (1GW)	80%	7.01	1.00	

Review of Power Generation Costs

[円/kWh]



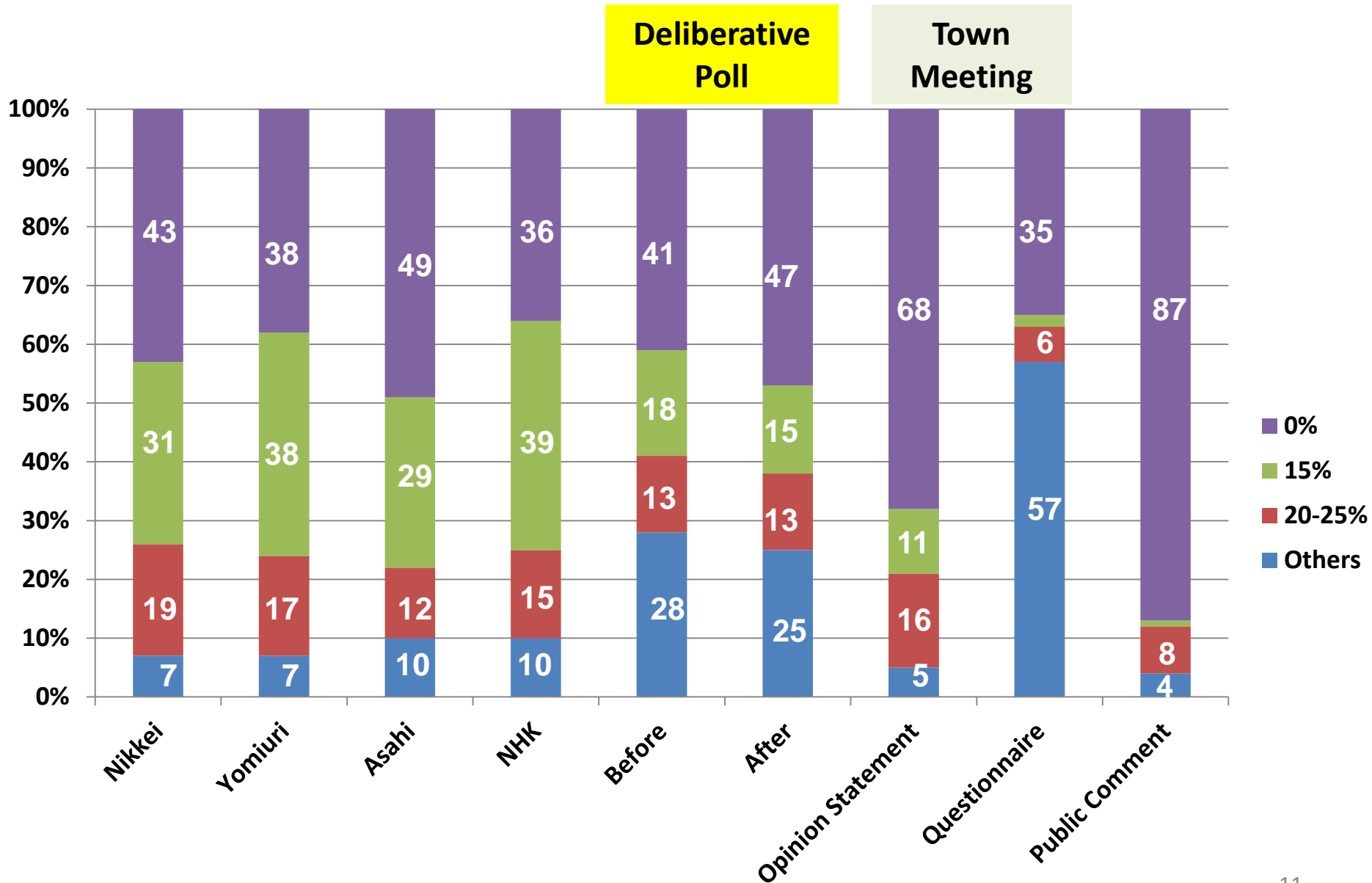
Options for 2030 Power Generation Mix - Energy & Environment Council (June 2012) -



Economic & Environmental Impact of Each Option

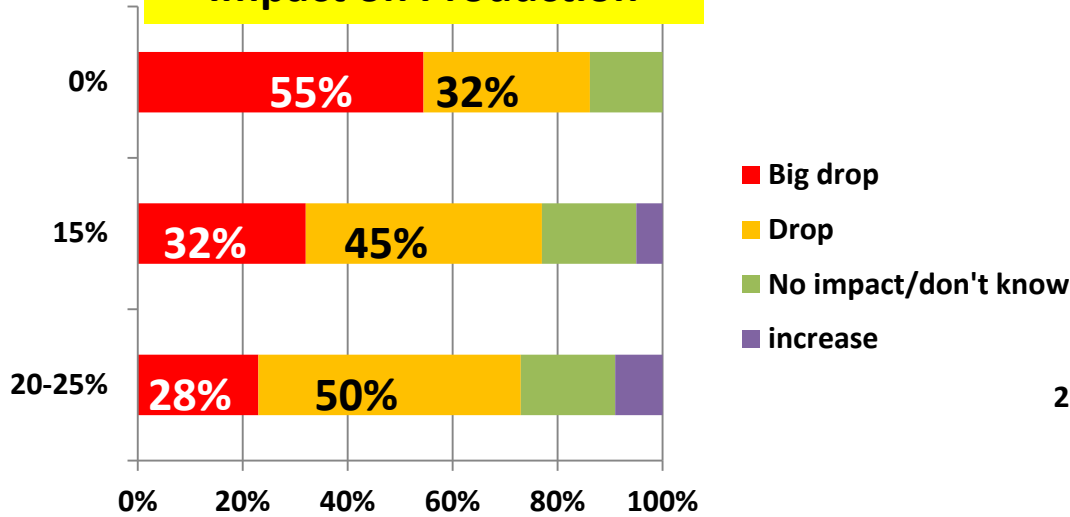
	2010	0%	15%	20-25%
Fossil Fuel Import Bill (¥ trillion)	17	16	16	15
Power Generation Cost (¥/kwh)	8.6	15.1	14.1	14.1
Grid Cost (¥ trillion)		5.2	3.4	2.7-3.4
Energy Conservation Investment (¥ trillion)		100	80	80
Household Electricity Bill (¥/month)	10,000	14,000-21,000	14,000-18,000	14,000-18,000
Real GDP (¥ trillion)	511	564-628 (▲8-▲45 from BAU)	579-634 (▲2-▲30 from BAU)	581-634 (▲2-▲28 from BAU)
2030 GHG Emissions (% of 1990 level)		▲23%	▲23%	▲25%
2020 GHG Emissions (% of 1990 level)		▲0% (2020 0%) ▲7% (2030 0%)	▲9% (2020 21%)	▲10-11% (2020 23-26%)

Various Public Opinion

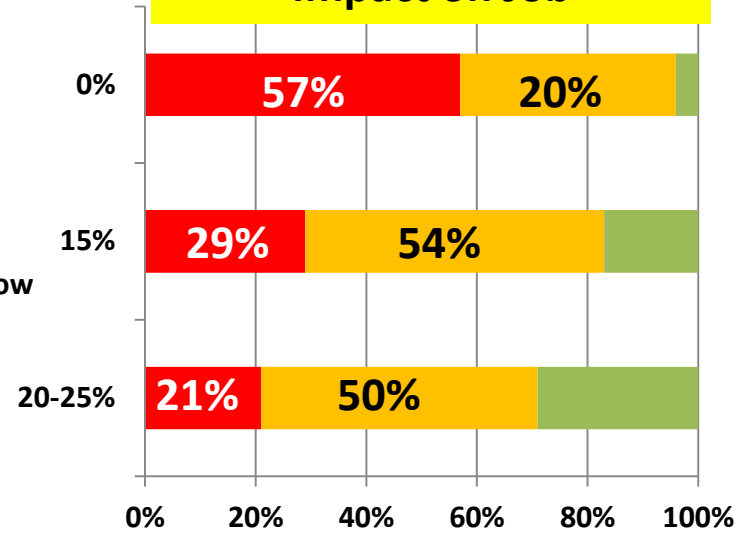


Industry's View

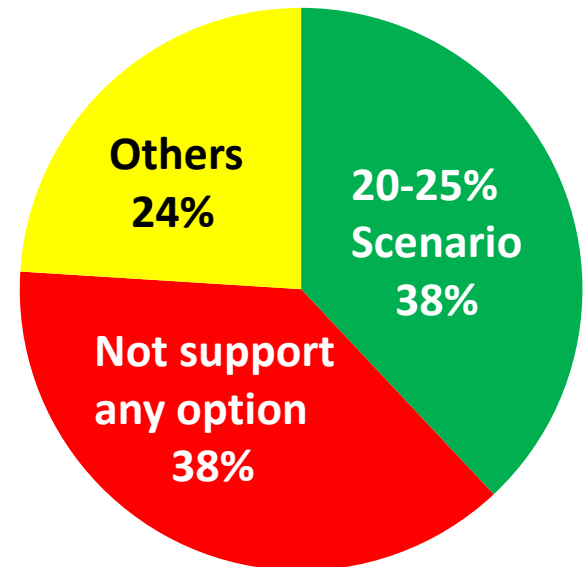
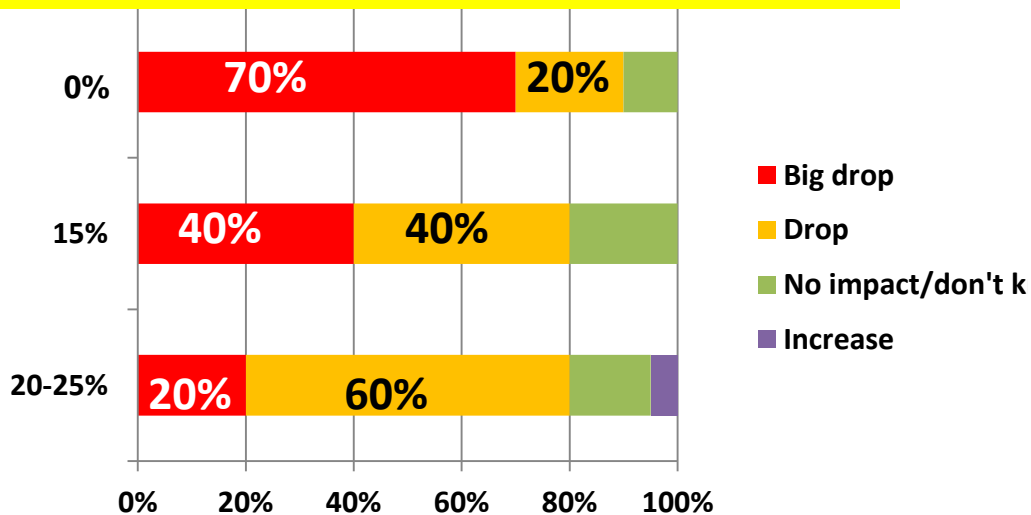
Impact on Production



Impact on Job










Impact on International Competitiveness



Innovative Energy & Environment Strategy (14 Sept 2012)







-Energy & Environment Council-

Realization of Society Not Dependent on Nuclear

-  Mobilizing all the possible policy resources to such a level even enabling Zero Operation of NPS in 2030s
-  Strict application of rules regarding 40 year limitation of operation
-  Restart the operation of NPSs once the NRA gives safety assurance.
-  Not to plan the new and additional construction of a NPS
-  Reprocessing projects assuming responsibility for the international community
-  Maintaining human resources and technologies
-  Cooperation with international community/ Strengthening measures for local areas with NPS

Review of the Path Towards a Society Not Dependent on Nuclear

Green Energy Revolution

-  Power Saving & Energy Conservation
-  ▲ 10% Power Consumption ▲ 19% Final Energy Consumption in 2010 -30
-  Cumulative Investment JPY 84 trillion
-  Renewable Energy
-  Non-Hydro RE 25 Twh (2010) => 190 Twh (2030)
-  Cumulative Investment JPY 38 trillion

Cabinet Decision (19 Sept 2012)

The Government of Japan will implement future policies on energy and the environment, taking into account of “the Innovative Strategy on Energy and the Environment” (the decision on the Energy and the Environment Council on September 14th, 2012), while having discussions in a responsible manner with related local governments, the international community and others, and obtaining understanding of the Japanese public, by constantly reviewing and reexamining policies with flexibility.

Future Energy Mix: Personal Observation

- ◆ In the short term, reoperation of existing NPSs is indispensable.
- ◆ 3Es (Energy security, Environment and Economic Efficiency) + S (safety) as the prerequisite. “Safety” should be defined technically and objectively, NOT emotionally.
- ◆ Mid-long term energy mix must be “Doable” taking into account
 - Physical, economic, environment and social constraints
 - Prospect of innovative energy technologies
 - International geopolitical, energy & environment situation
- ◆ Every energy source has Pro and Cons. No Silver Bullet!
- ◆ “Zero Nuclear Scenario” warrants very prudent examination in terms of cost, CO2 emissions, energy/national security, practicality.
- ◆ Public opinion is an important input in policy making, but it does NOT take ultimate responsibility for its consequences.
- ◆ Incessant check and review responding to uncertainties!!