Changes in Science-Policy relation after Fukushima: Impact on low-carbon Japan

September 2012 Oxford

Dr. Shuzo Nishioka
Secretary General, LCS-RNet
Institute for Global Environmental Strategies (IGES)

Changes in Science-Policy relation after Fukushima: Impact on low-carbon Japan

Contents

- New decision (14/09/2012): Less nuclear dependent society
- Japanese energy and GHG situation
- Impact of Fukushima (Earthquake, Tsunami and nuclear accident)
- Impact on Science –Policy relation
- energy plan
  low carbon plan
  decision process
- conclusion

(New) Innovative Energy/Environment Strategy

Decision on 14/09/2012 by Energy・Environment Conference

Less nuclear depending society (aiming zero nuclear in 2030's)

Three Principles on Nuclear

- Phase out after 40 years life-time
- No new construction
- Restart existing plants after strict check and regulation
- Hi-level radioactive nuclear waste: decision pending
  re-treatment for MOX/Breeder and /or direct disposal

Green energy revolution

- Mobilize all the policy resources into promote renewable and energy saving technologies
- Promote saving energy (reduce 10% in electricity and 19% in energy consumption
- renewables energy to increase 8 times and to 30% of kWh (2030/2010)

Stable supply of energy

・ Coal as the base-load electricity, promotion of gas fired generation

Reform of electricity system

- Separation of generation and transmission
- Integrated supply and demand sides

⇒GHG reduction from 1990 level 2020 5- 9% 2030 ～20%

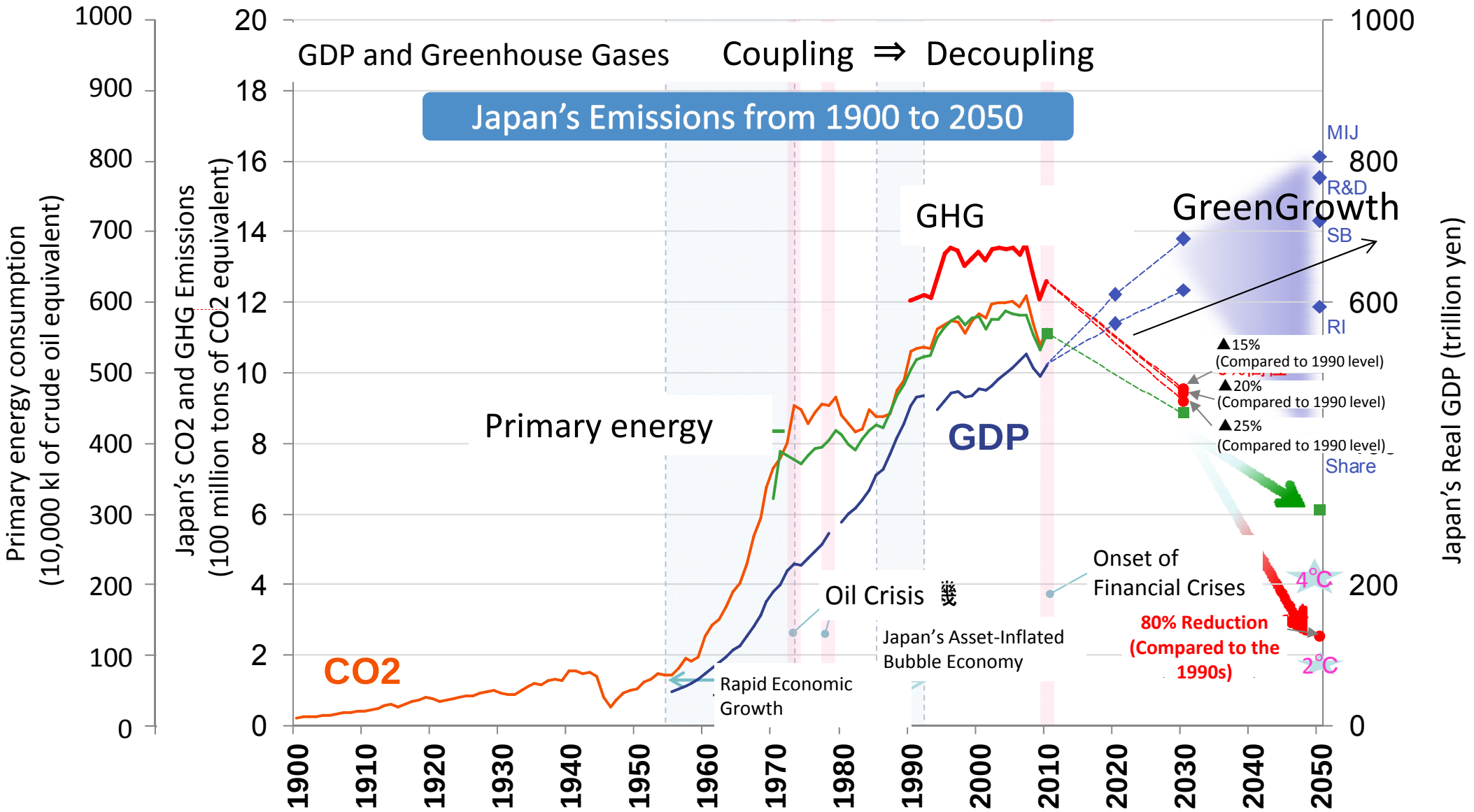
New Decision on Energy and Environment:

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

	Present State	Basic Energy plan (Old) 6/2010	New Decision by Energy/Envt. Ministers Meeting 14/09/2012	Policy in new decision
year	2010	2030	2030	
Energy Consumption Mil, kl	390		318 19% saving	
Total Electricity bil. kWh/year	1100	1020	1000 10% saving	
Nuclear Dependency Share in Elec	26%	45% Major Base-load	2030 Zero in 2030's	Realize as soon as possible
Nuclear Waste		recycle	Recycle/ direct disposal	Still undecided
Renewable Energy Bil. kWh	110 w/o Hydro 25	220 20% of power	300 w/o Hydro 190 19% of power	Maximize by mobilizing all the policy resources
Fossil Fuel	65% 0f power	35% of Power Coal/Gas/Oil as adjustment role	Coal: as major base-load LNG shift	Keeping appropriately balanced mixture
GHG Reduction rate From 1990	6%	2020 GHG（25%） 2030 CO2 30% 2050 GHG 80%	2020 CO2 5-9% 2030 CO2 ～20% 2050 CO2 80%	80% fixed by 4th Environment .Basic Plan

Challenge towards Low Carbon Japan

80% GHG reduction by 2050



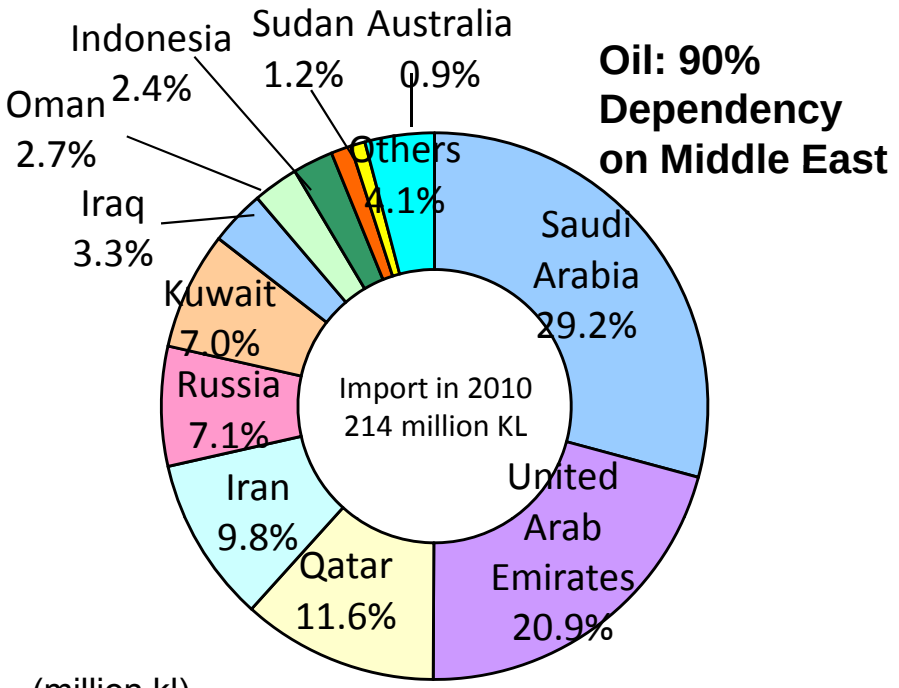
2) Future GDP values are assumed values based on scenarios A and B from the NIES Low Carbon Society Research Project 2050

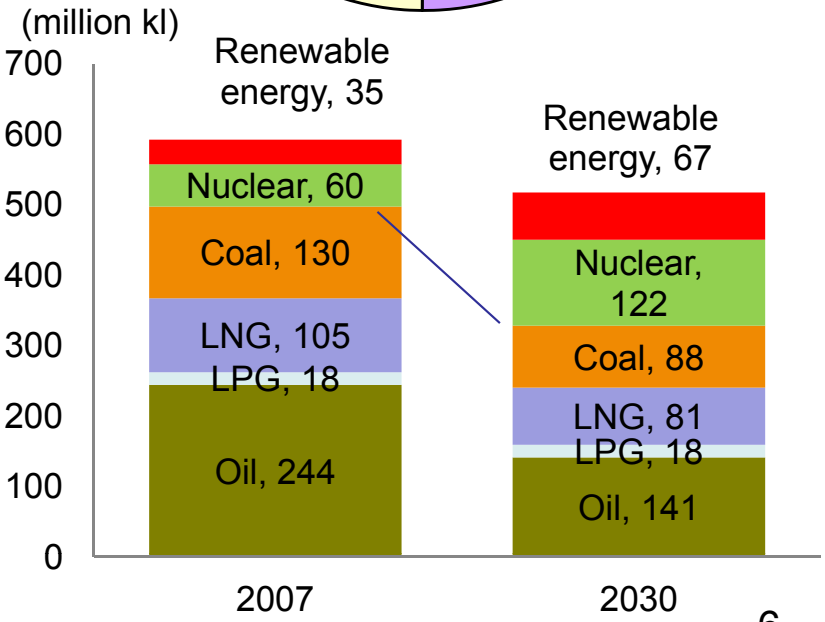
Japan's energy situation

- Energy security
  - – Energy self-sufficiency 4%
  - – Japan‘s external energy payment JPY 16 trillions (0.8% of GDP)
  - – Oil dependence on the Middle East 90%
- Renewable energy (exclude hydraulic power) is almost zero

- Rigidity of the power system
  - Independent power operation and monopoly by 9 electricity companies (limited capacity of Hokkaido-Honshu transmission line, different frequency with 50Hz(east)and 60Hz (west)

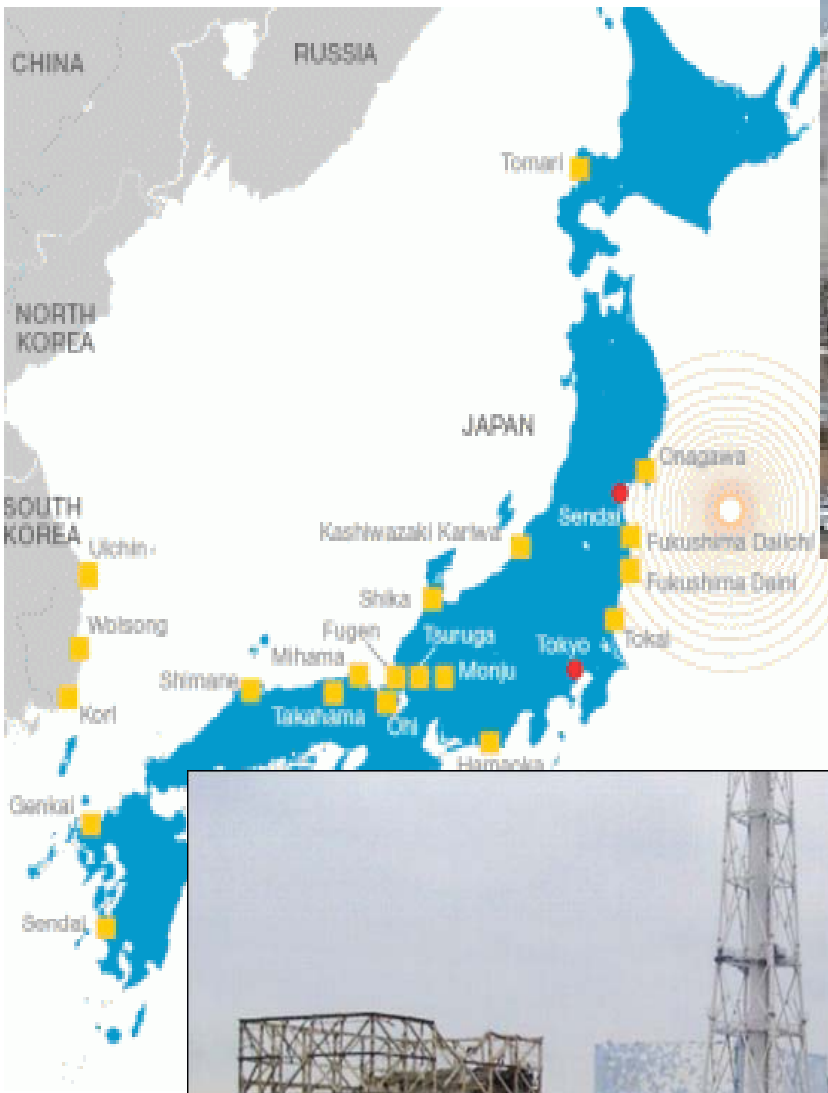
- Difficulty in accepting nuclear plants
- Treatment and disposal of used nuclear fuel not yet established (“ like a mansion without toilet”)
- Stagnation of energy saving (energy/ GDP)





Primary energy supply under Energy Basic Plan (before 3.11)

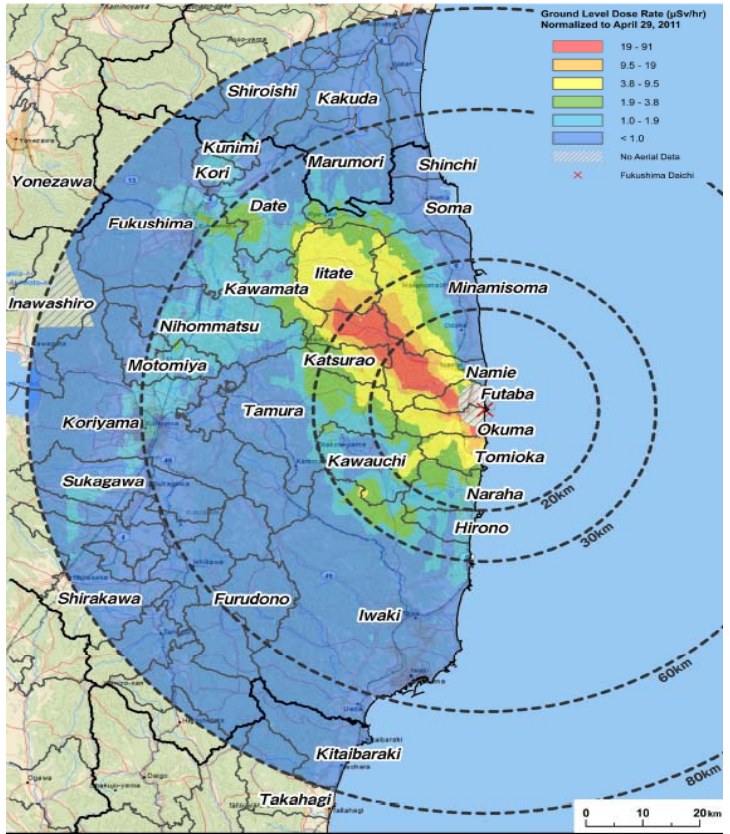
What changes Fukushima 3.11 brought into Science-Policy relation?



Fukushima No.1 nuclear power plant

Aerial Measuring Results

Joint US / Japan Survey Data



Different risks related to Fukushima

	speed	**damage**	**cause**	**countermeasure**
Energy Nuclear/ Radioactive	Prompt Slow	Local wide	anthropogenic (economy)	prevention
Natural disaster Earthquake, Tsunami	prompt	local	natural	restoration
Climate Change	slow	global	anthropogenic ＋ natural	mitigation and adaptation

How have the rapid type of risk experiences in Fukushima
Impacted on Japanese low carbon transition policy?

Fukushima's impacts on Japanese society

- Revitalized feeling of awe in nature among people
- Enhanced science and risk literacy of earthquake, energy and nuclear system
- Realised the mean of resilience of society (Tsunami－disaster and restoration)

- Increased understanding of "risk (What if..,?) " concept
  - "Myth of Safety" (Perfect Safety) to acquire local acceptance of nuclear plant resulted in no countermeasures being prepared by the power company in case of an accident (logically correct, but?)

- Revealed hidden cost of nuclear power

- Increased awareness of the effectiveness of demand side action
  (Setsuden (energy saving) July cf. 2011 △6-11% average,
  Household Tokyo △14.5%)

- Shifting the priority from short term profit to long term safety

- Recognised the value of local security ⇒distributed energy system with support of centralised/regional network

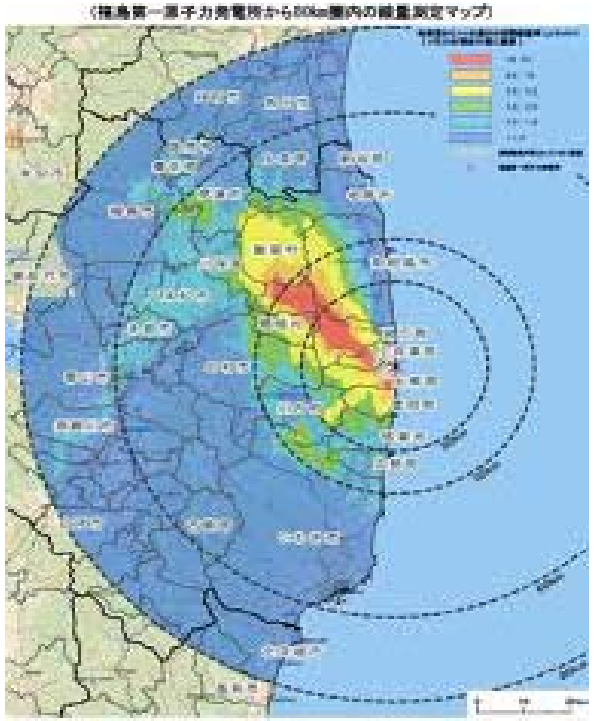
Increasing distrust of science-policy relations

Defect of use of science, transmission of risks related information

- Ignored warnings of seismologists in plant design

- Intentionally hid and delayed information of melt down accident

- Misled evacuation due to neglecting radioactive dispersion map :Speedi (System for Prediction of Environmental Emergency Dose Information) :case of Iidate Village run away



- Confusion over radioactive pollution levels in food standard and disposal/ incineration of rubble

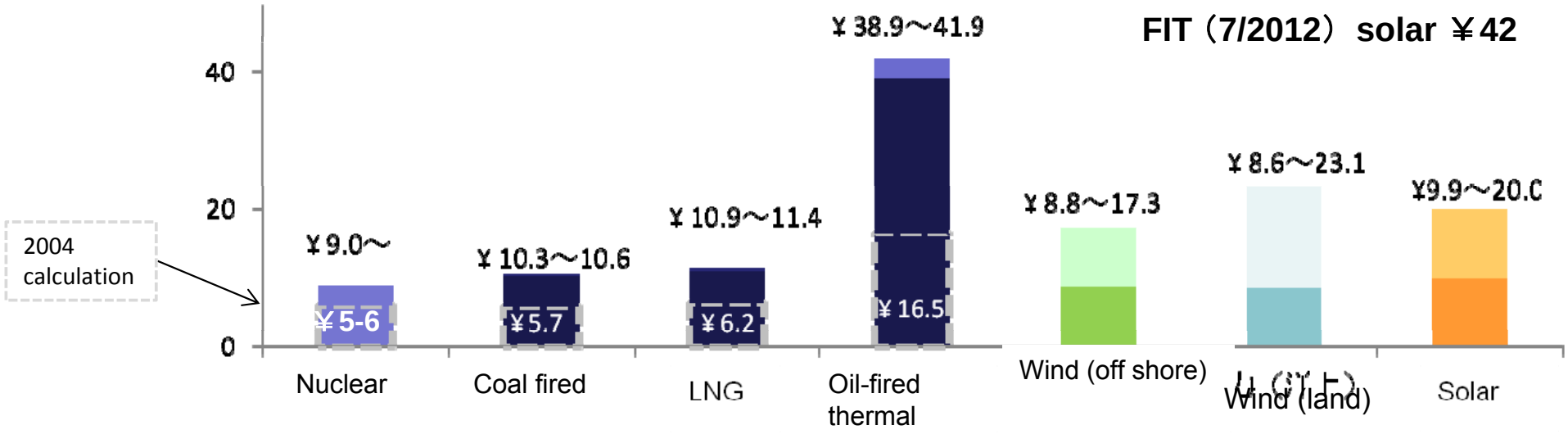
Increased distrust in science-policy-industry relation: ("Collusion in Nuclear village"?)

- Decisions made by a small group of power industry, academic experts, backed up by the government.
- Monopolised technical knowledge only within the "Nuclear Village". Medias tacitly followed government policy
- Defective review system: promotion and safety regulation departments in the same Ministry: ⇒separation is in process now
- Distorted energy cost estimation (recalculation clarified there was no economic advantage to nuclear)
- Overestimation of centralised nuclear availability crowded out renewable/ distributed energy system under locally monopolised power system and nuclear oriented policy
- Prioritized acceptance of nuclear plant construction. Not considered the countermeasures against nuclear accident as unexpected, "Myth of Safety"

  ⇒ Investigations of active fault and re-examination of safety

Re-calculated power generation cost in 2030

Japanese Yen	Nuclear (70%)	Coal-fired thermal power (80%)	LNG thermal power (80%)	Oil-fired thermal power	Hydraulic power	PV (Residential)	Wind power (land)
Existing facility	6.4-	8.1	10.0	26.6-20.2	2.3	7.4	3.6
Newly constructed 2010	9.0-	9.5	10.7	36.0-22.1	10.6	35.9	13.6
Newly constructed 2030	9.0-	10.3	10.9	34.9-21.0	10.6	12.0	13.1



Hedging risk in low carbon plan to deal with over-estimated nuclear availability

- As for nuclear power, a draft proposal has been included to add 9 new plants by 2020 and achieve a utilization ratio of 85% (has averaged 75% since 1990).
- Each new reactor will reduce Japan's CO2 emissions by approximately 5 million tons, while every 1% increase in the utilization ratio of new plants will lead to a 3 million ton reduction.

●Relationship between the Plan for Additional Nuclear Power Capacity and CO2 Emissions

CO2 emissions will rise 66 million tons if Japan's nuclear power utilization ratio remains at 75% and only 2 new plants are built. This would mean a 5.2% increase over the benchmark for 1990.

2020

- Utilization Ratio **85%**
- New plants **9**
- Total Output 61.43 MM kW

-98MM tons of CO2
(▲7.8% over 1990)

- Utilization Ratio **75%**
- New Plants **9**
- Total Output 61.43MM kW

+30MM tons of CO2
(2.4% increase over 1990)

- Utilization Ratio **85%**
- New Plants **2**
- Total Output 51.60MM kW

+40MM tons of CO2
(3.2% increase over 1990)

- Utilization Ratio **75%**
- New plants **2**
- Total Output 51.60MM kW

+66MM tons of CO2
(5.2% increase over 1990)

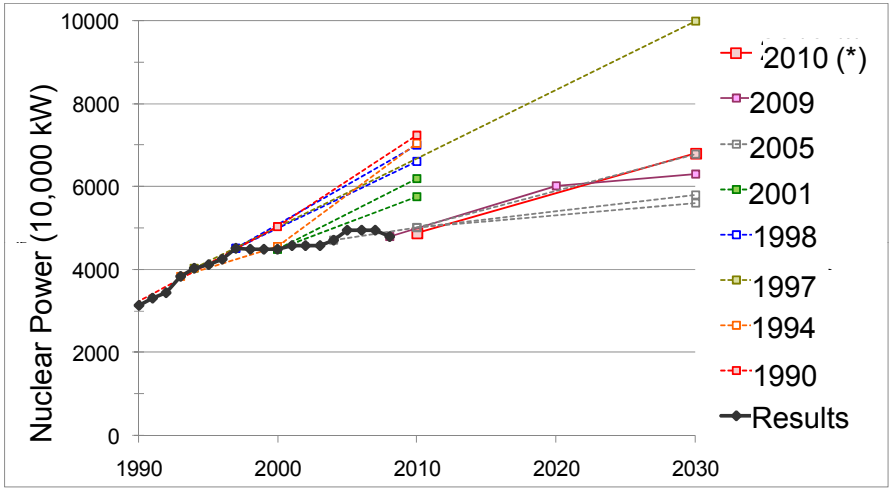
[when reducing CO2 emissions by 25%]

2009

- Utilization Ratio **66%**
- 48.85MM kW

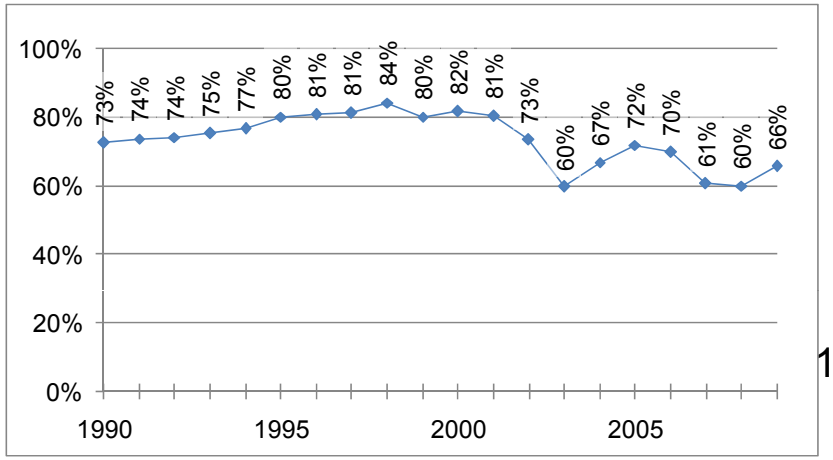
Plan to add nuclear power generation and fluctuations in utilization ratio will play a key role.

●Outlook for Nuclear Power in the Long-term Energy Supply-Demand Forecast



(*) Years appearing in the legend indicate years for which the Advisory Committee on Energy and Natural Resources has formulated a long-term forecast for the energy supply-demand balance

●Utilization Ratio of Nuclear Power Plants



13

Impact on present climate policy

- ambivalence about science and science community
- Increasing distrust in information from government
- majority (more than half) support “less nuclear-dependent society “

↓

- Short term impact on low carbon policy: mostly negative
  - Crowded out of climate issue by nuclear argument (temporary?)
  - Tentative increase of fossil fuel use (2020 compared to 1990 △5～△9% domestically cf . Hatoyama Target △25%)
  - Recognition of effectiveness of demand side initiative

- Long term impact to low-carbon policy: mostly positive?
  - More realistic low-carbon scenario became possible, based on accurate energy cost and confirmed nuclear projection
  - Upcoming renewable energy (introduced FIT, carbon tax, 30% in Elec. target,), enhancing more energy-saving systematically; both compatible with middle term energy supply security issue
  - Enhanced literary in nature - human and science - policy relation
  - Experimental step in nationwide participatory process applying scientific method started
  - (Long-term 80% reduction target for 2050 unchanged in the 4th Basic Environmental Plan)

Impact of Fukushima accident to policy on low-carbon policy

1. Decline of national interest in climate change. Nuclear energy is a single issue now
2. Option to decreasing nuclear power was addressed. Under such conditions, the potential reduction of CO2 emissions in Japan will be significantly reduced. (See table on right)
3. Energy-saving efforts under complete suspension of nuclear reactor increase the energy-related knowledge and awareness of the people. Increased participation in decision-making and radicated energy-saving behaviour
4. Industrial expansion to renewable energy and energy systems. Activation of local initiatives
5. Now possible to strengthen energy conservation and renewable energy policy (such as FIT)
6. Planning of basic energy policy with scientific procedures to be carried out in public. [Consideration of options]

Potentials of CO2 reduction (%)from 1990

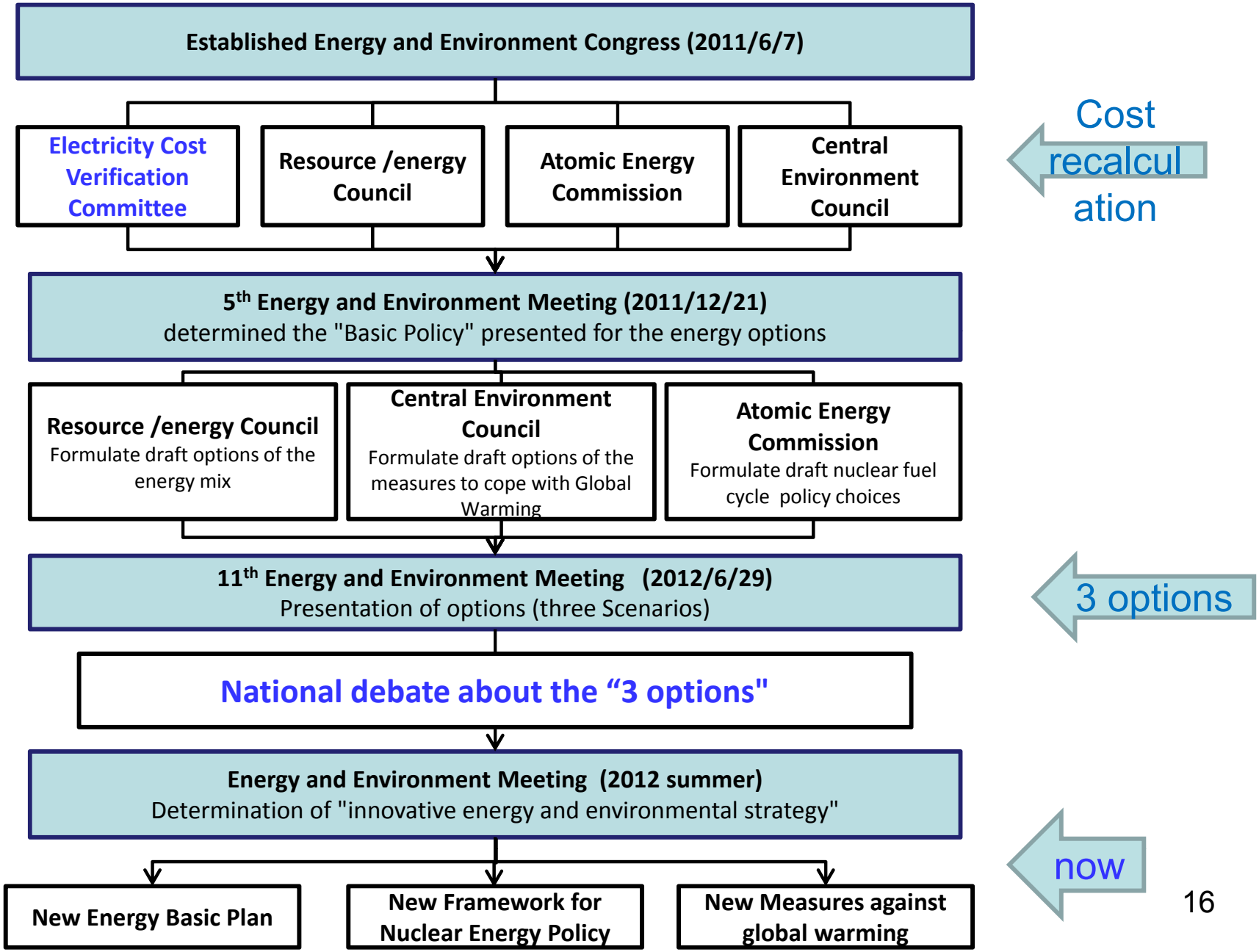
Year	2020	2030	2050 target
Basic Law	25*	-	80
Based on Energy Plan before Fukushima	15-25**	30**	80
Options after Fukushima	5-7**	20**	80 Fourth Basic Plan for Environmental

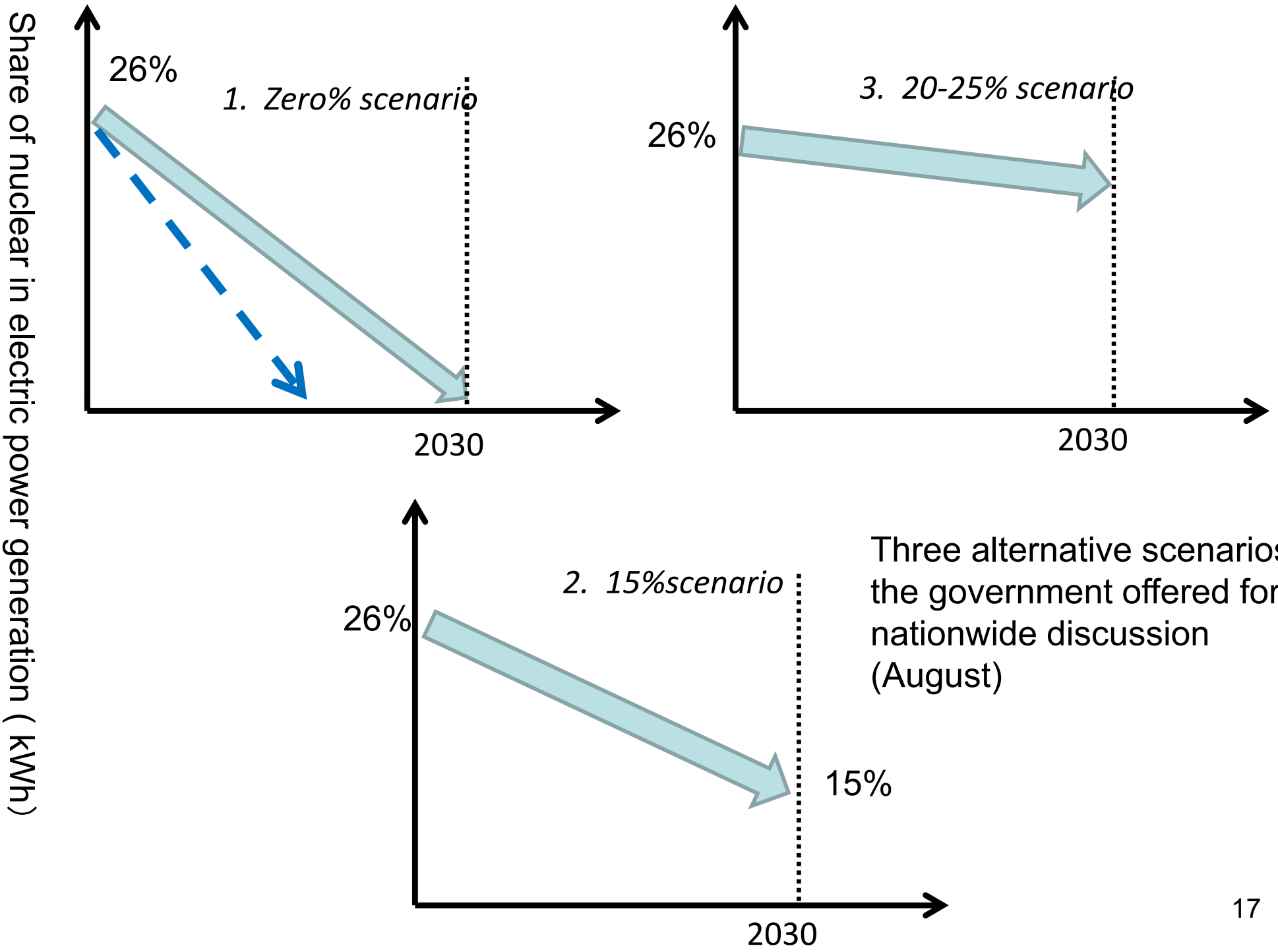
*Included absorption［about 3.5］＋overseas procurement
**Only domestic reduction

Need for policy transition:
Review reduction targets and the plan
Promotion of energy-saving and renewable energy and greening
Fuel conversion [gas shift]
Ensuring CO2 sinks
Promotion BOCM (Bi-lateral Offset Carbon Market)
Promoting bilateral partnership with Asian countries

Re-examination & Nation-wide participatory process started

The First Participatory Process for New Energy Plan





Three alternative scenarios the government offered for nationwide discussion (August)

Three scenarios in 2030

	2010	Zero scenario	15% scenario	20-25% scenario	Current energy basic plan
Nuclear	26%	0% (▲25%)	15% (▲10%)	20-25% (▲5-▲1%)	45%
Renewable energy	10%	35% (+25%)	30% (+20%)	30-25% (+20-+15%)	20%
Fossil fuel	63%	65% (present level)	55% (▲10%)	50% (▲15%)	35%
Non-fossil fuel	37%	35% (present level)	45% (+10%)	50% (+15%)	65%
Electricity output	1.1T kWh	1T kWh (▲10%)	1T kWh (▲10%)	1T kWh (▲10%)	1.2T kWh
Final energy consumption	390 M kl	300 M kl (▲85M kl)	310 M kl (▲72M kl)	310 M kl (▲72M kl)	340 M kl
CO2 emission (compared to 1990)	▲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 from1990

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

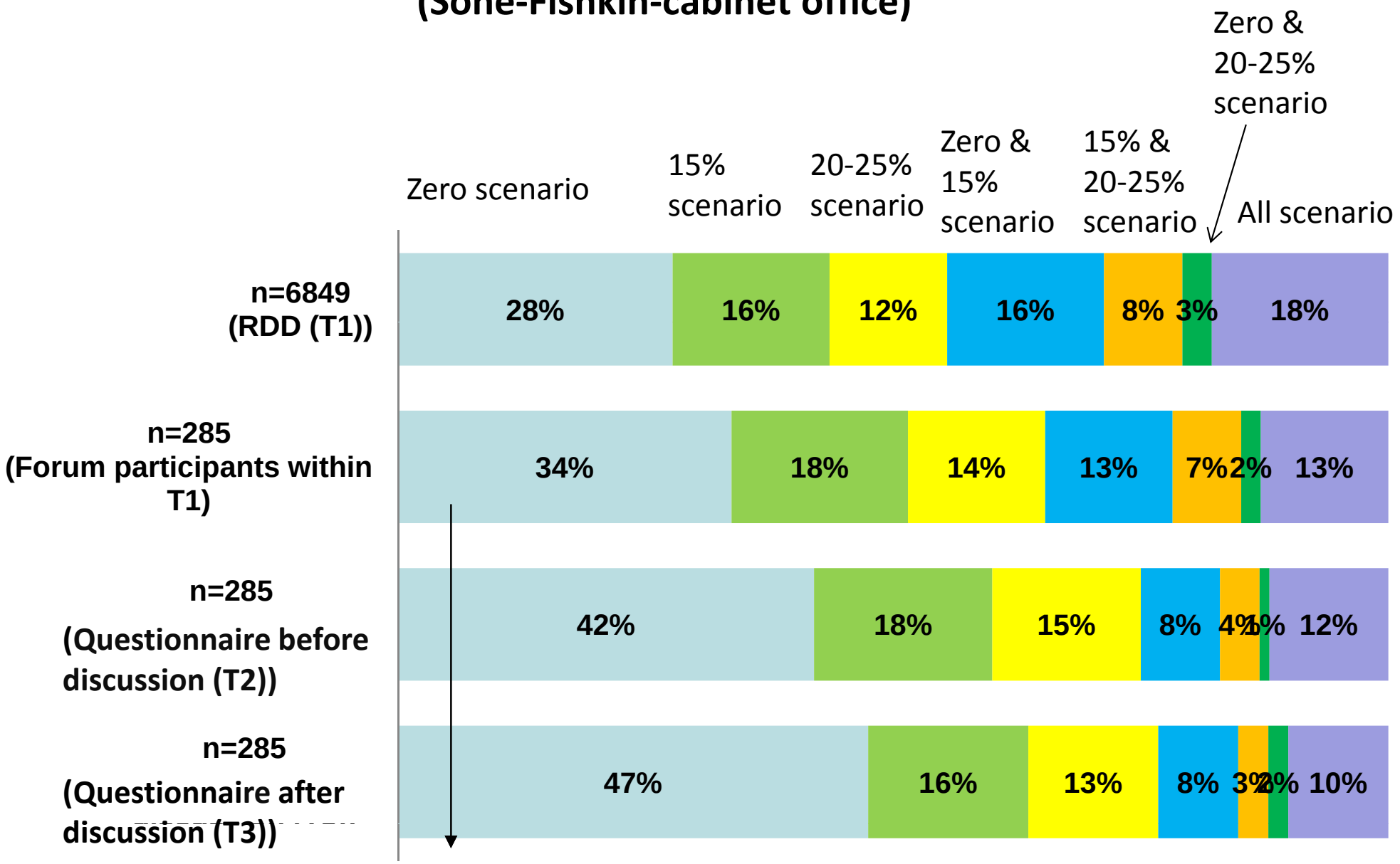
Nation wide surveys

Survey Method	Number of comments	Result ① / ③ %
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

Result of Deliberative Poll

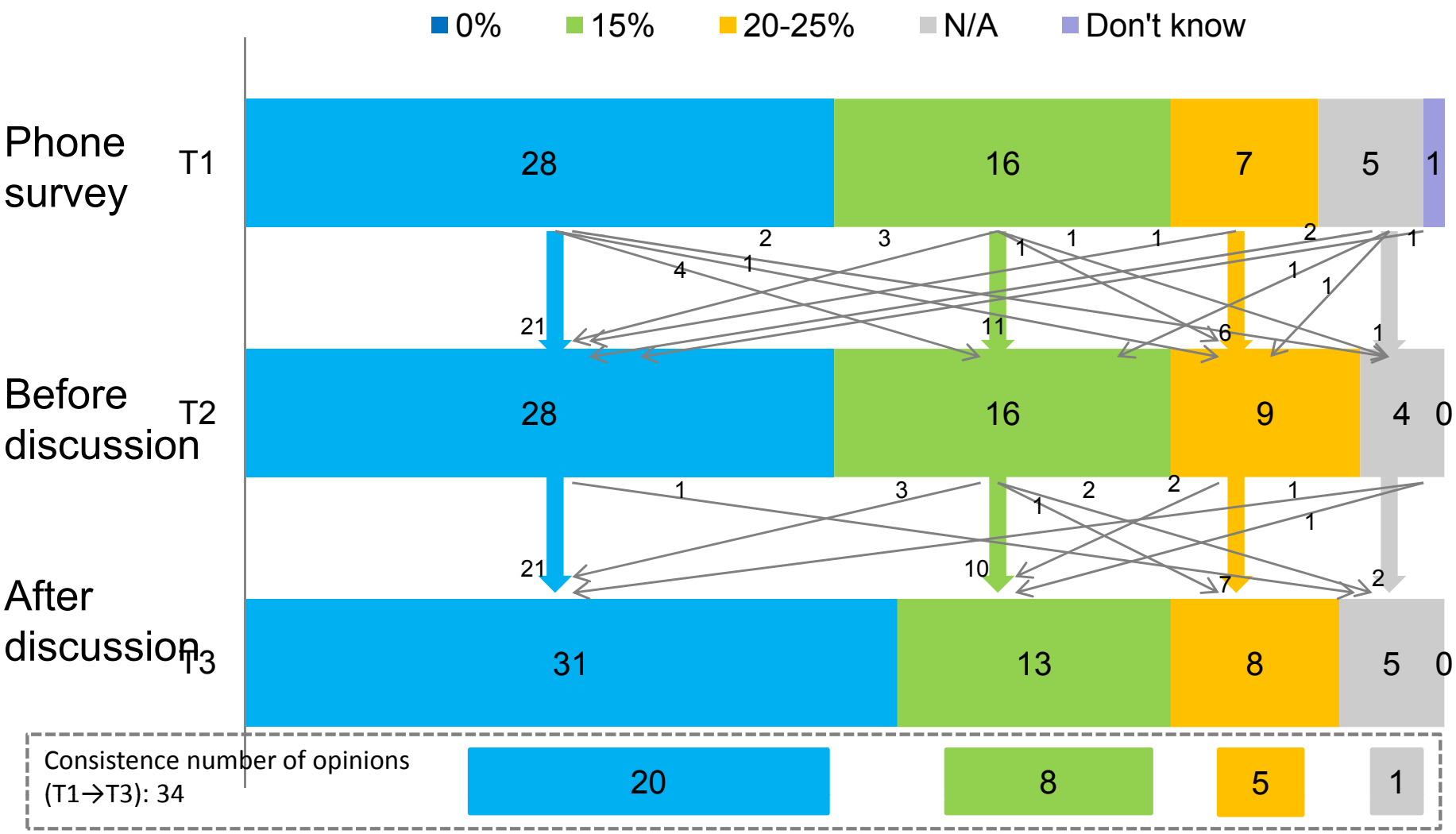
(Sone-Fishkin-cabinet office)



after group-discussion, support of 0% increased

Transition of opinion on nuclear energy dependences by 2030 (T1→T2→T3)

(Yagishita project)



Yagishita Project 2012

Conclusion
Impact of changes of science-policy relation triggered by Fukushima on low carbon Japan policy

- Severe shock caused by tsunami and nuclear accident in Fukushima created huge controversy among society related to science - policy relation in Japan
- Less nuclear dependent path became major opinion but not yet agreed fully.
- Government starts to revise energy/climate plan and reform power system, as well as introduce participatory process

- This will stagnate climate policy in around a decade, due to the less nuclear dependency policy and slow penetration of renewable energy.

- Still in the long run, this impact from Fukushima rather has potential to thrust climate policy foreword, if the distrust in science and policy relationship is resolved and each role and responsibilities are more clearly defined and restructured.

    - Science side: Establish scientific integrity. Participate more actively in decision-making process with independent and neutral expertise
    - Policy side: Respect scientific results. More erasonably institutionalize science-policy relation

➢


Thank you for your kind attention!
Changes in Science-Policy relation after Fukushima:
Impact on low-carbon Japan
Save our common climate

Democratic Party (ruling) decision 7/9/2012

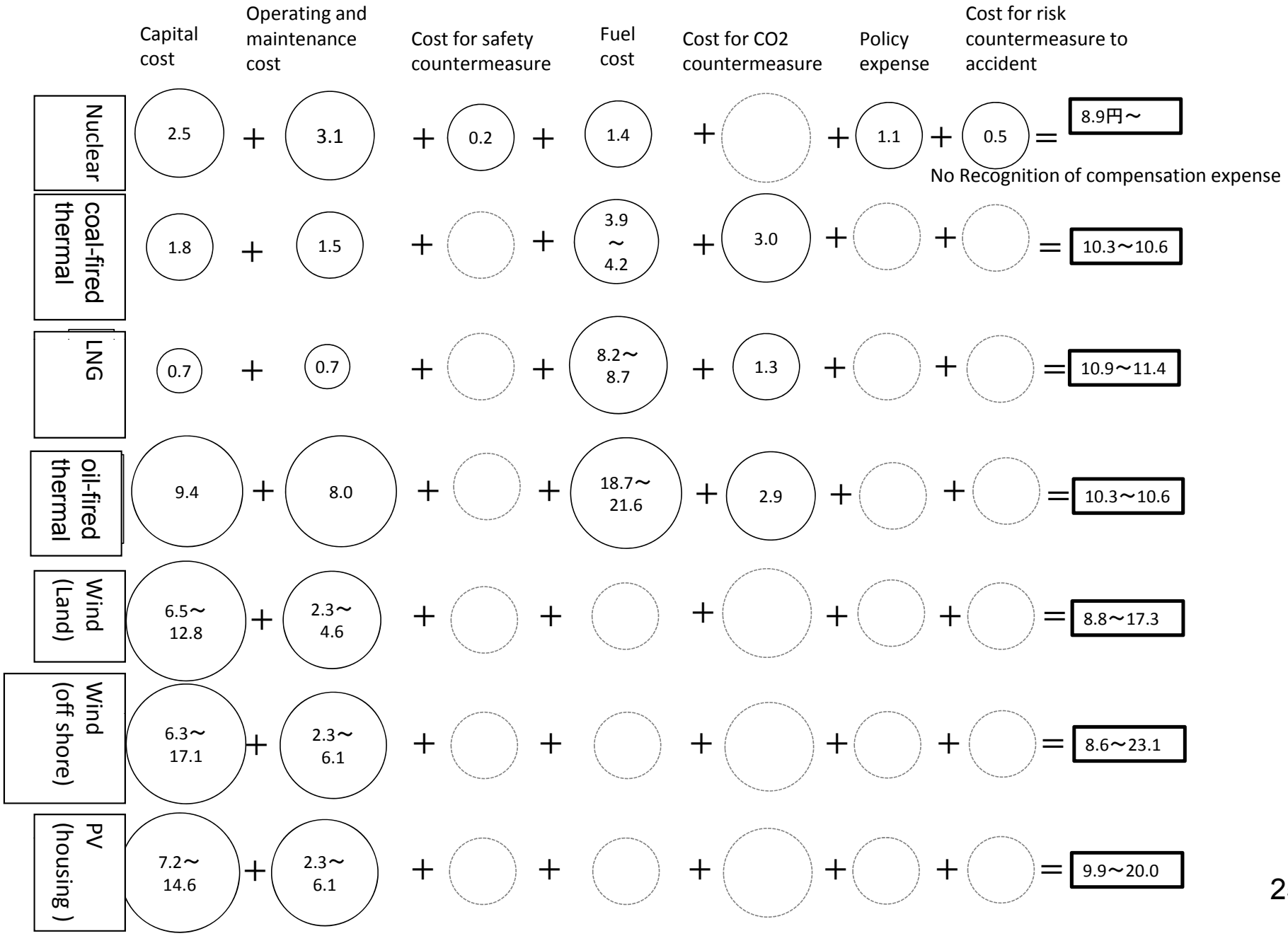
- Aim for zero nuclear society
- Mobilise maximum policy resources for zero-nuclear operation in 2030's
- Strictly apply "40 year life time" policy
- Restart nuclear plants (now 2 out of ten in operation) after check by newly established Nuclear Regulatory Committee
- No new construction of nuclear plants
- Renewable energy share to be more than 20% in early 2020's, and about 40% in early 2030's
- Fully revise nuclear fuel cycle

⇒government decision 11/09/2012

⇒ Issue of election? (Autumn ～June 2013)

Revalidation of the cost is carried out: the advantage of nuclear power has collapsed

Recalculation of generation cost(Yen/kWh)



Weakness of the government to utilise scientific information

- Intentionally hid and delayed information of melt down accident
- Confusion over radioactive pollution levels in food standard and disposal/ incineration of rubble
- Misled evacuation due to neglecting radioactive dispersion map :Speedi (System for Prediction of Environmental Emergency Dose Information) :case of Iidate Village