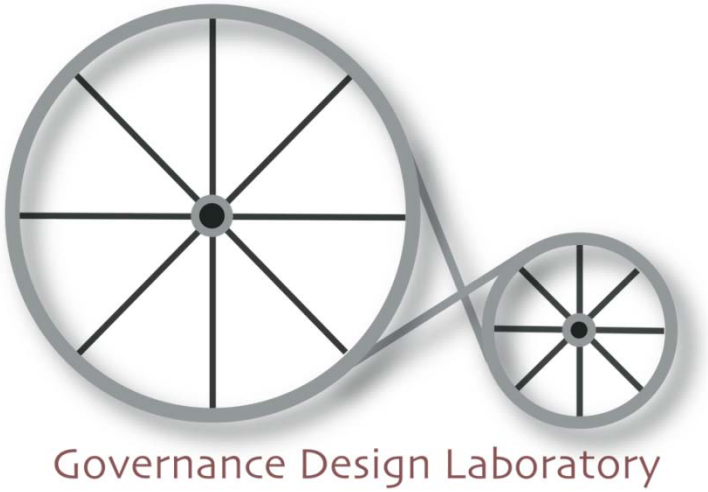

Resilience and Security of Spent Fuel in North-East Asia

The Japanese Energy Sector, Energy Policies, and the Japan LEAP Modeling Effort

Kae Takase

Governance Design Laboratory, Inc.

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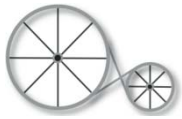

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The Japanese Energy Sector

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3.11 Earthquake and nuclear accident

2011.3.11 Earthquake, Tsunami

Level 7 nuclear accident

(Fukushima Daiichi, #1,2,3,4)

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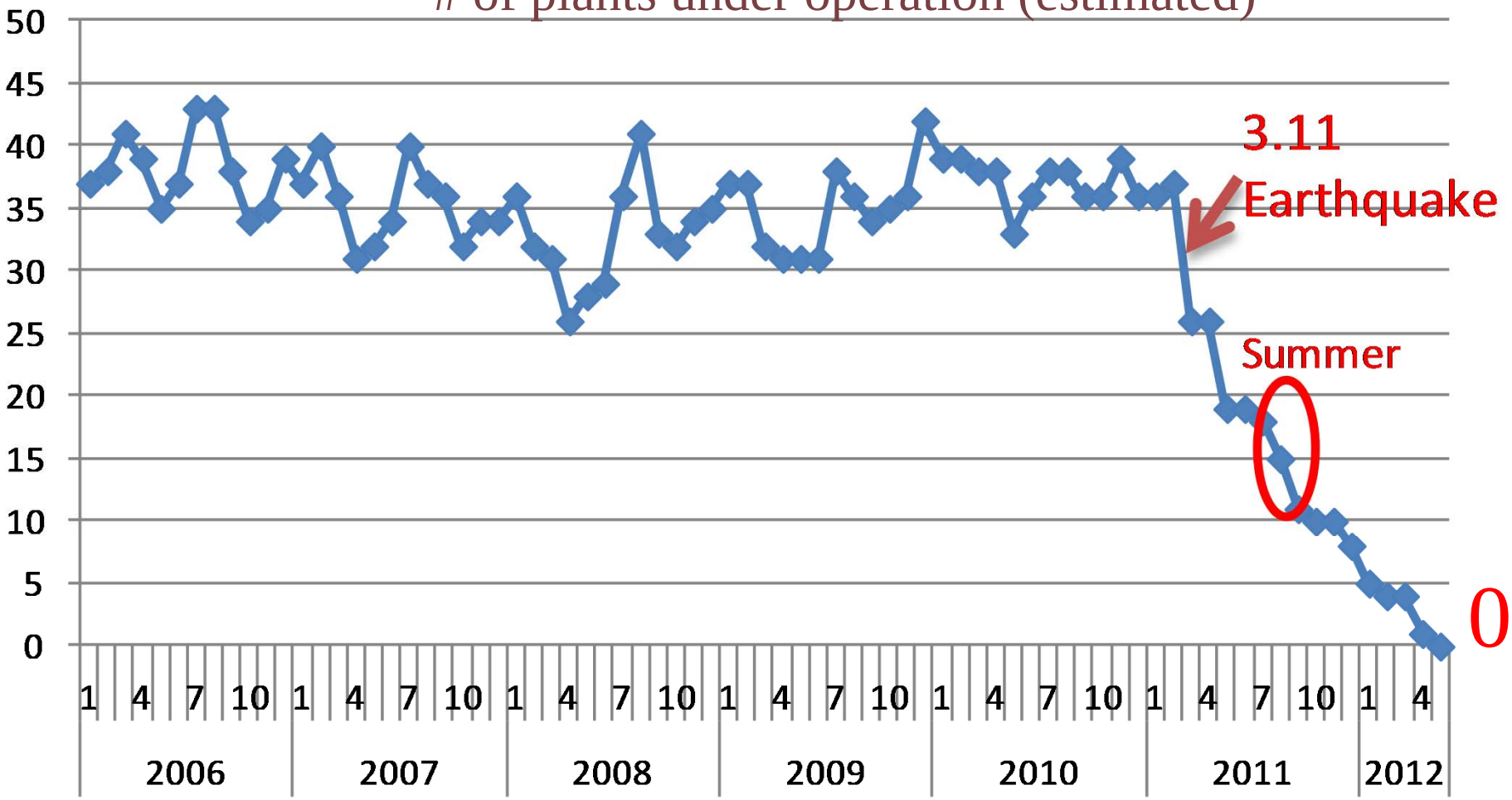
Nuclear power will be 0 in May 5th, 2011



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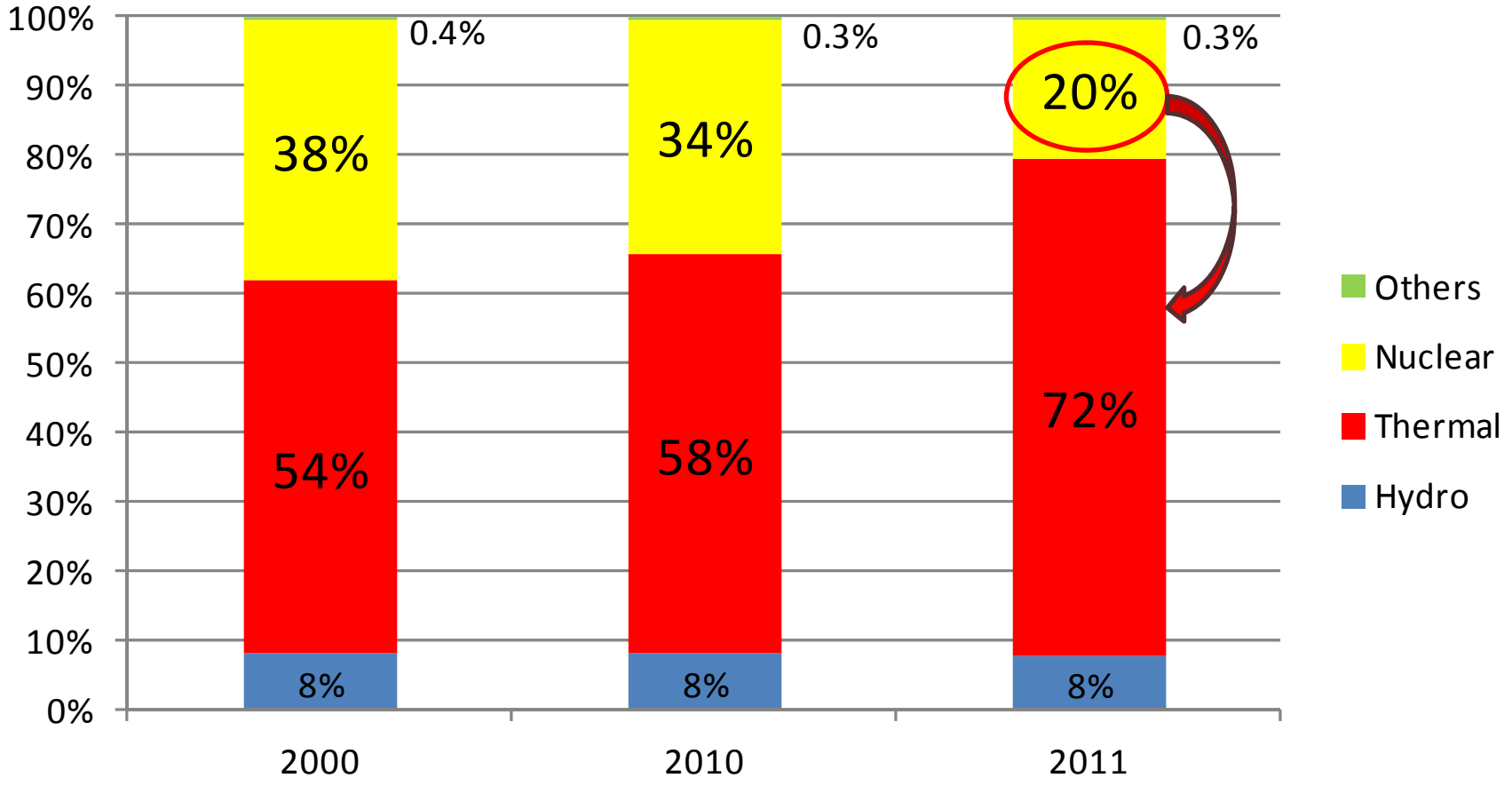
Source of Electricity

Electricity Generation by sources (utilities) (kWh→%)



In 2011, nuclear power decrease, substituted by thermal.

Source: METI, 電力調査統計月報

*figures are in calendar year.

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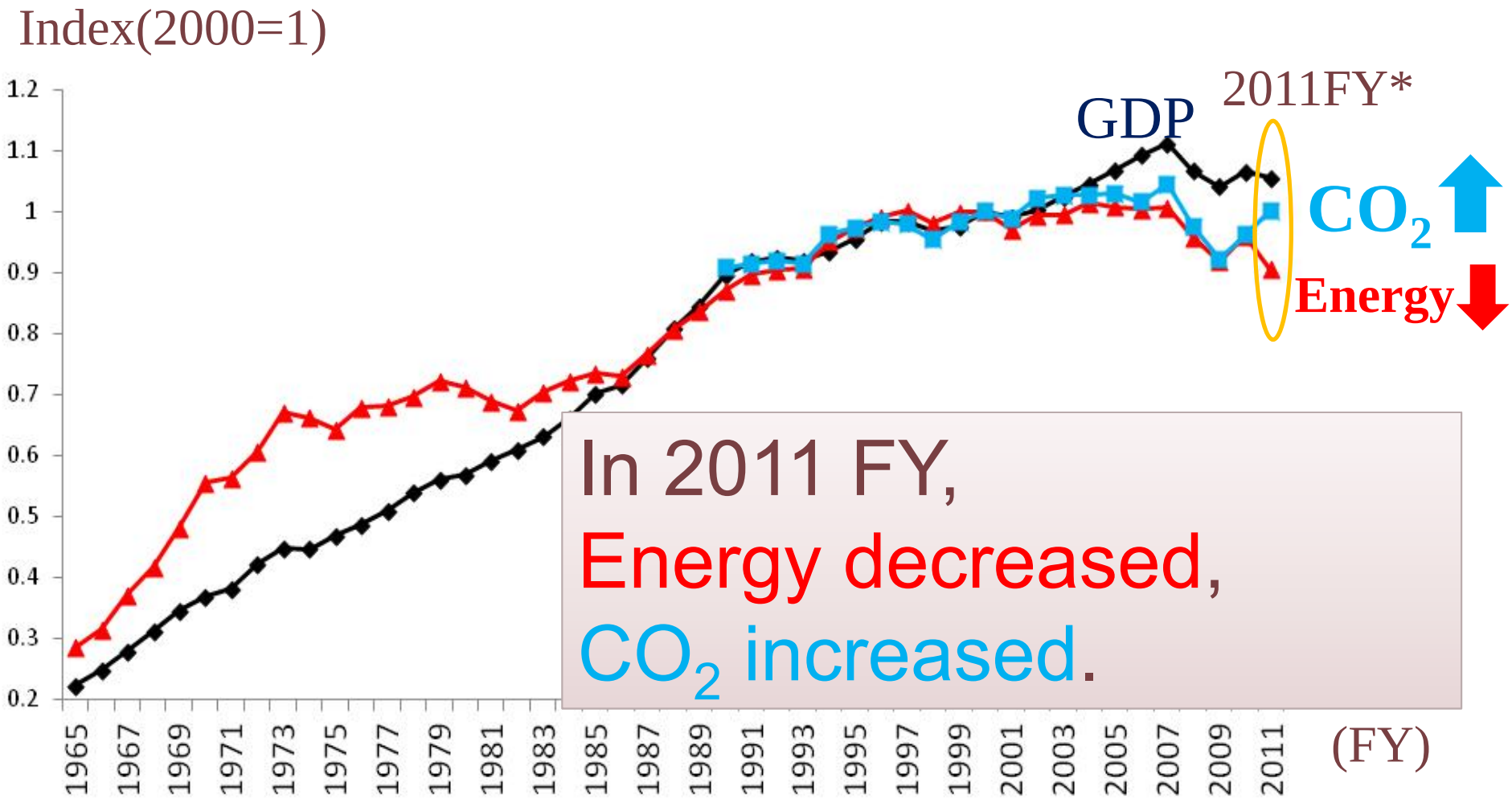
GDP, CO_2, and Energy



Source: 1965-2010, EDMC/IEEJ, EDMC Handbook of Energy & Economic Statistics in Japan 2012
*Data for 2011 is estimated by GDL with various sources.

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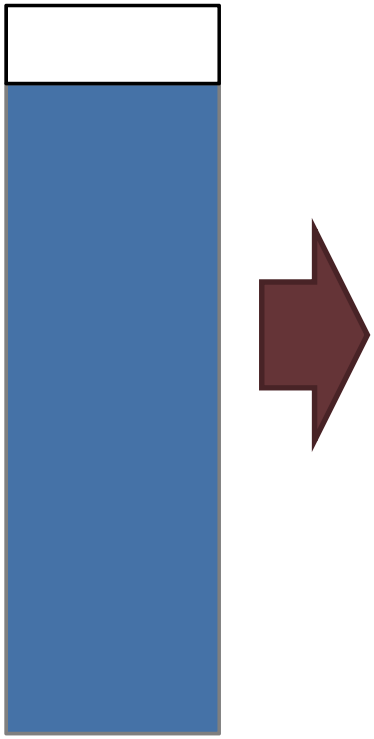
Revision of the Strategic Energy Plan of Japan

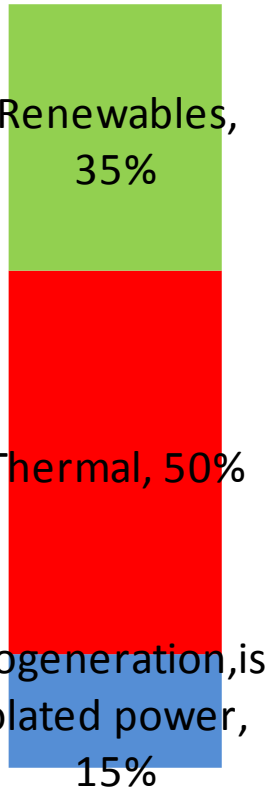
October 2011 ~ Summer in 2012

10%? 20%?

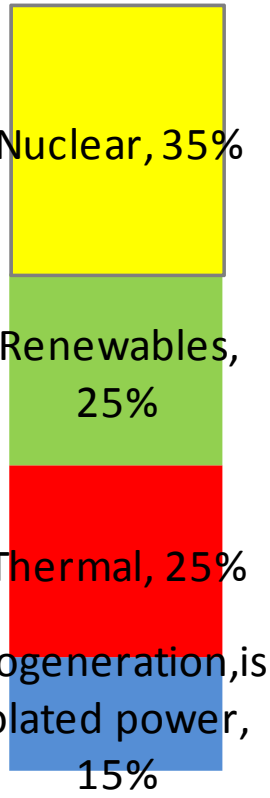
Saving



No Nuclear



Max. Nuclear



This is a image of the range under consideration.

Ref: http://www.enecho.meti.go.jp/info/committee/kihonmondai/17th/17-3-1.pdf

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Behind Nuclear 0%-35%

Following addition/replacement of plants are needed

1200MW/plant, 70% capacity factor

20% 9 plants

25% 16 plants

35% 30 plants

Source: Junko Edahiro, presentation at the committee (2012.4.11)
http://www.enecho.meti.go.jp/info/committee/kihonmondai/18th/18-9-1.pdf

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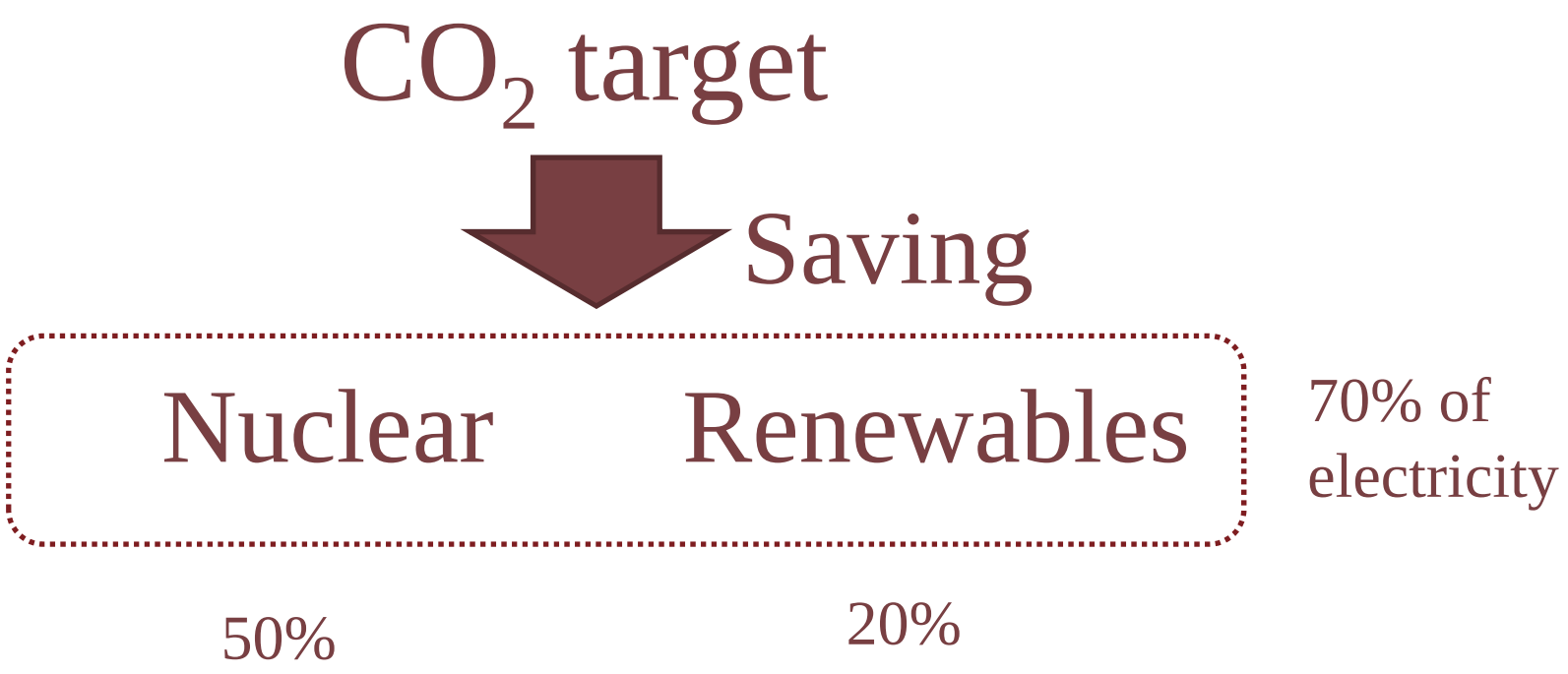
Old way to think



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Current Situation

??? Nuclear ← Public Opinion & Politics

↓

?? Renewables ← Feed-in Tariffs (2012 ~)

? Saving ← Regulation,Market,Cost

↓

Thermal → CO_2 ?????

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Changed or not?

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- 山地 憲治 （財）地球環境産業技術研究機構理事・研究所長

Nuclear ratio: #

0% :6

20%: 7

25%: 2

30%: 1

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What is happening?

- Members of the committee is **divided** into 3 groups.
  - Finally zero nuclear (inc. no restart group)
  - ?? (market?)
  - Pro nuclear (maximum compromise is 50%→35%)
- Chairman is a president of iron&steel company. → opinion of “finally zero nuclear” group is not neglected, but not considered seriously.

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Obstacles

- To what?
  - to public opinion to be considered
  - Normal people to feel “included” in the discussion → increased public understandings
- Inside committee (From Junko Edahiro)
  - No consideration about what happened on 3.11.
  - Basic policy of “reduce nuclear dependency” is ignored.
  - Renewables are too small currently.
  - CO2 problem.

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Public Opinion

Risk became reality.

Behind the number (small risk, but);

Not able to return home

Sales reduction of agricultural products

Divided

-Help each other, or protect yourself & family.

-Eat fukushima products or not (let children eat)

-Go back to the hometown or not.

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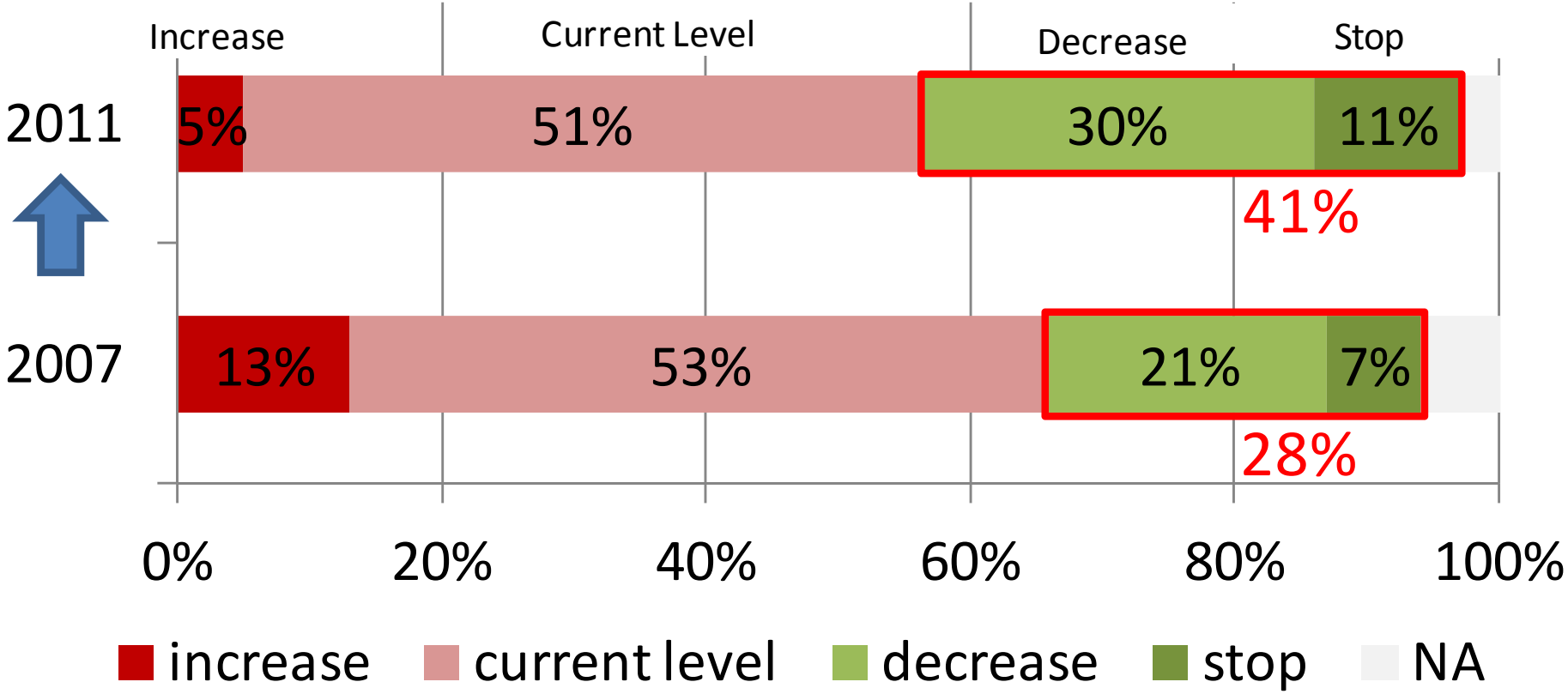
Public Opinion Poll (1) (before and after Fukushima)

- How should we do with nuclear power?



Telephone survey done by Asahi News on April 16-17, 2011.
http://www.asahi.com/national/update/0417/TKY201104170324.html

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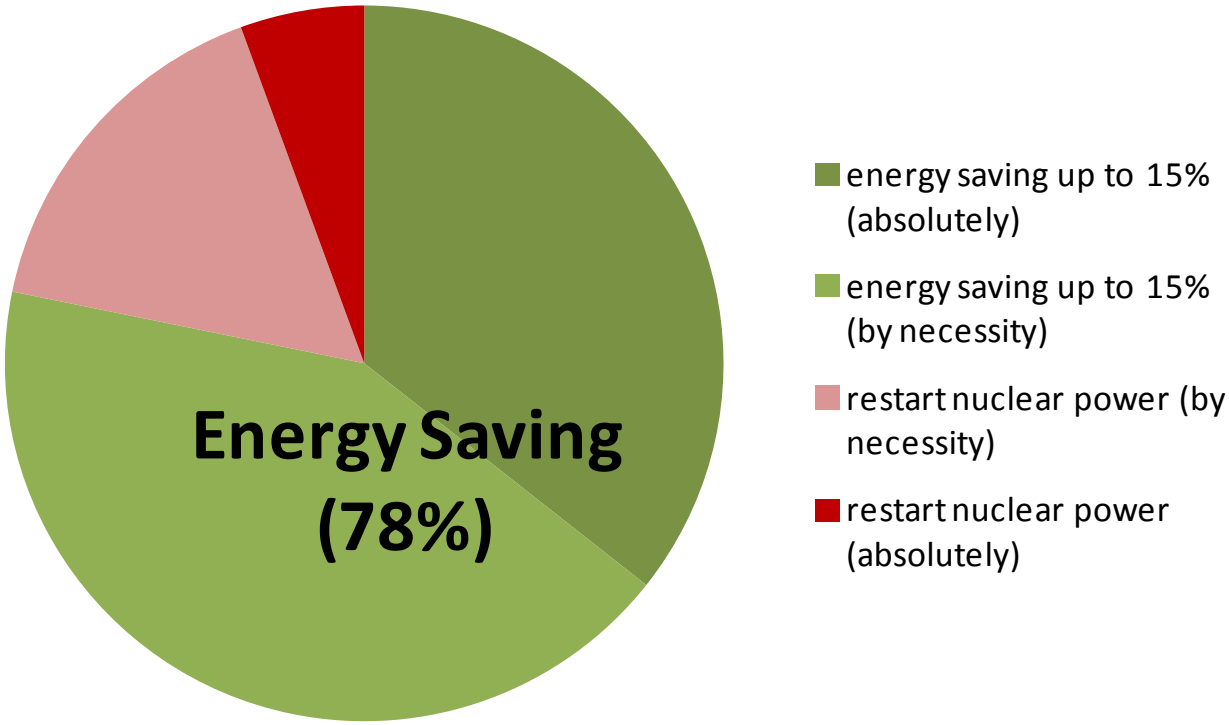
Public Opinion Poll

- Which do you prefer, restarting nuclear power or save electricity up to 15%?



Internet survey done by Marsh, Inc on September 21-22, 2011.
http://www.marsh-research.co.jp/examine/ex2309.html

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Should we restart now?

- 60-75 % of people are against restart currently.
  - → need more inspection or regulatory
  - → no restart
- If the summer 2012 is VERY hot, 20% of the peak power is estimated to be short to the demand in Kansai (inc. Osaka) area.
- If the summer is not too hot, 5-6% shortage in Kansai area.

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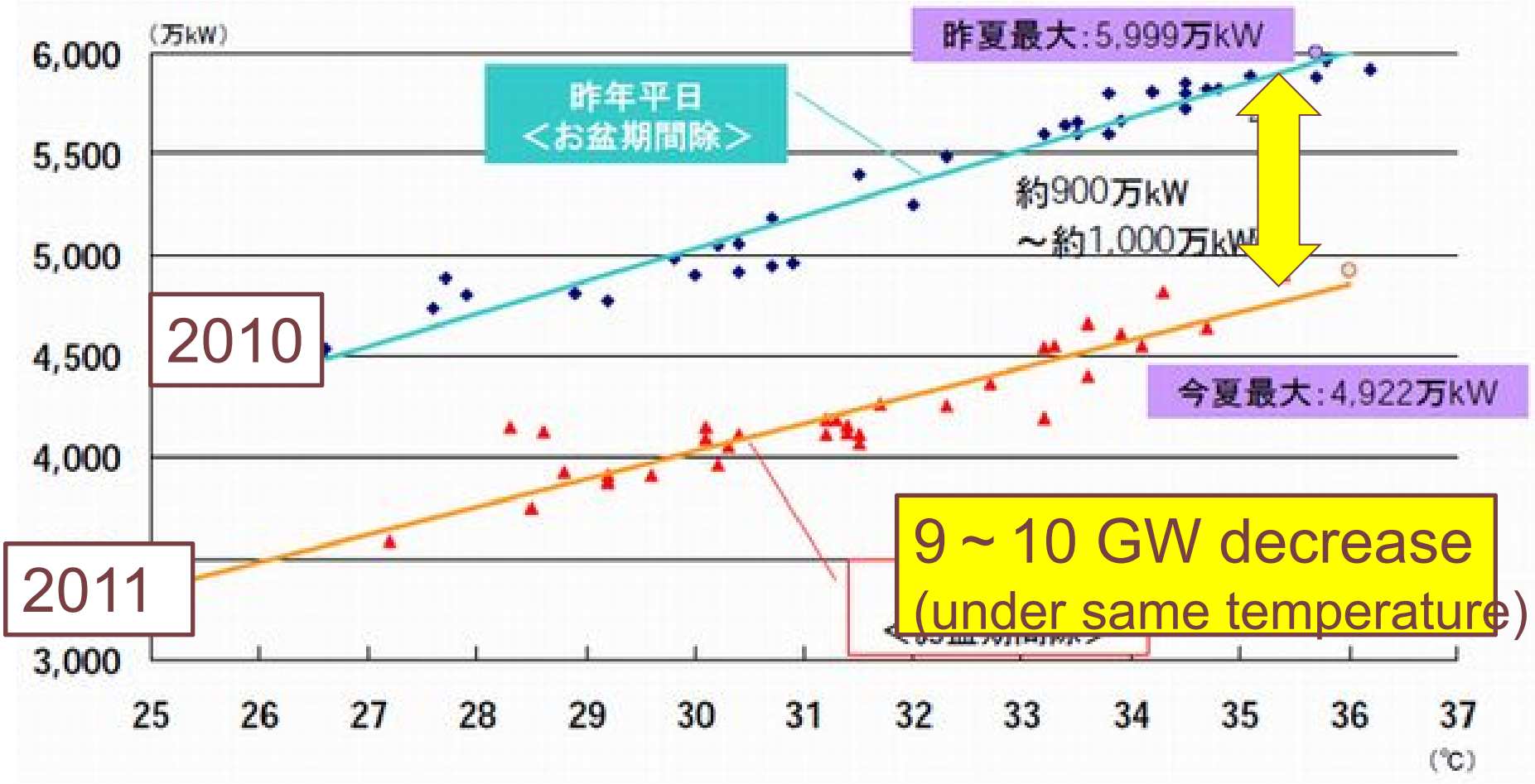
Reference Information

Electricity was saved under same temperature



Source: TEPCO

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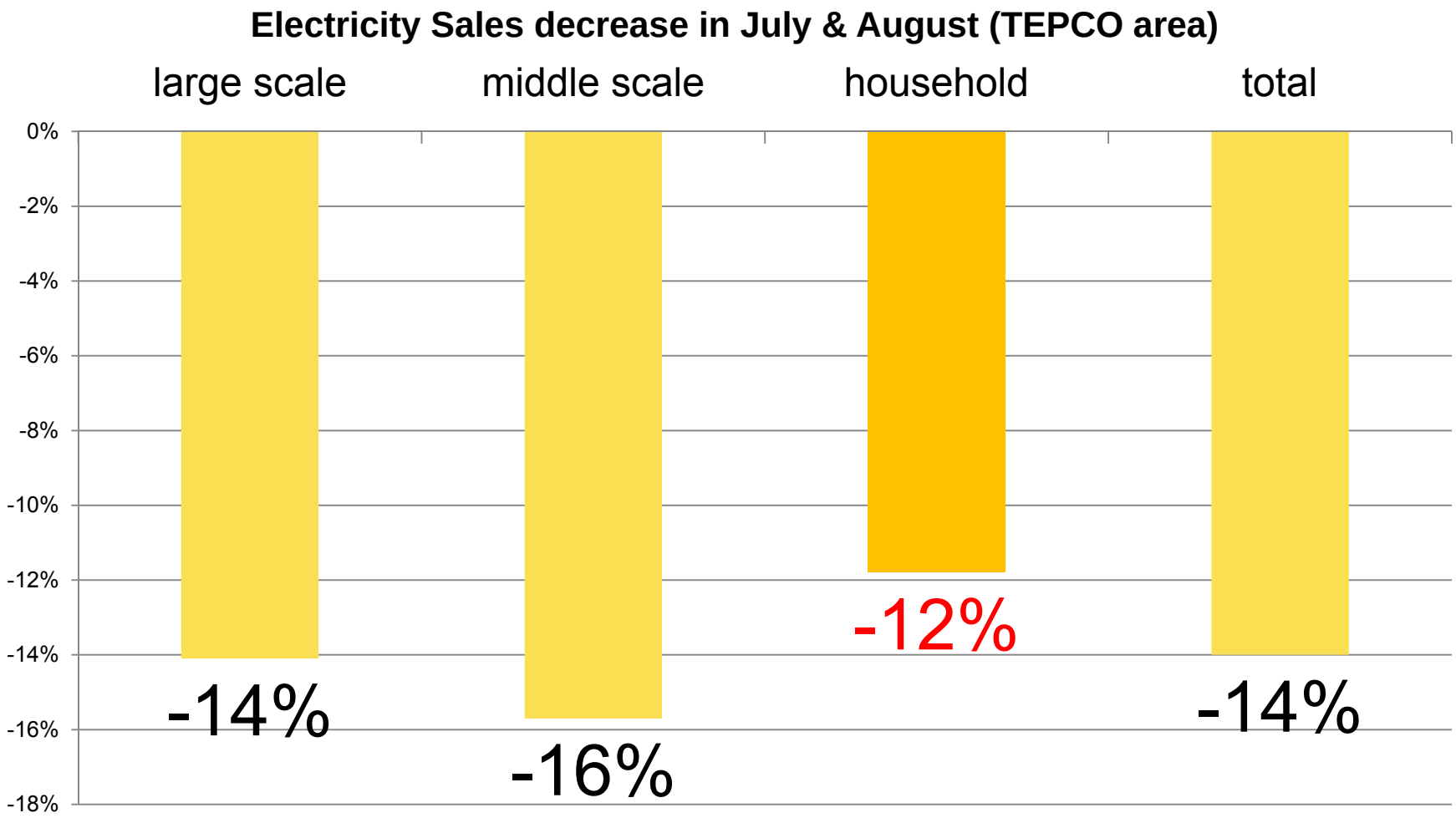
Reference

Saving Efforts in all sectors



Source: TEPCO

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Feed-in Tariffs

2003 — RPS (to set target % of renewables) started

2009.11 — FIT for Surplus electricity from rooftop PV

2012.7 — FIT for all* renewables

* non-household owned PV, wind power, biomass power, small-hydro, and geothermal.

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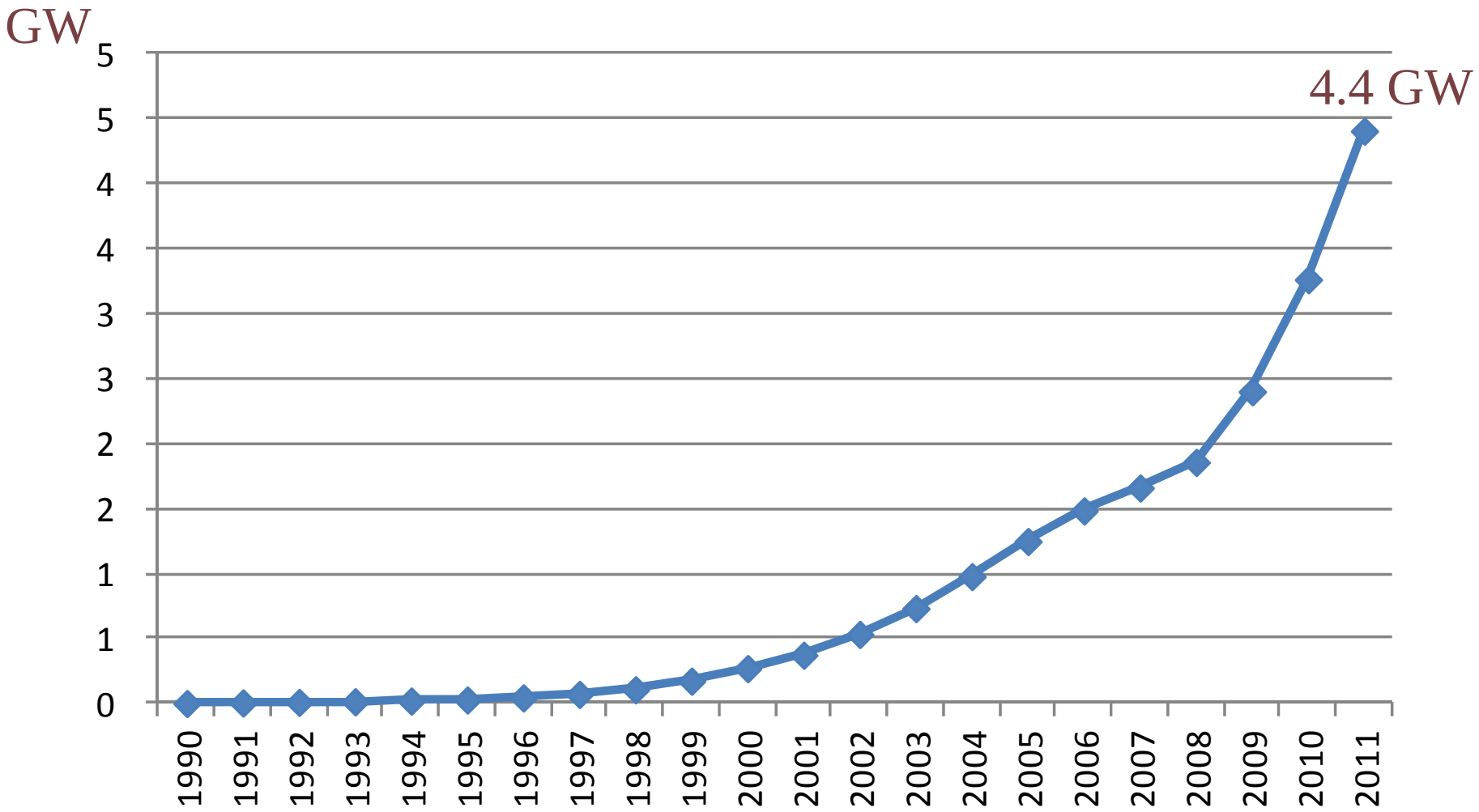
Rooftop PV (cumulative)



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Renewables are not minor anymore

Renewables

Rooftop PV	7 GW
Mega-Solar	3 GW
Wind Power	5 GW
Biomass Power	5 GW

20 GW

2013 estimated capacity
(30% increase since 2011, every year)

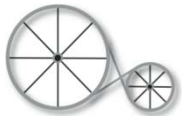
Nuclear

49 GW ➡ **25 GW**

2010 capacity

Moderate Scenaio (2015)

*estimate by GDL.



Summary (inc. personal opinion)

- Nuclear power has a difficulties to “restart” from regular inspection, and will likely to be 0 plants under operation in early May.
- We are now revising Strategic Energy Plan of Japan (old version 2010.6) before summer of 2012.
- 0% to 35% of nuclear ratio (electricity) is considered, but because of the chairman is from iron&steel, it is likely to be around 20%.

- There are no discussion about nuclear waste, and fuel cycle yet.
  - Everything about nuclear (Rokkasho, nuclear power plants under construction, etc.) is suspended or stopped by other reasons.
- It is very important to show backend situation of nuclear power, with numbers.

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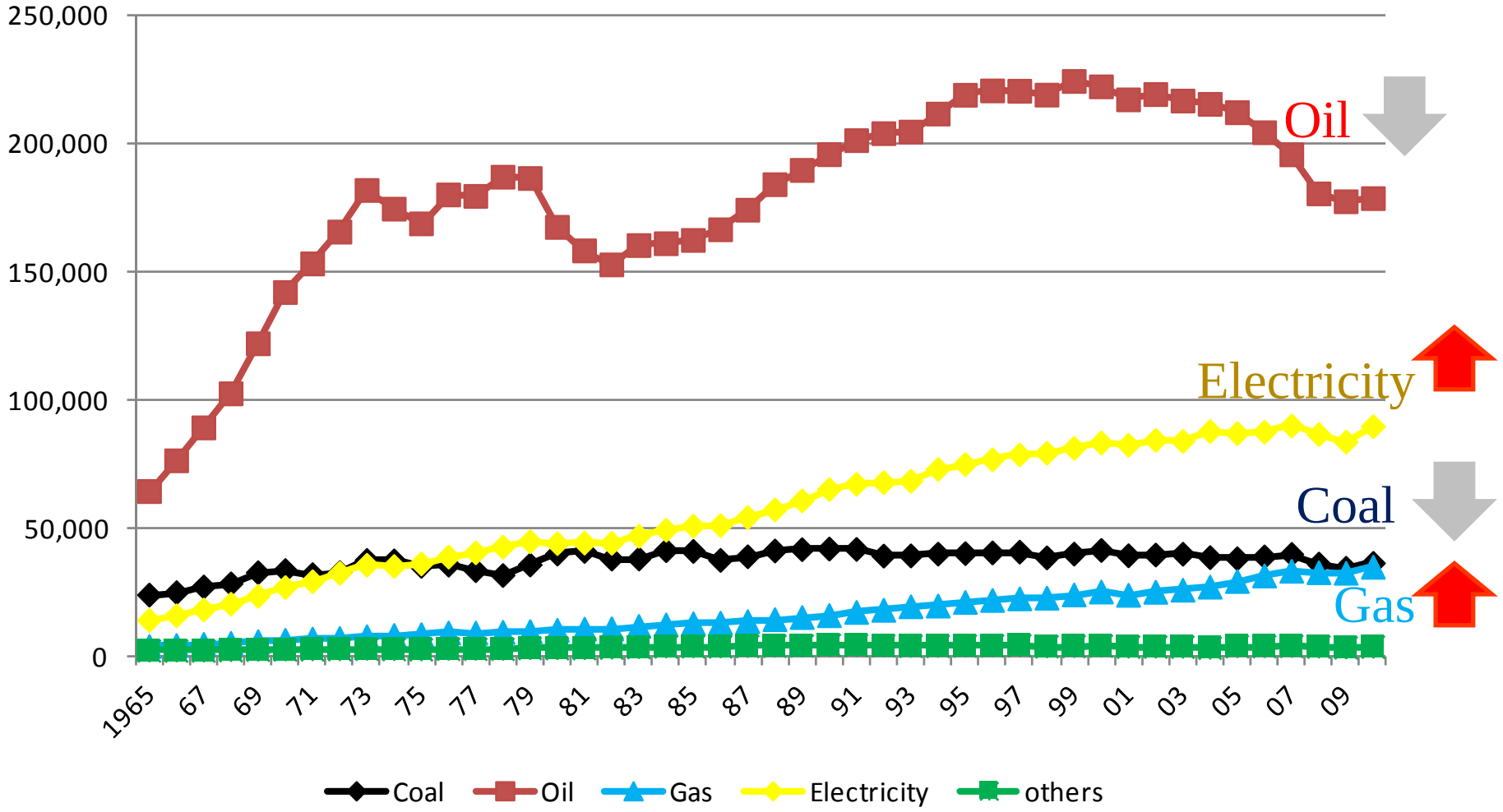
Reference: Final Demand by Sources



Oil and Coal is decreasing, Electricity and Gas is increasing.

Source: EDMC/IEEJ, EDMC Handbook of Energy & Economic Statistics in Japan 2012

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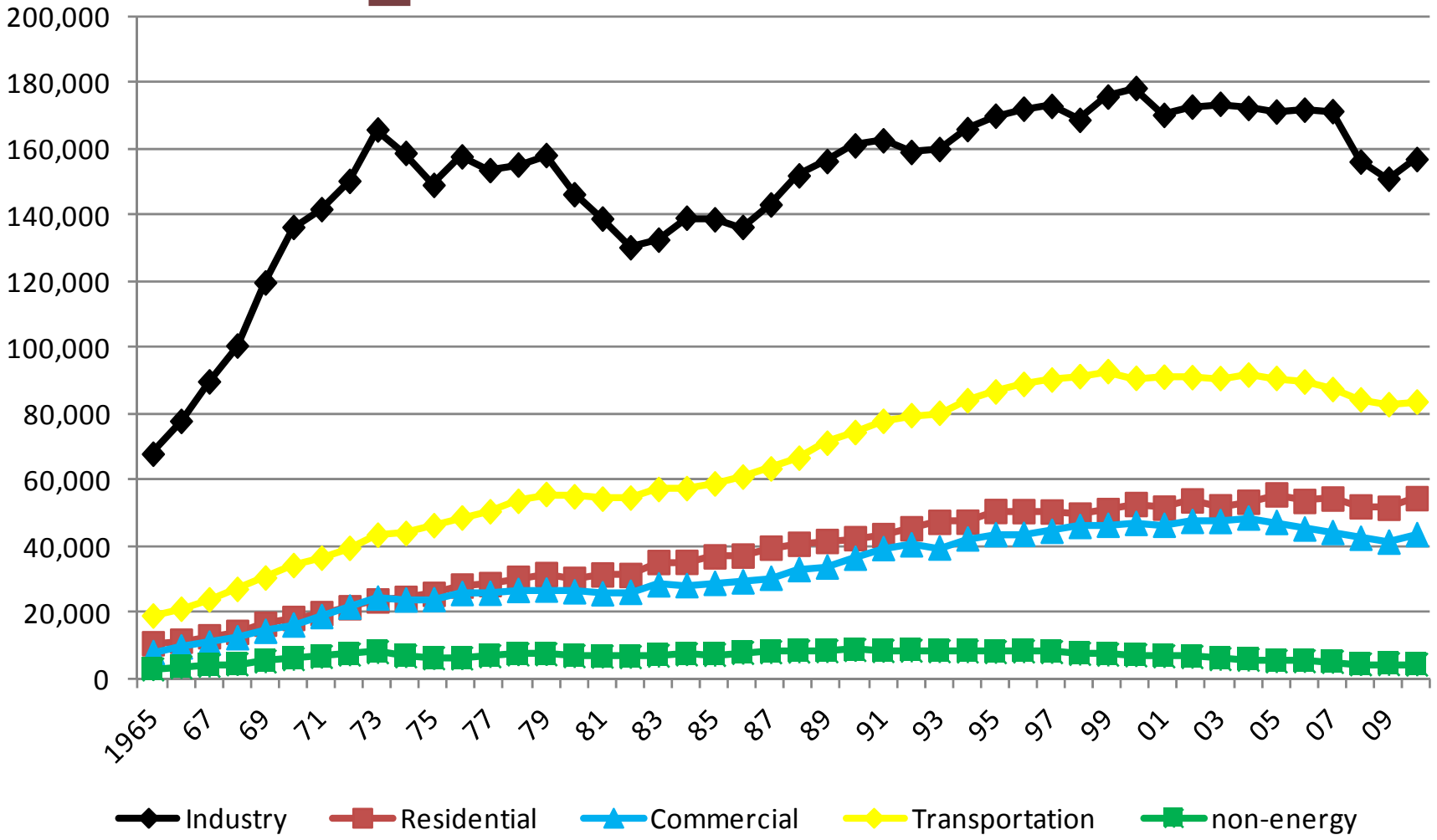
Reference: Final Demand by Sector



Demand in industrial sector decreased after 2008.
Demand in Transportation sector started decreasing.

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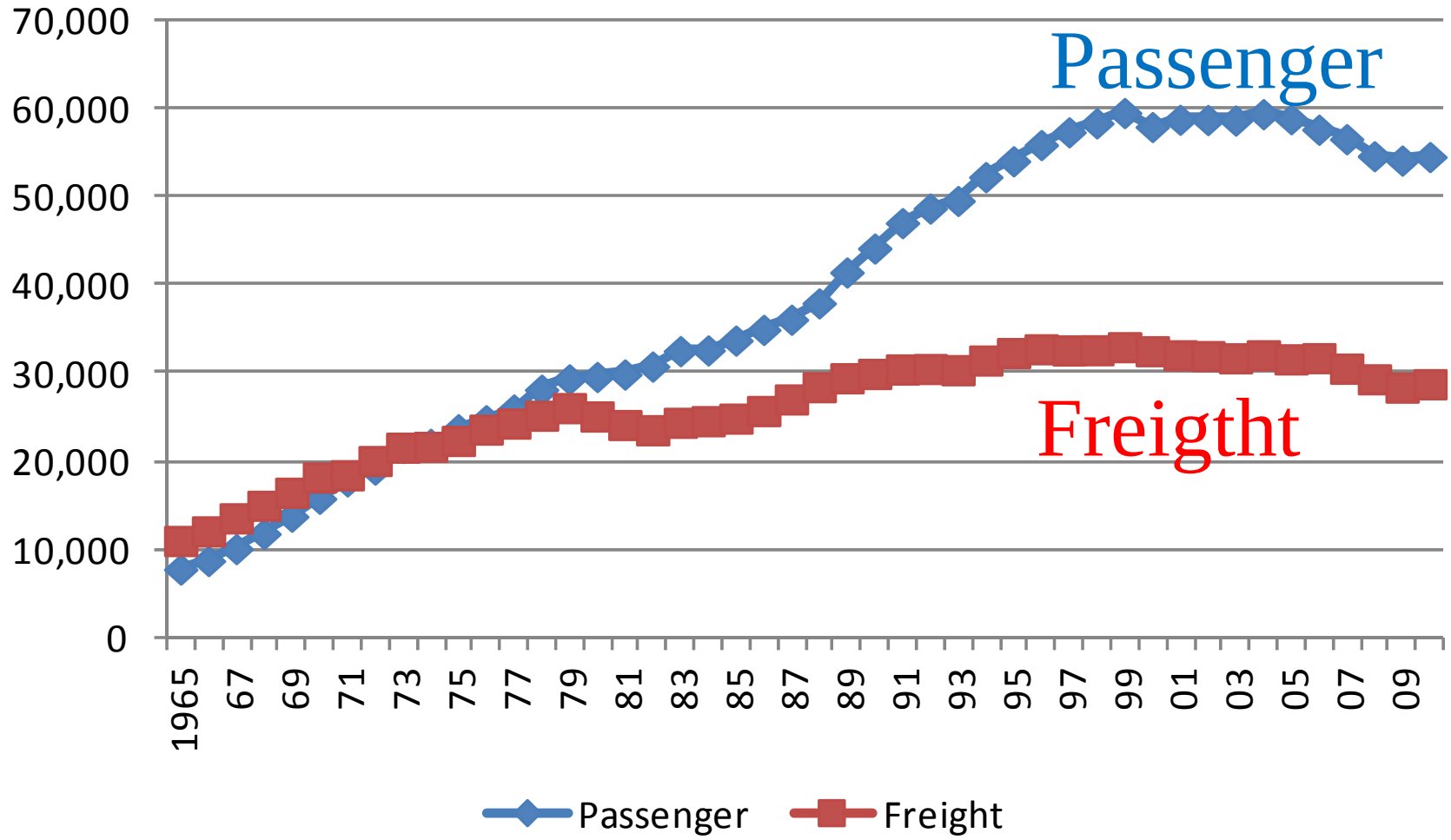
Reference: Passenger and Freight



Energy demand in Freight sector is stable since 1978.

Energy demand in passenger sector stopped increasing since 1998.

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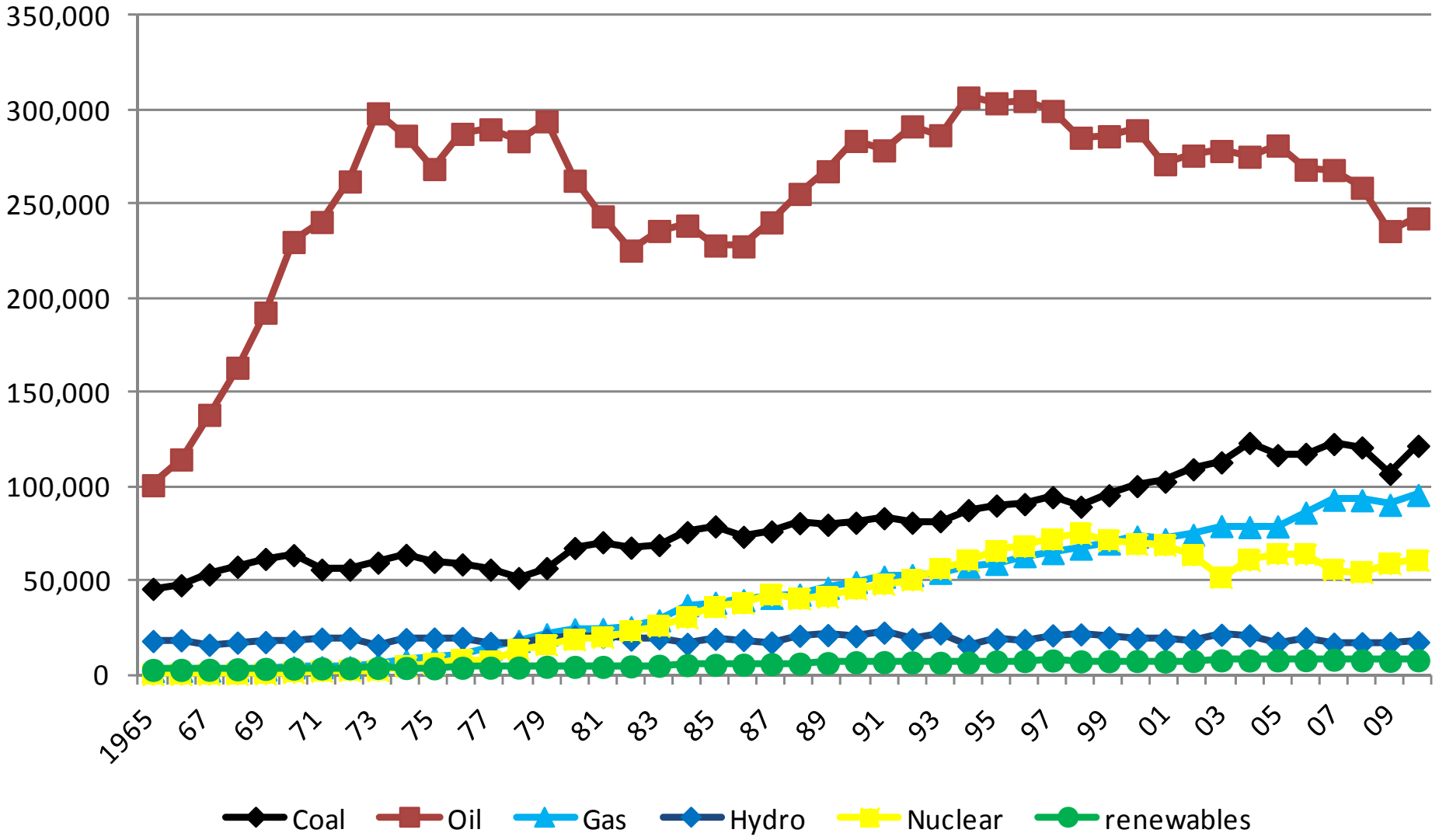
Reference:Primary Energy Supply



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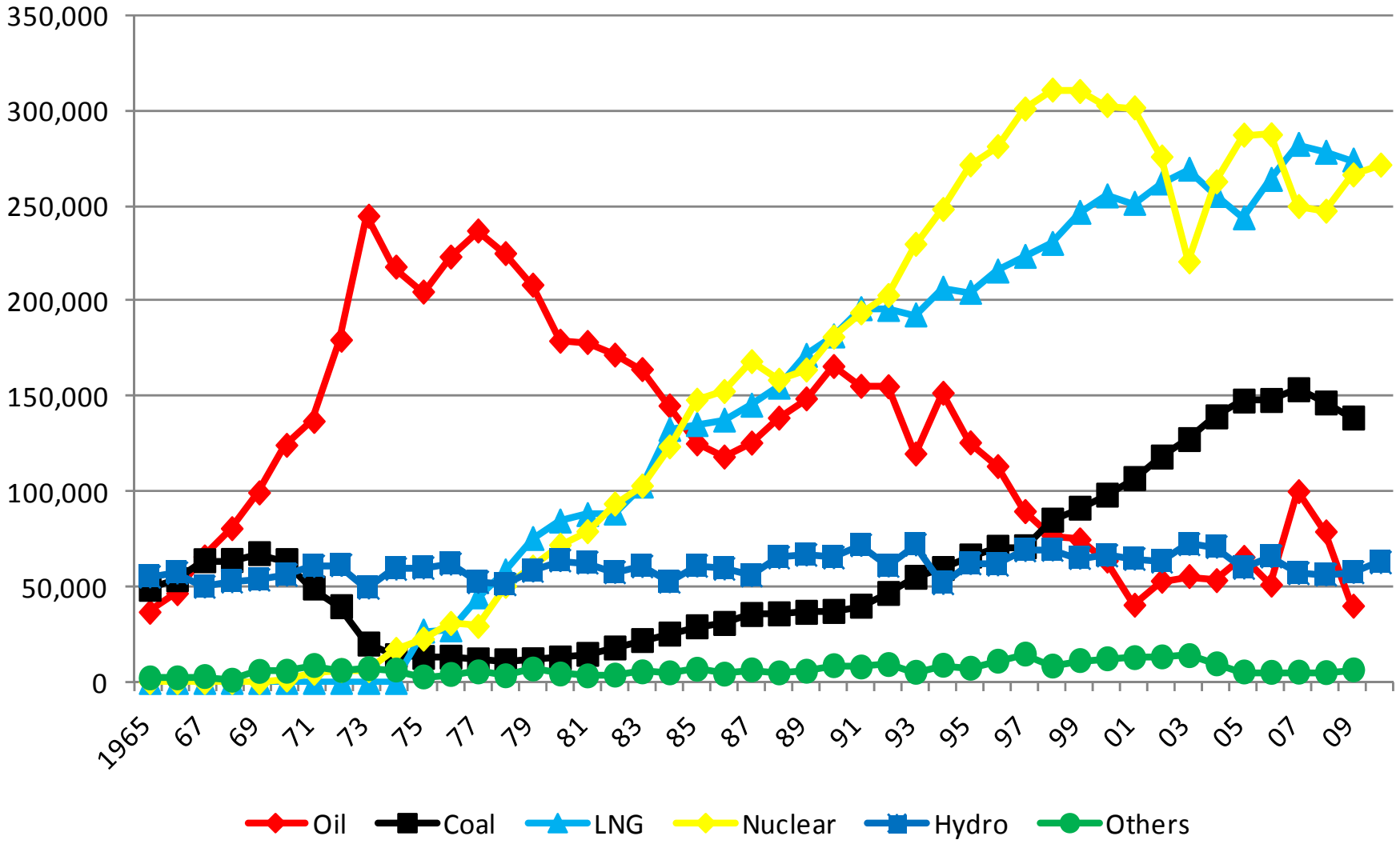
Refrence:Electricity by Source



Japan LEAP Model

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Japan LEAP Model

- Software: LEAP (the Long range Energy Alternatives Planning System)
- Calculate bottom up energy demand, and energy supply to satisfy the needs under the condition described in the model. (no optimization, but there are “rules”.)
- Base data :now updating to 2010 -->calculate to 2030

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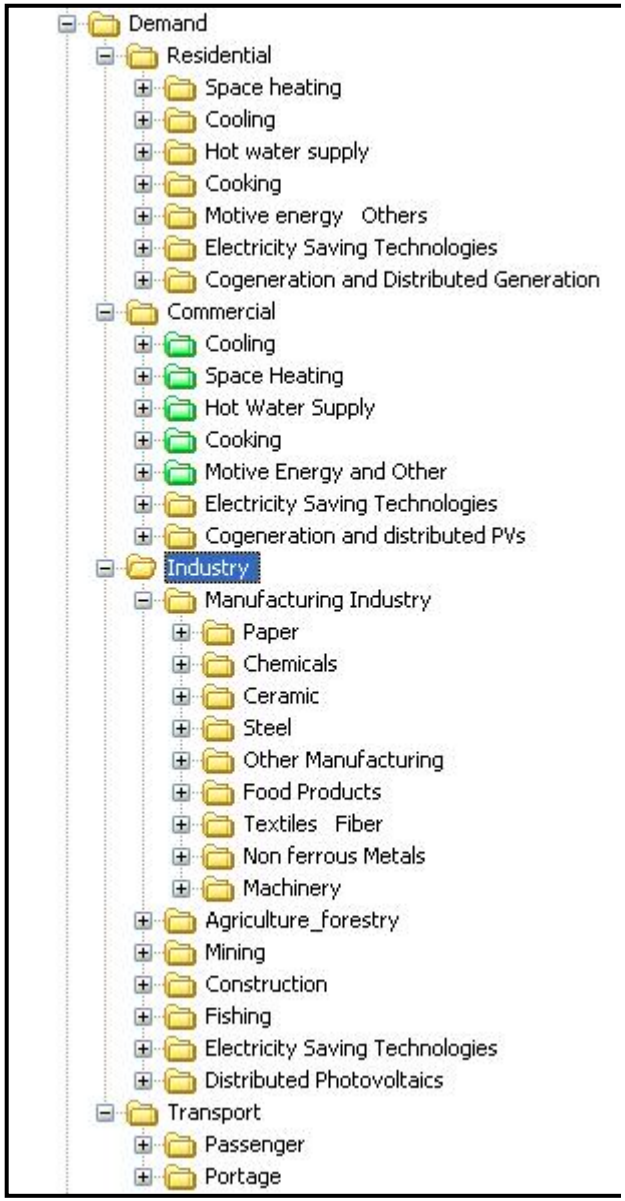
Demand Structure

- Demand = unit energy use X activity level.
- Residential & commercial sectors are divided into 5 usages.
- Industrial sector is divided into 13 sectors.
- Transport sector is divided into passage & portage.



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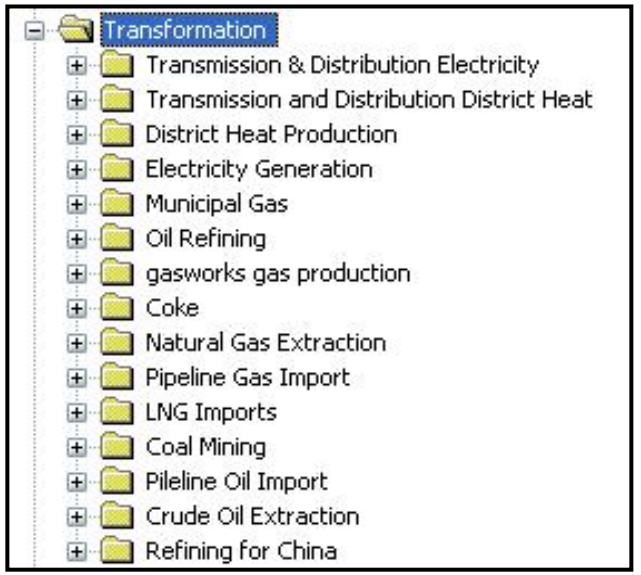
Supply Structure

- Transformation:
  - Electricity generation, oil refinery, etc.
- Resources:
  - Underground fossil fuel resources.
  - Renewable annual yields.



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Scenario Structure

		Policy for Renewables and Energy Savings	
		Aggressive	Modest
Nuclear	Maximum	1	
	Modest	2	4
	“Zero”	3	5

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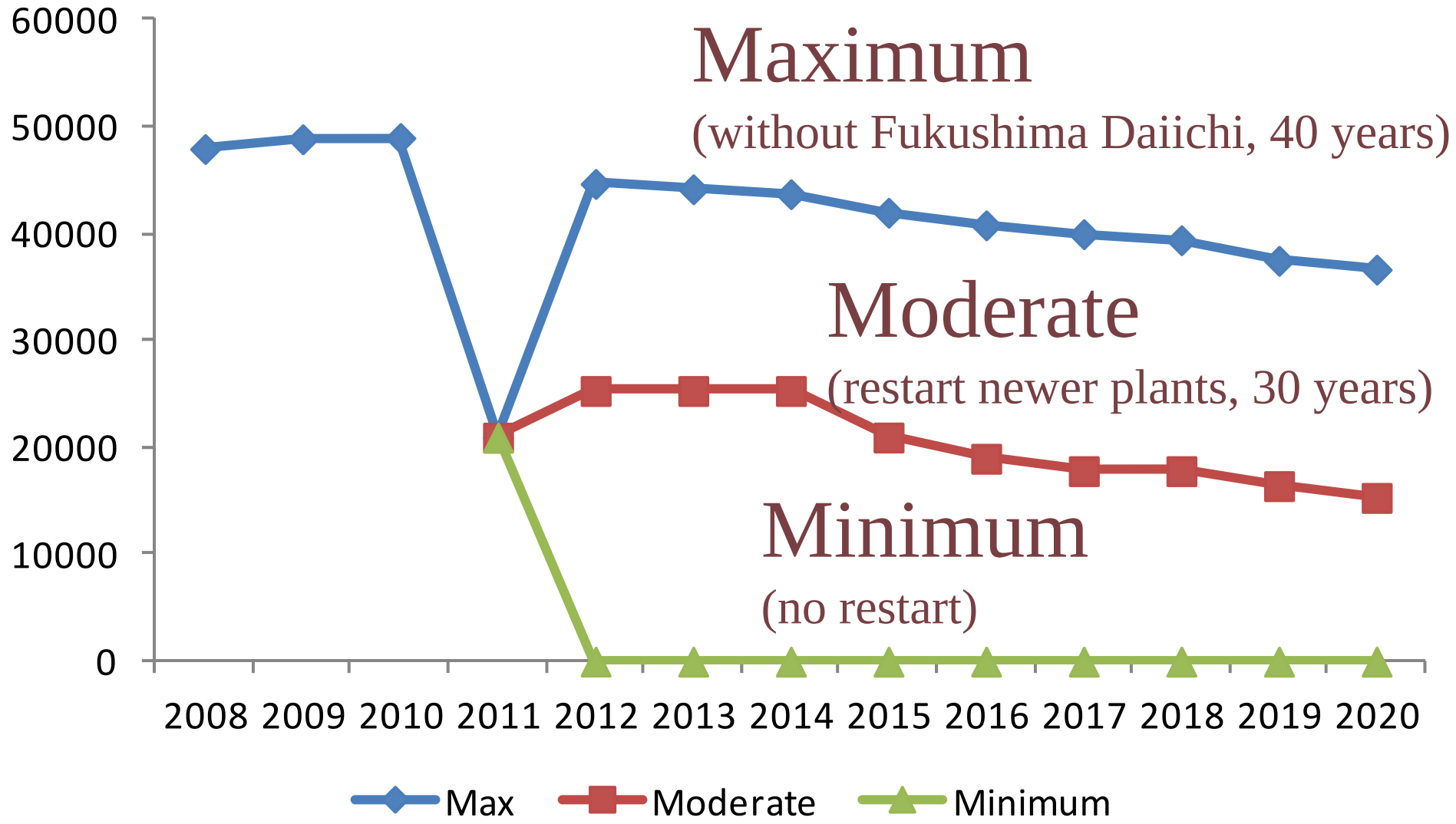
Nuclear Scenarios (draft)



*2011 data: average capacity of plants under operation.

** Actual scenarios are to be fixed after the discussion within Japan team.

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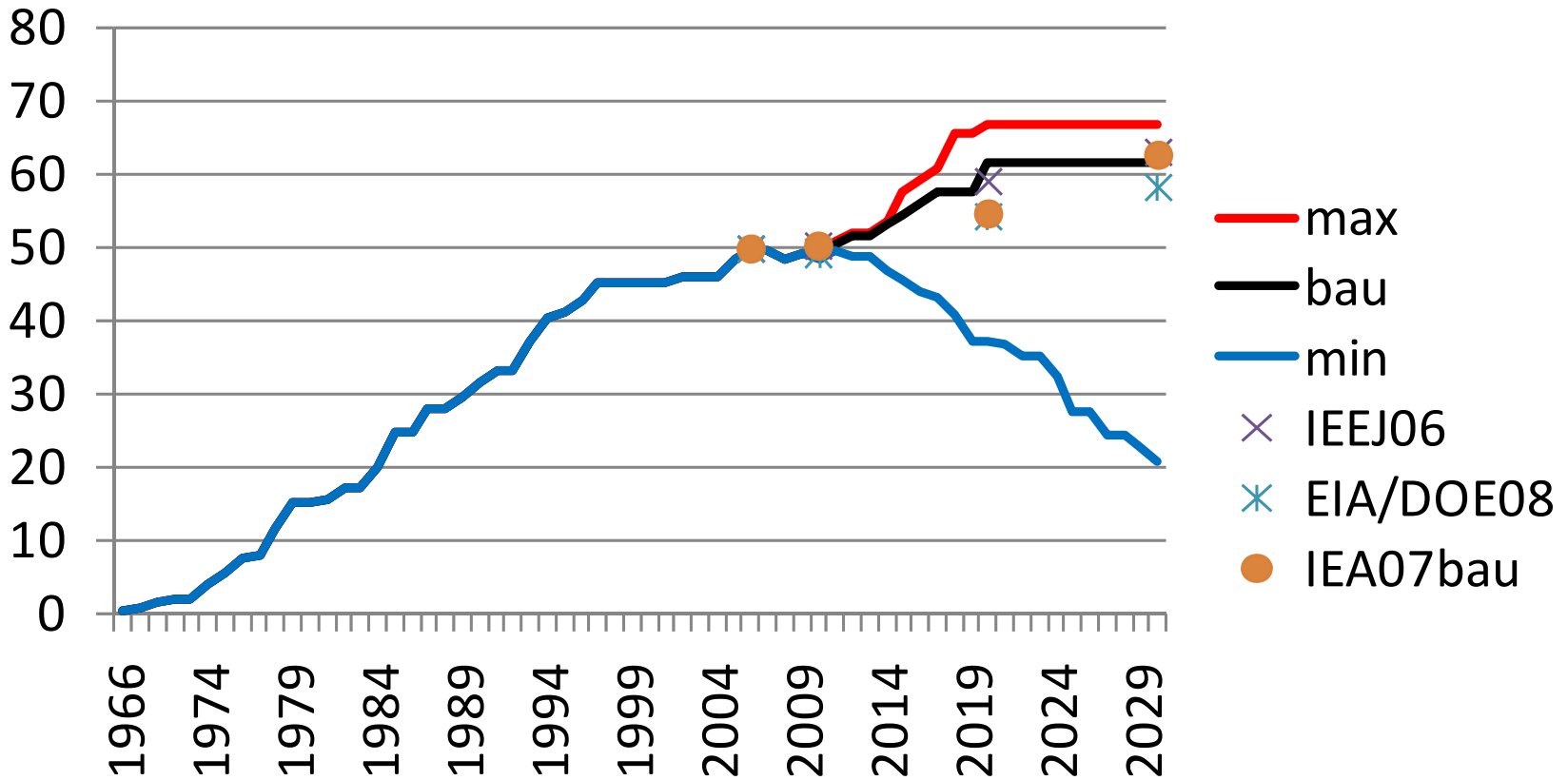
Previous Scenarios for Nuclear

- Minimum: +3 by 2020, 40 years operation.
- BAU: +10 by 2020, 60 years operation.
- Maximum: +14 by 2020, 60 years operation.
- **Maximum** is close to “Energy Basic Plan”.



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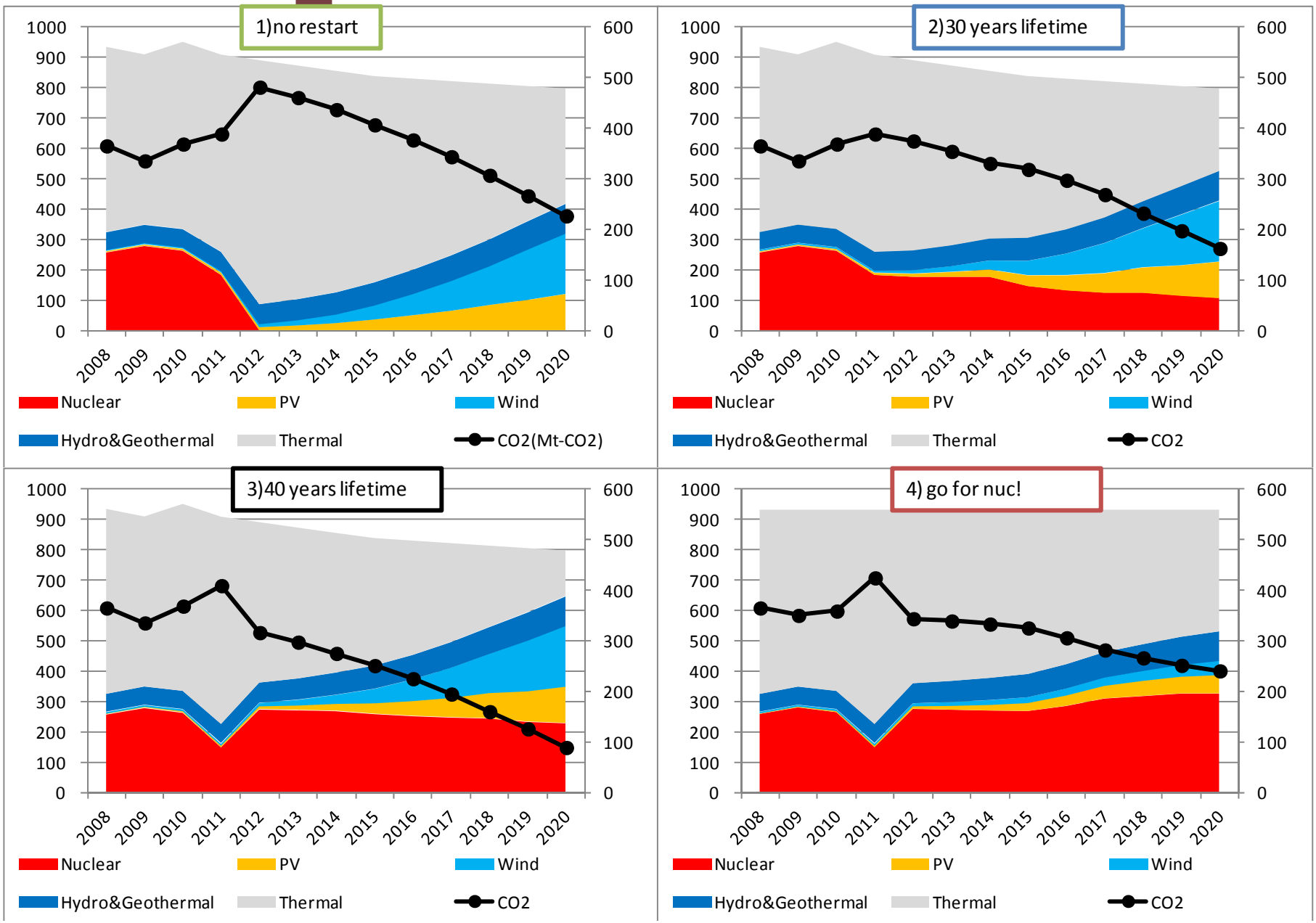
Electricity by Source -2020



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Overview