IAEA Technical Mtg. on Best Practices in Media and Public Communication for Nuclear Power Programs,
Fukui, Oct. 5, 2015

Utilization of Nuclear Energy and Public Communication

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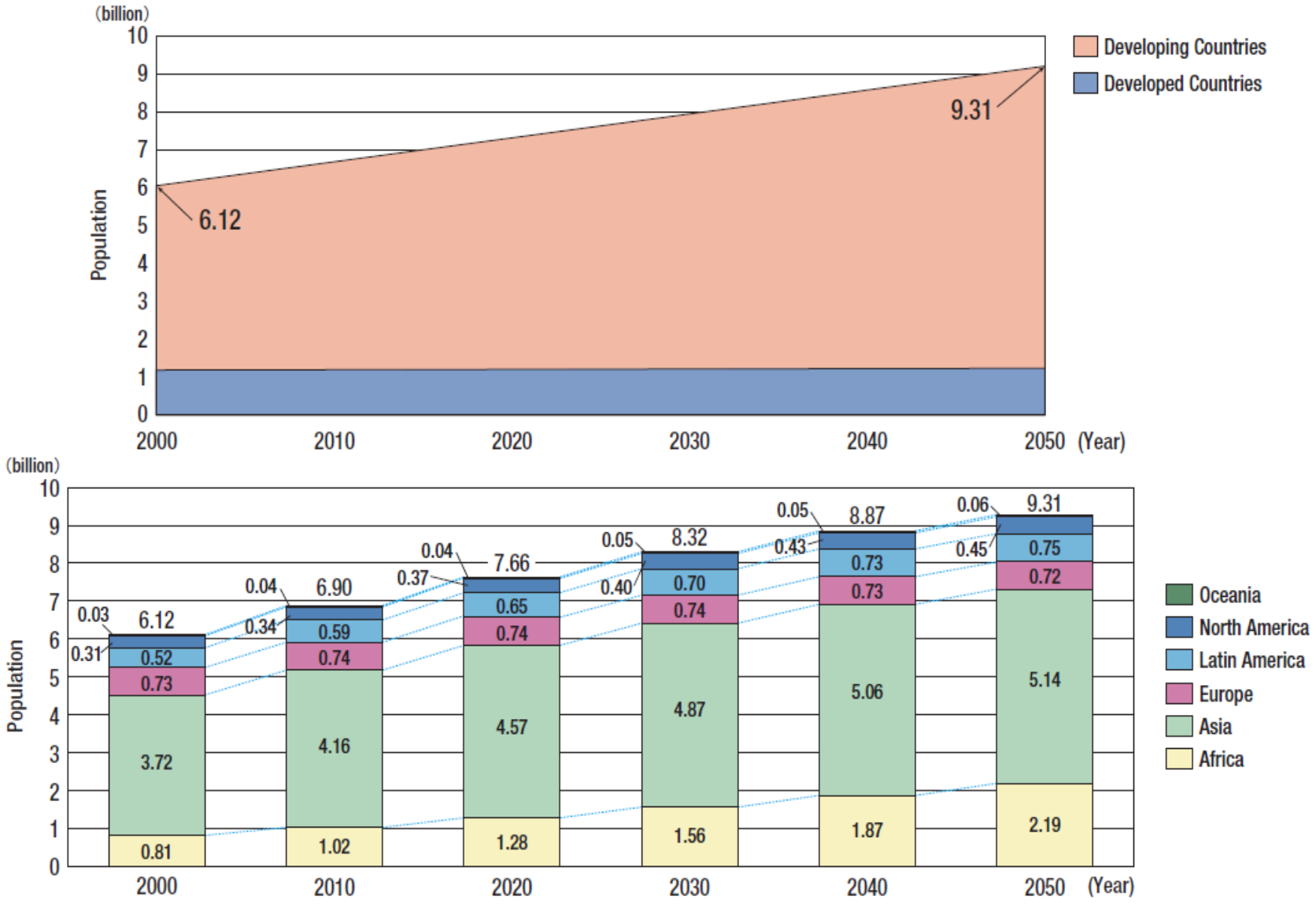
The views expressed here are of my own and do not necessarily reflect those of JAEC nor the government

Contents

- Energy demand outlook, energy security
- Global warming
- Electricity prices/cost
- Nuclear power utilization
- Advances in LWR technologies
- Risk communication/public information

World Population Projections

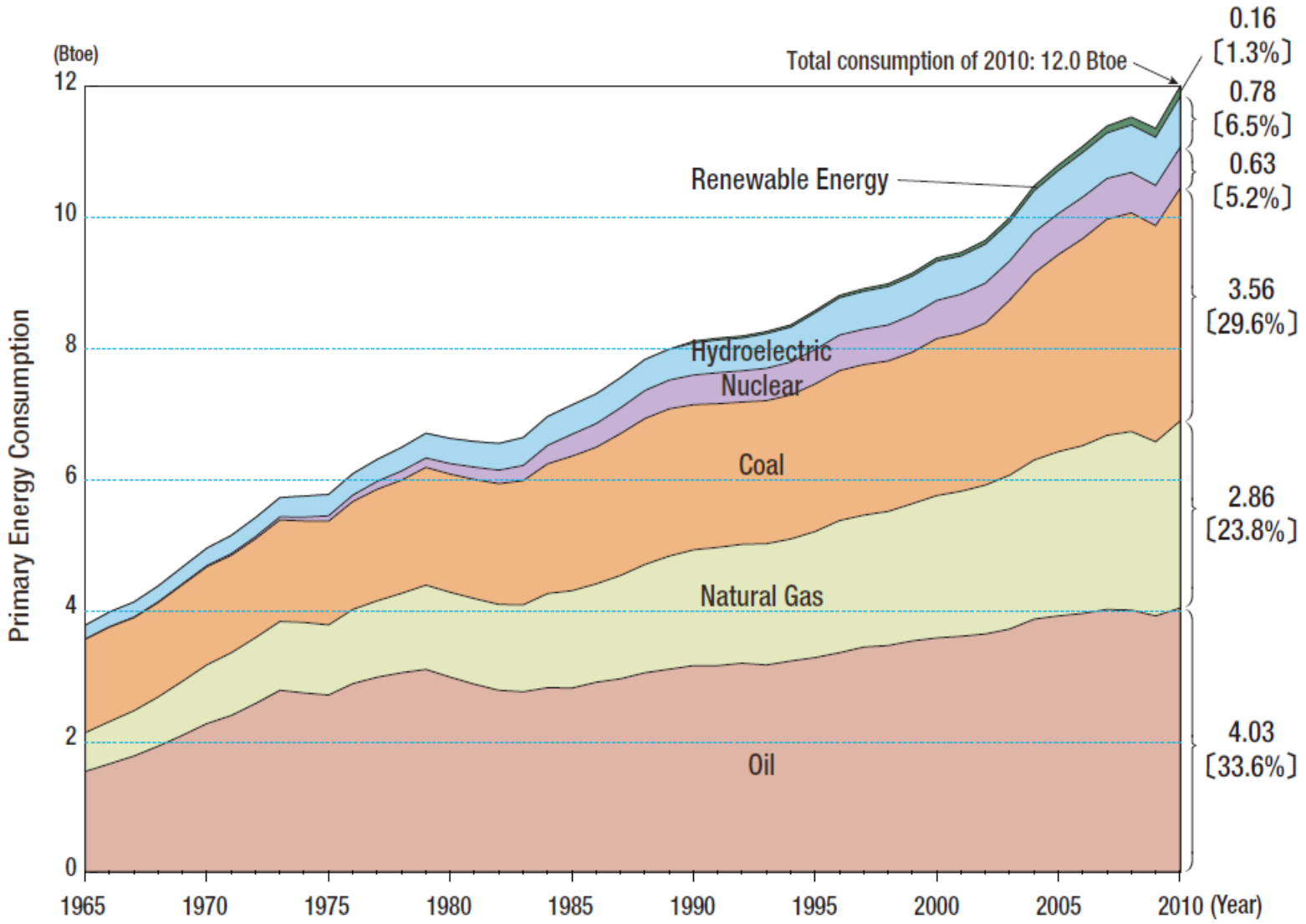


(Note) Figures may not add up to the totals due to rounding.

Source: World Population Prospects "The 2010 Revision Population Database (DB)"

Source: http://www.fepc.or.jp/library/pamphlet/zumenshu/pdf/all_english.pdf

The World's Primary Energy Consumption

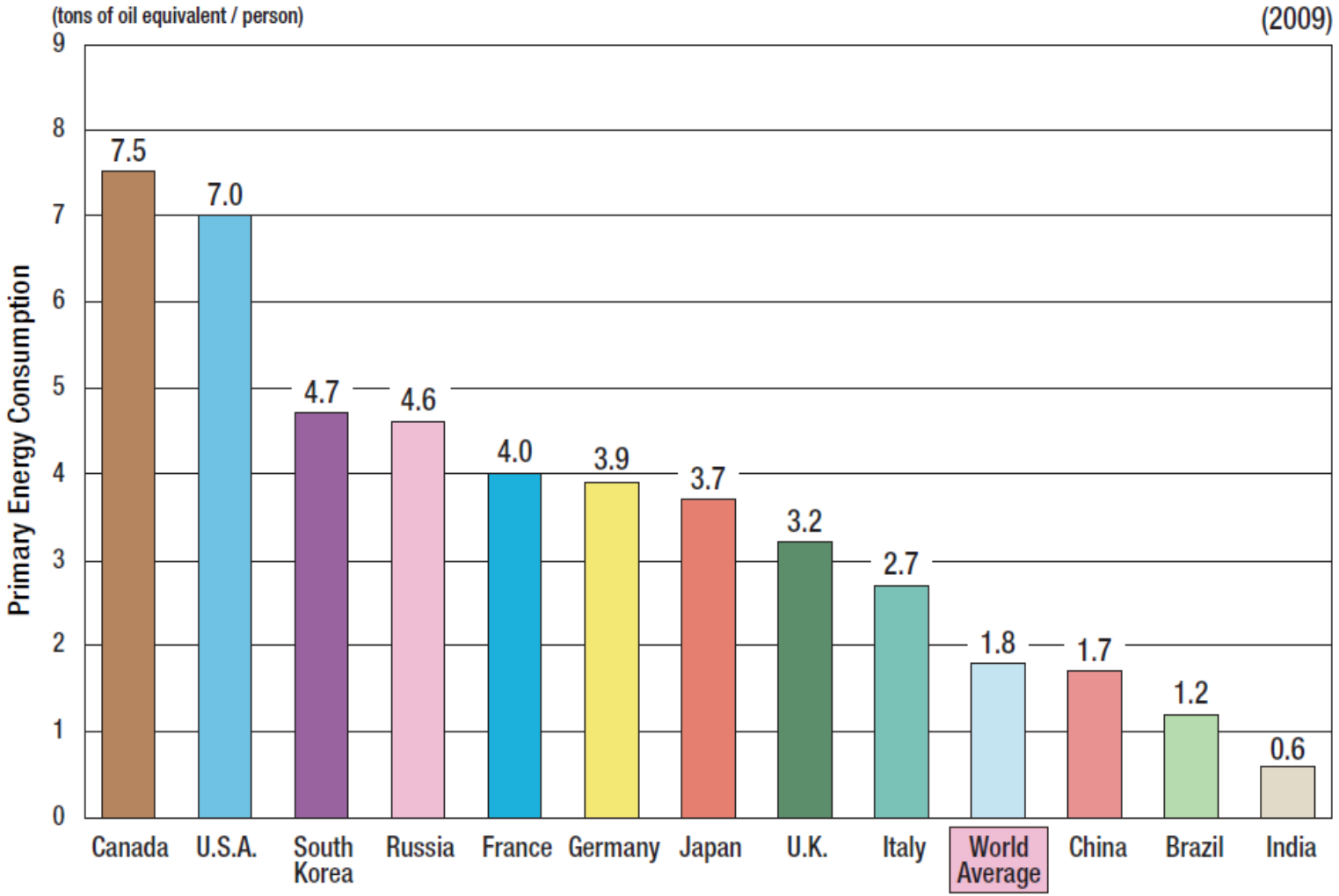


(Note) Figures may not add up to the totals due to rounding.
The figures in parentheses are share of total.
Btoe: billion tons of oil equivalent

Source: BP Statistical Review of World Energy June 2011

Source: http://www.fepc.or.jp/library/pamphlet/zumenshu/pdf/all_english.pdf

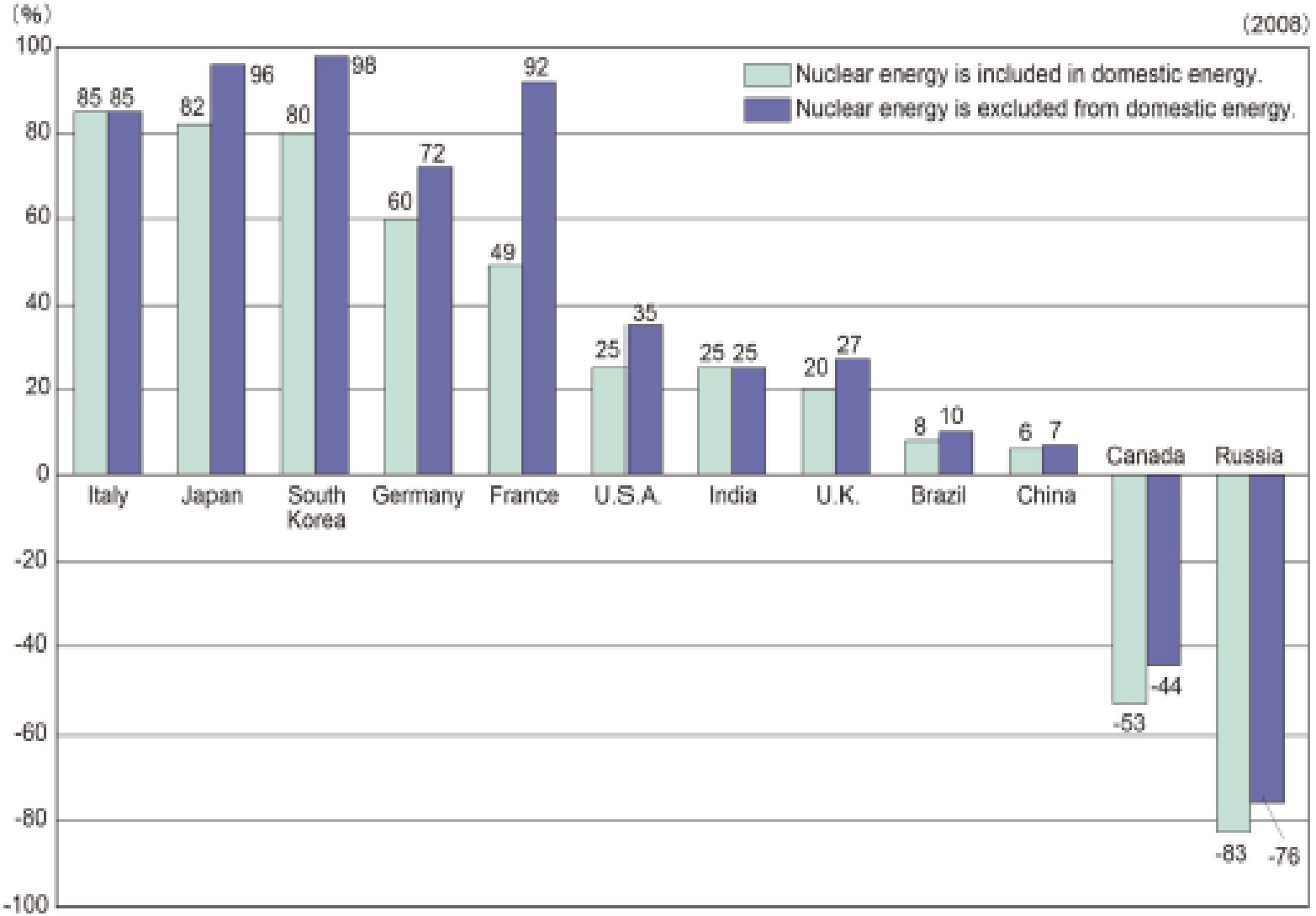
Primary Energy Consumption per Capita



Source: IEA "ENERGY BALANCES OF OECD COUNTRIES (2011 Edition)" / "ENERGY BALANCES OF NON-OECD COUNTRIES (2011 Edition)"

Source: http://www.fepc.or.jp/library/pamphlet/zumenshu/pdf/all_english.pdf

Dependence on Imported Energy Sources in Major Countries



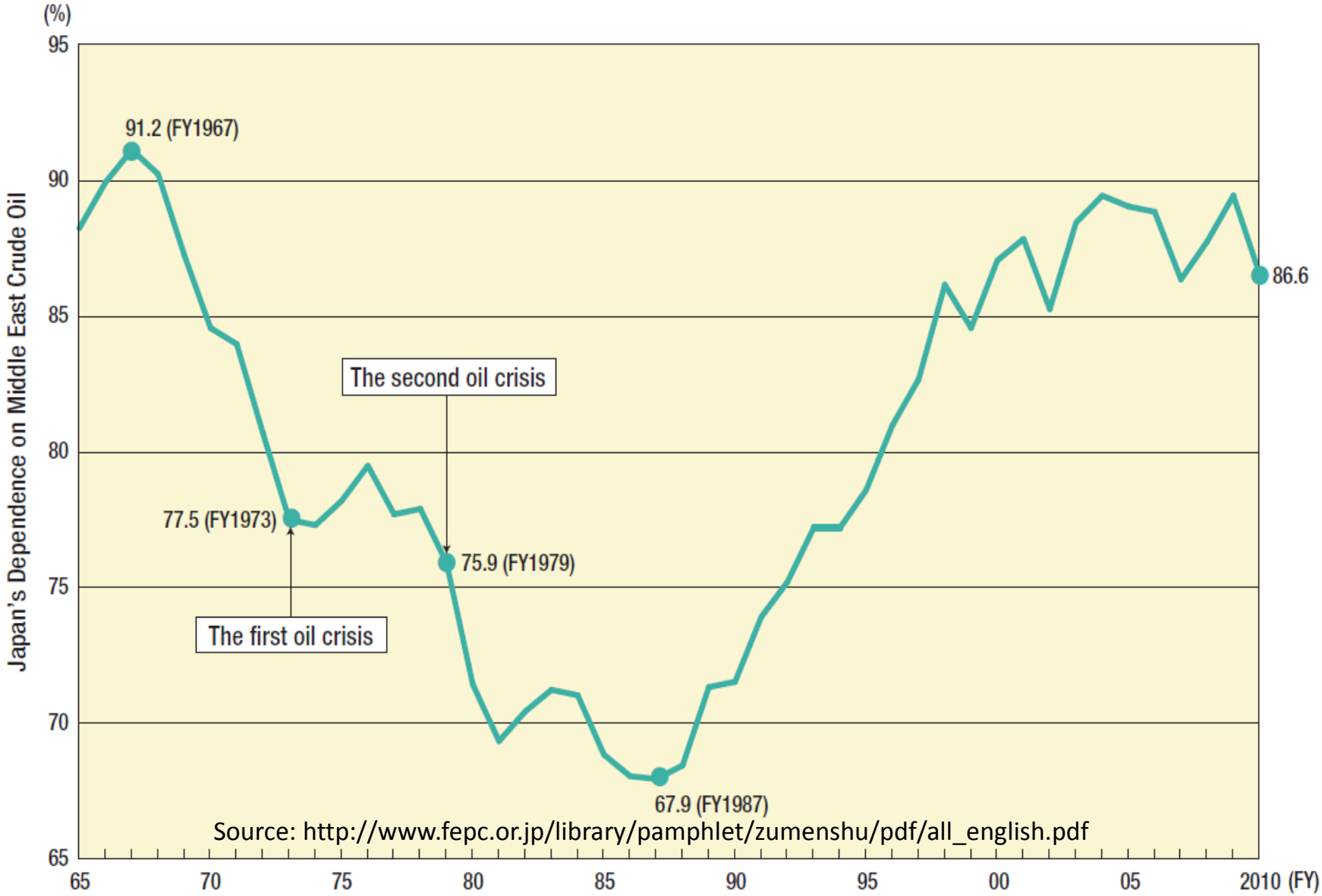
(Note) Canada and Russia are net-exporting countries.

Source: IEA "ENERGY BALANCES OF OECD COUNTRIES (2010 Edition)" / "ENERGY BALANCES OF NON-OECD COUNTRIES (2010 Edition)"

1-11

Source; http://www.fepc.or.jp/library/publication/pamphlet/nuclear/zumenshu/index.html

Japan's Dependence on Middle East Crude Oil of Total Imports

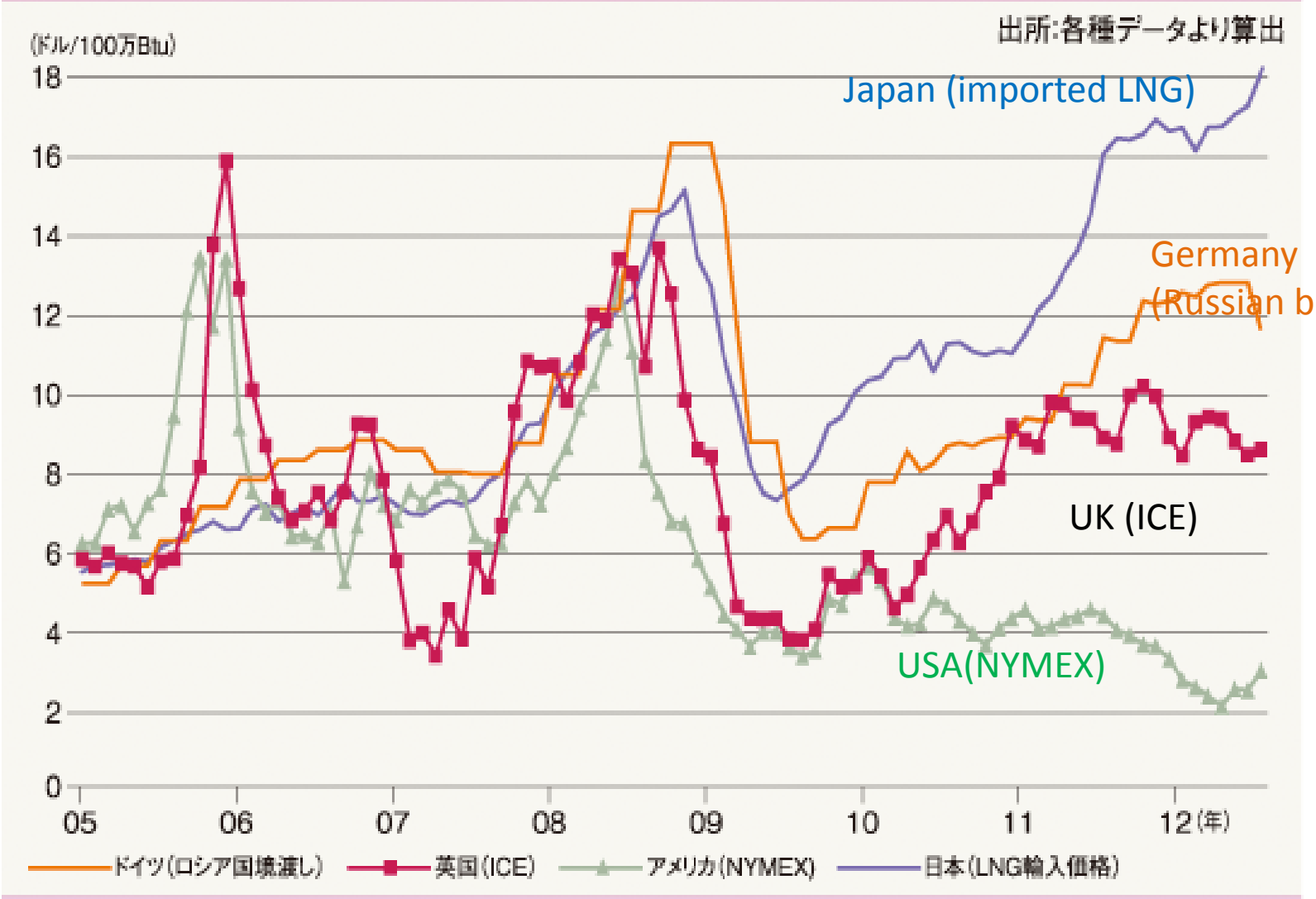


Source: http://www.fepc.or.jp/library/pamphlet/zumenshu/pdf/all_english.pdf

Source: Petroleum Association of Japan

Natural gas prices (2005-2012)

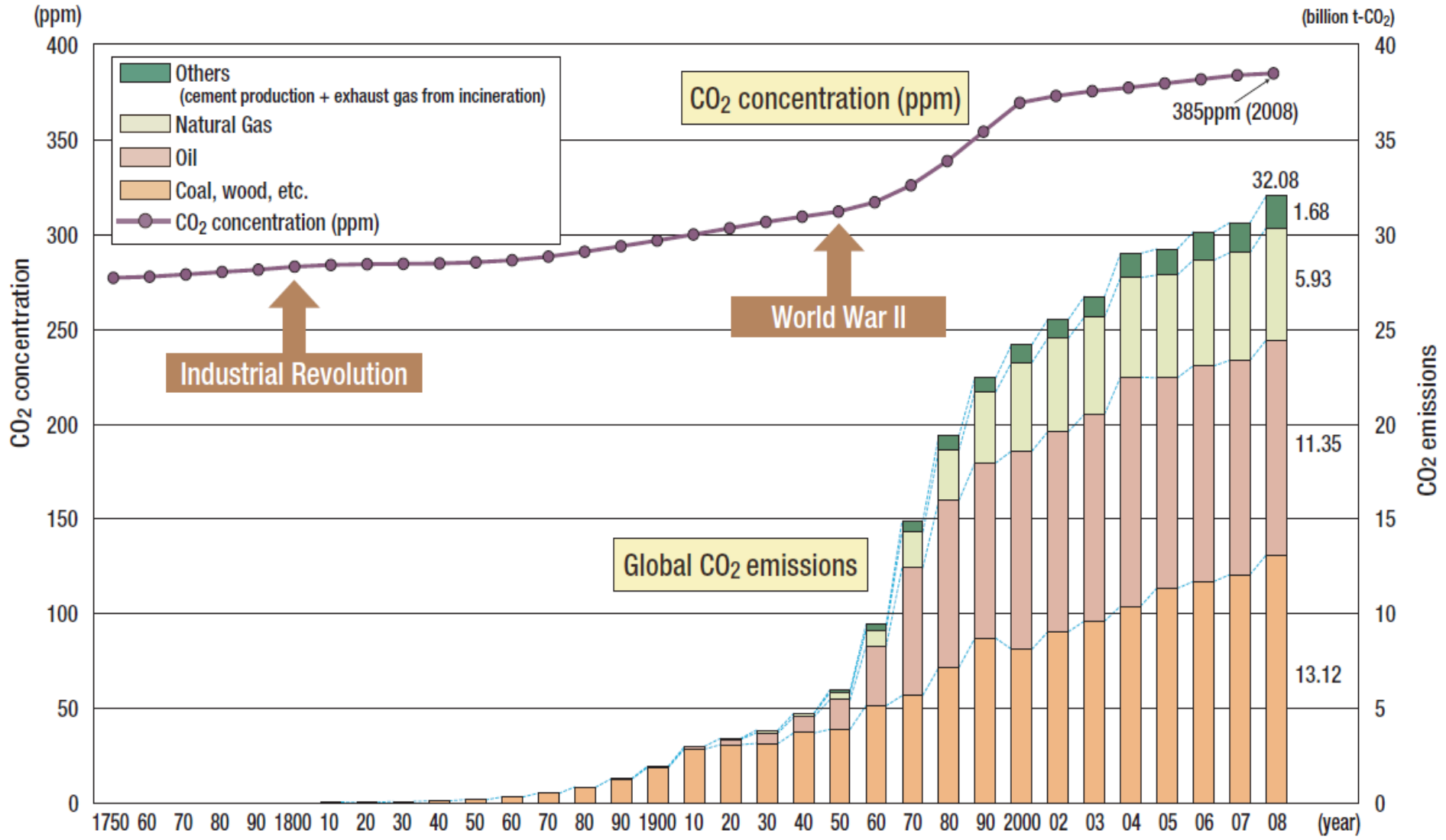
not stable



Source : JOGMEC, http://www.jogmec.go.jp/library/contents8_05.html

Global warming

Changes in CO_2 Emissions from Fossil Fuels and Atmospheric CO_2 Concentration



(Note) Figures may not add up to the totals due to rounding.

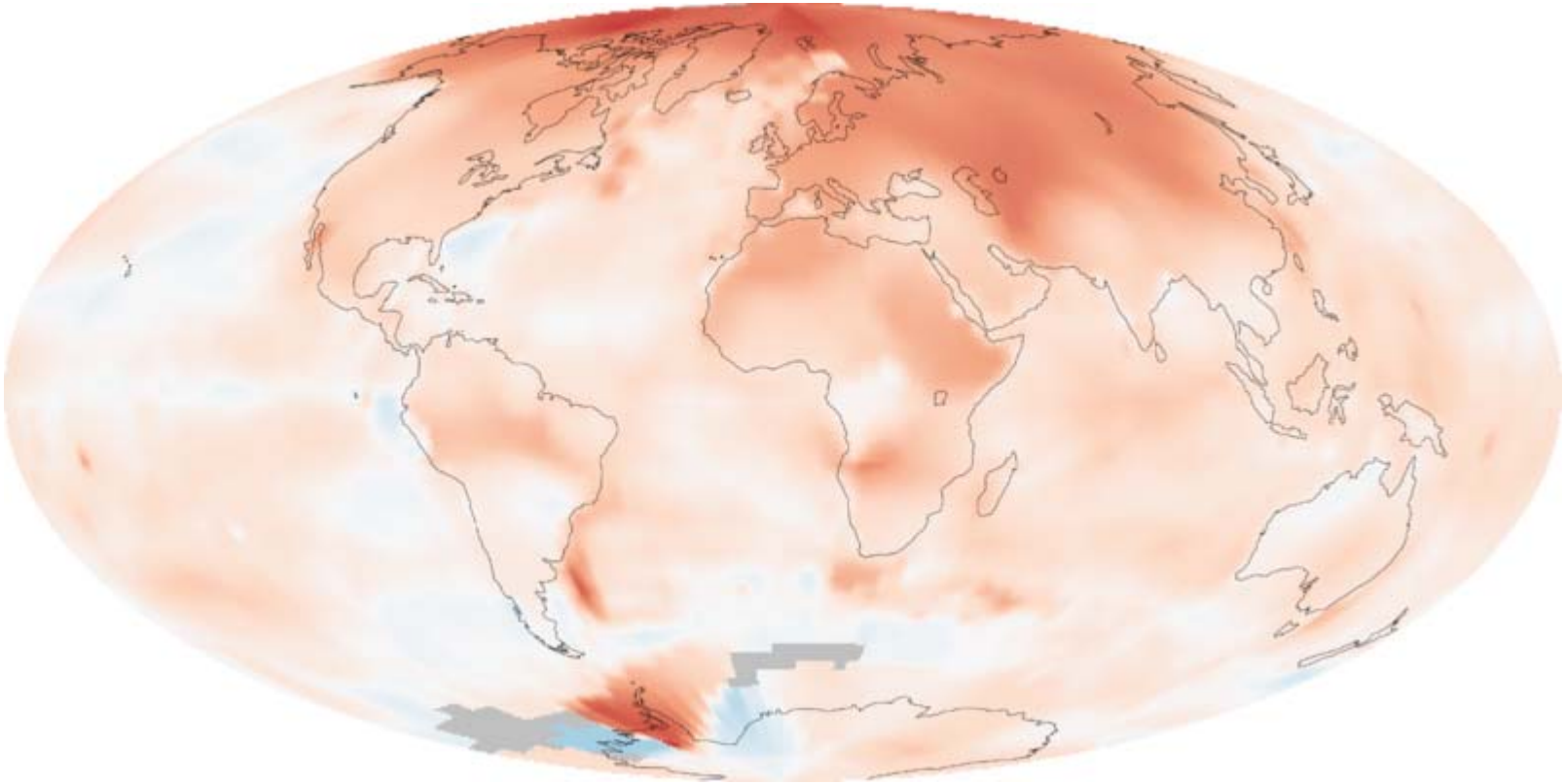
Source: CDIAC "Global Fossil-Fuel Carbon Emissions"

Source: http://www.fepc.or.jp/library/pamphlet/zumenshu/pdf/all_english.pdf

Temperature rise in 2000-09

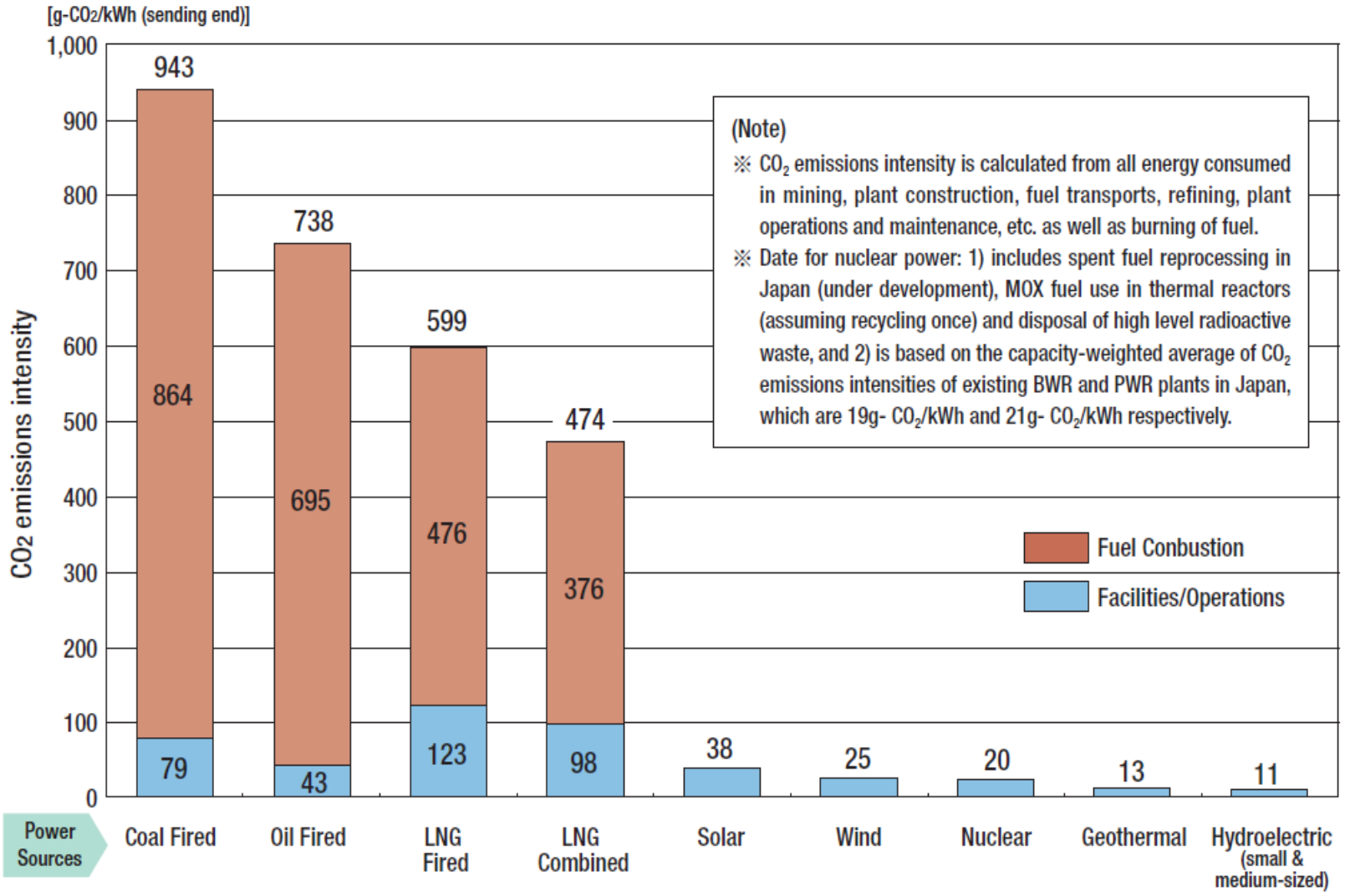
Compared to average temperatures recorded between 1951 and 1980

The most extreme warming, shown in red, occurs in the Arctic



Source: Wikipedia ; Global warming

Lifecycle Assessment CO_2 Emissions Intensity for Japan's Erergy Source

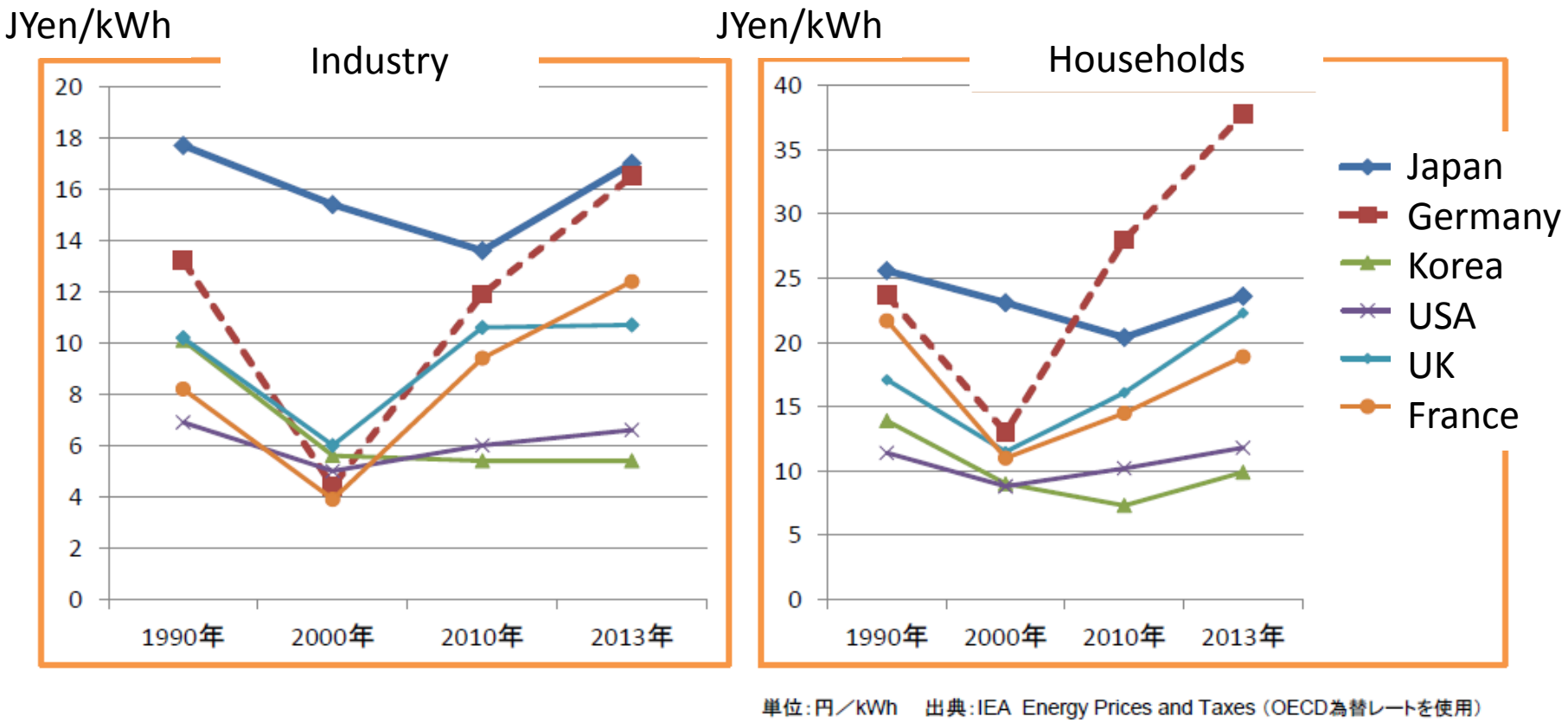


Source: Central Research Institute of Electric Power Industry "Evaluation of Life Cycle CO2 Emissiows of Power Genevations technologies (July 2010)"

Source: http://www.fepc.or.jp/library/pamphlet/zumenshu/pdf/all_english.pdf

Electricity prices/cost

Comparison of electricity prices

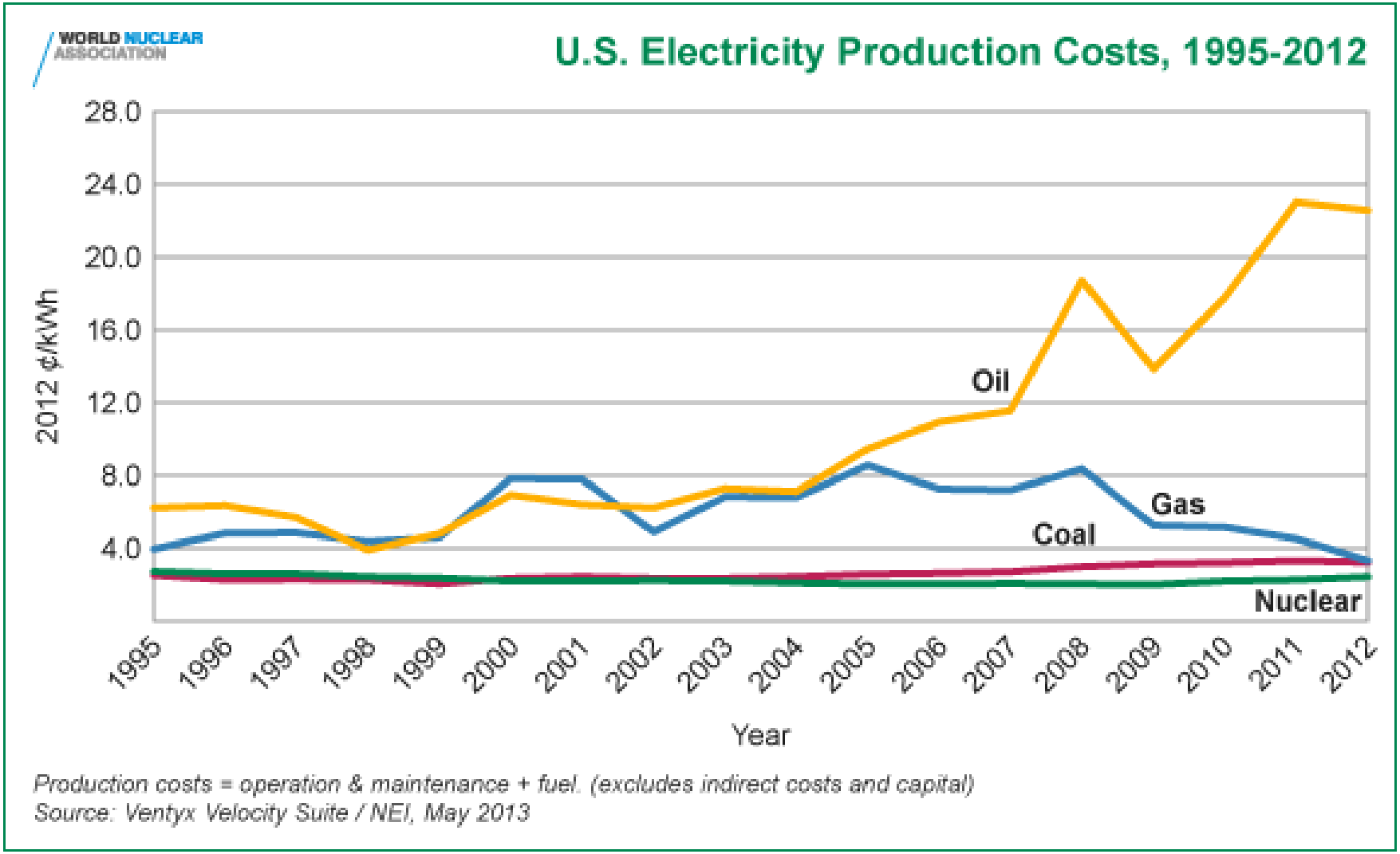


単位：円／kWh　出典：IEA Energy Prices and Taxes（OECD為替レートを使用）

出典：総合資源エネルギー調査会　原子力小委員会　第1回会合参考資料1、平成26年6月

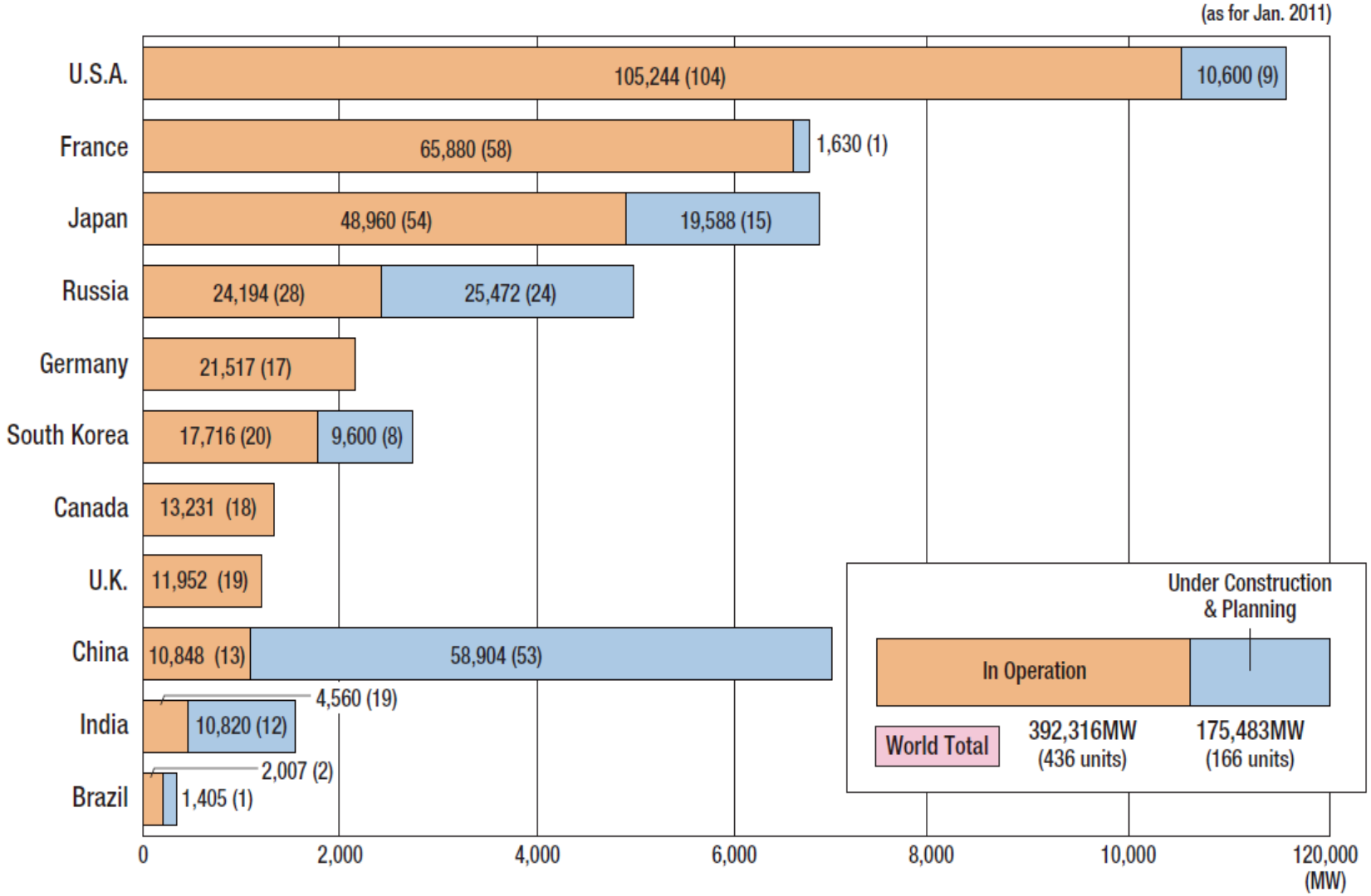
US electricity production cost

Nuclear is the cheapest after depreciation of the construction cost



Source:http://www.world-nuclear.org/info/Economic-Aspects/Economics-of-Nuclear-Power/

Generating Capacity of Nuclear Power Plants in Major Countries



(NOTE) The figures of Japan are based on the data as of March 31, 2011.
The four units of the Fukushima Daiichi Nuclear Power Station which were damaged by the Tohoku-Pacific Ocean Earthquake and tsunami are included in "In Operation".

Source: Japan Atomic Industrial Forum, Inc. "World Nuclear Power Plants 2011"

Source: http://www.fepc.or.jp/library/pamphlet/zumenshu/pdf/all_english.pdf

Nuclear Power Utilization in Japan

43 LWR plants; BWR and PWR

9 utilities (TEPCO, Kansai, Chubu etc.) by region and JAPC and J-Power(EPDC)

First LWR demo (JPDR, 12MWe BWR) in 1959

First commercial plant (GCR) in 1965, LWR in 1970

3 Manufacturers; Toshiba/WH, Hitachi/GE and MHI

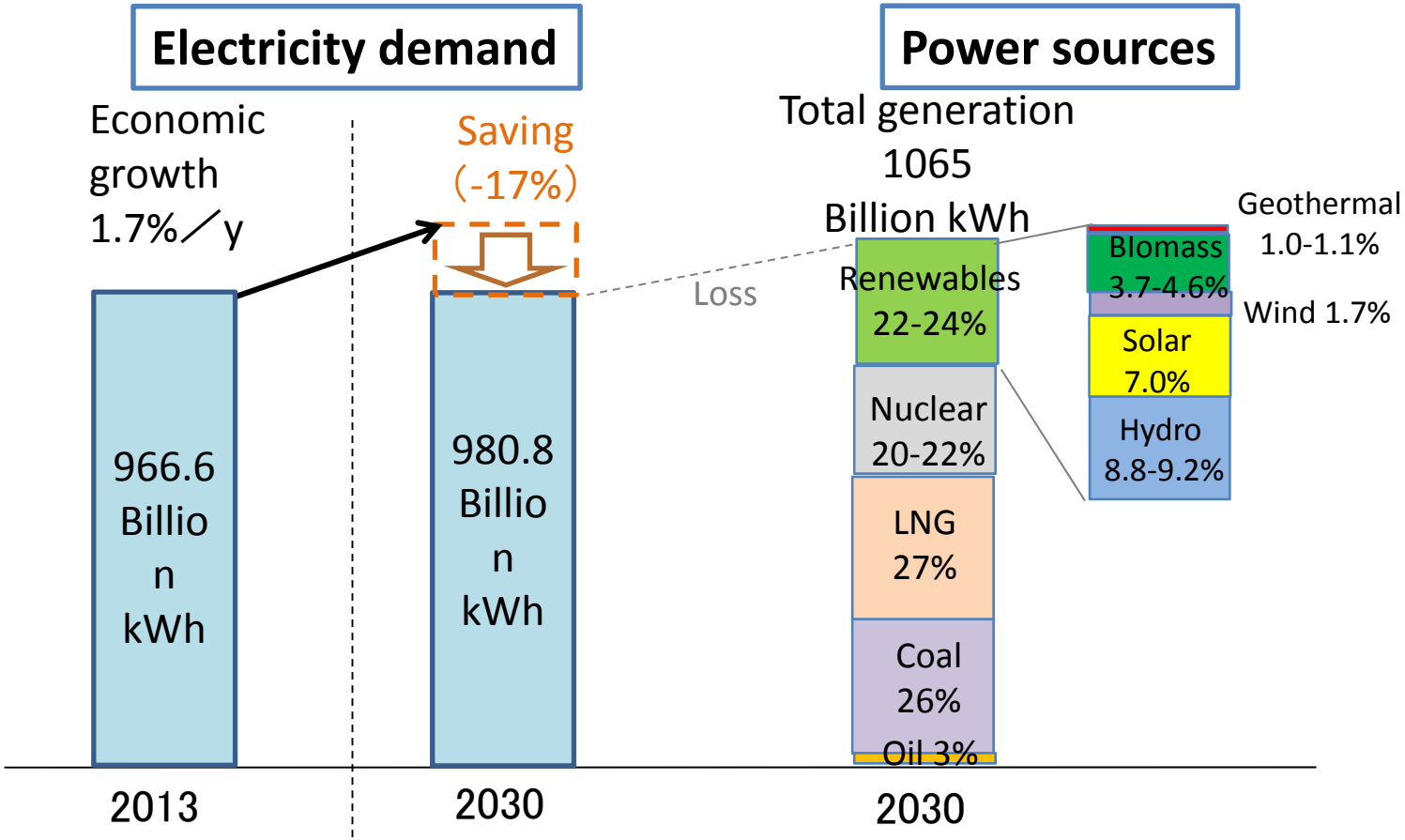
3 nuclear fuel manufacturers; GNF, Mitsubishi NF, NFI

Commercial nuclear fuel cycle program by JNFL (enrichment, spent fuel reprocessing and low level radioactive waste disposal) in Rokkasho-mura

Only for peaceful use, no nuclear weapon by law

Sendai-1 started commercial operation on September 10, 2015.

Electricity demand and supply in 2030

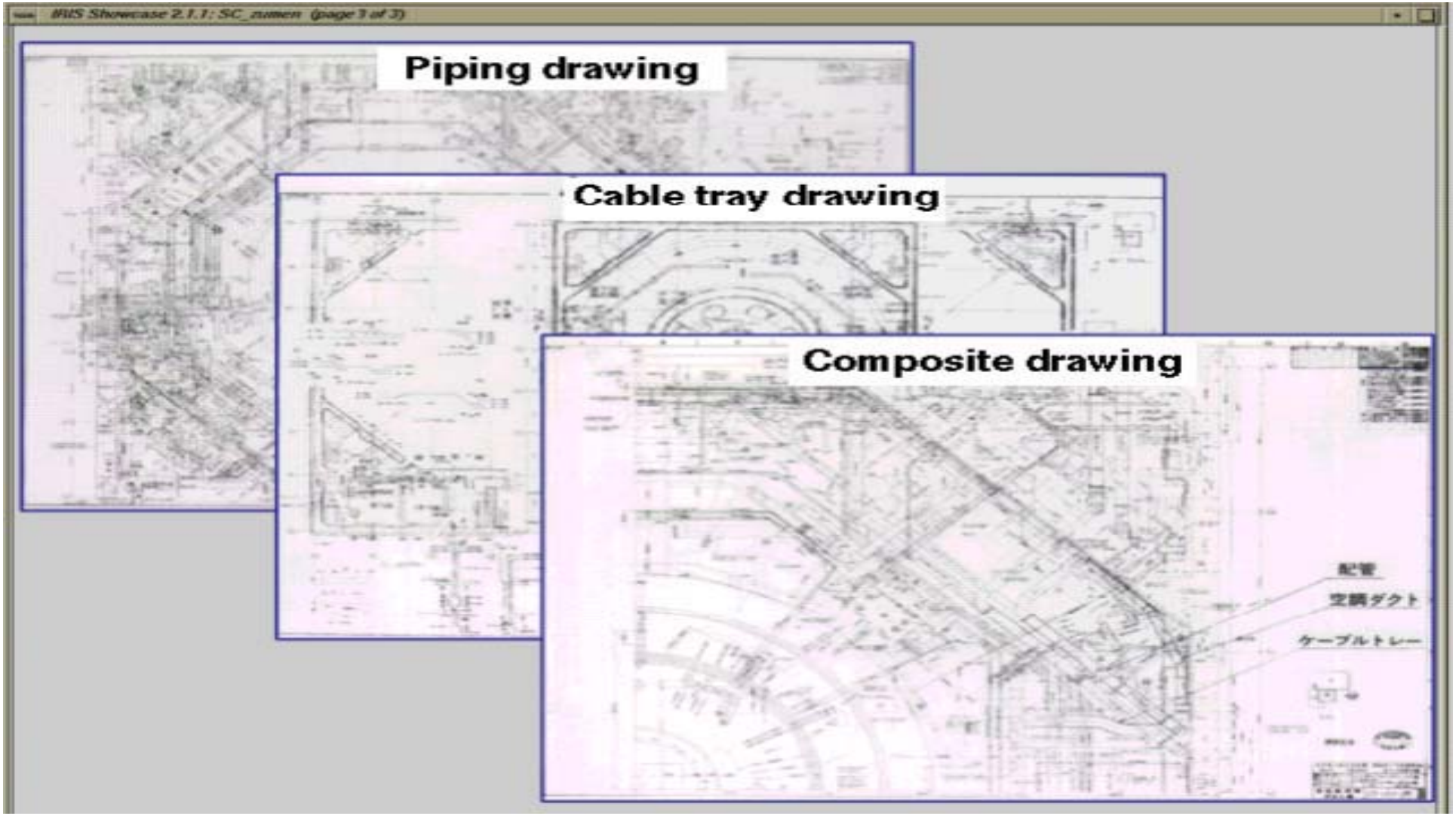


Source; Long-term energy supply and demand outlook, July 2015 METI

Advances in LWR technologies

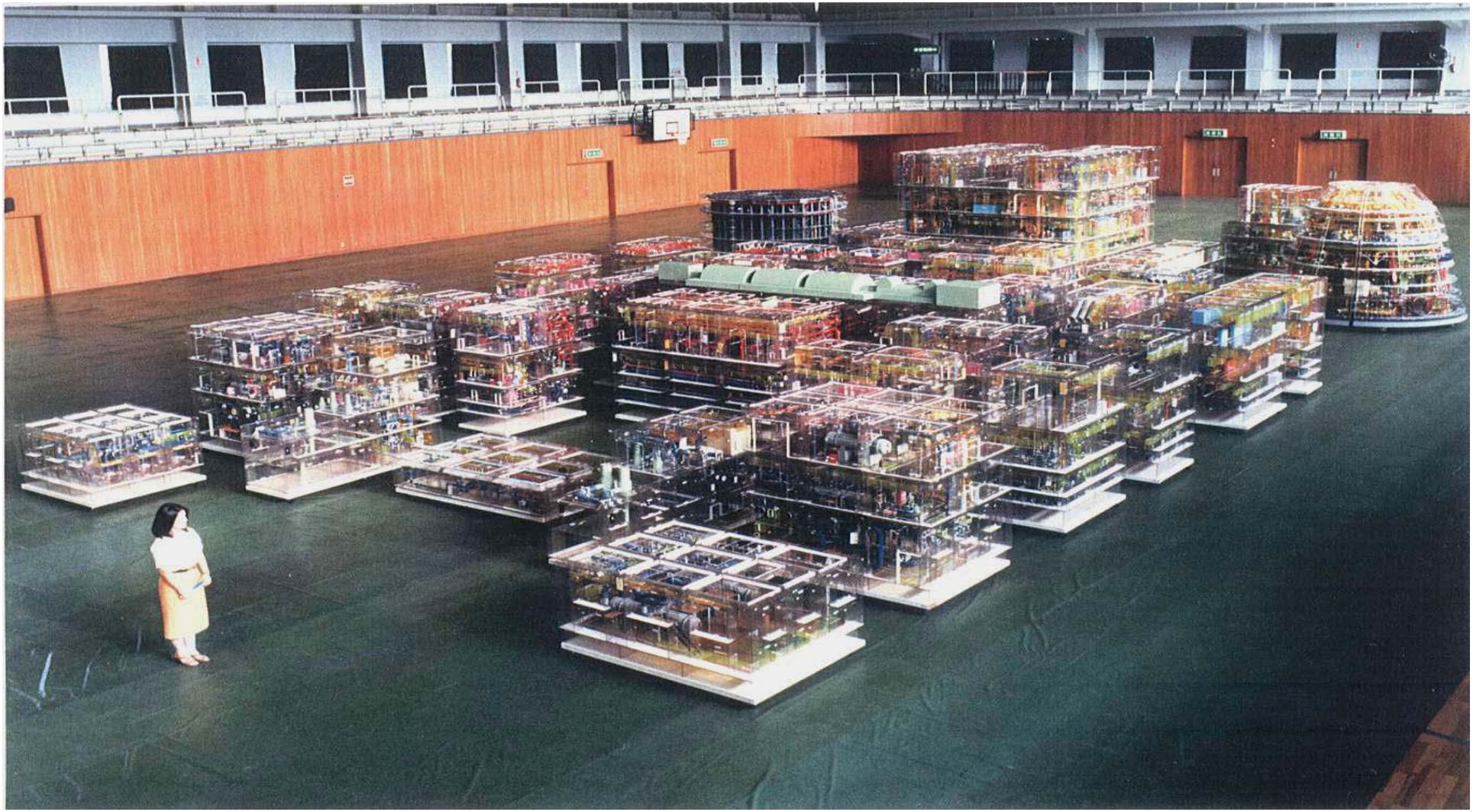
Q: How to utilize computer technology for design, construction and maintenance?

Design by Hand drawing (1975's)



"Source: Kawahata, Hitachi-GE Nuclear Energy, Ltd., Intn'l Summer School of Nuclear Power Plants, Tokai-mura, Univ. Tokyo 2009"

Design by plastic model (1985’s)

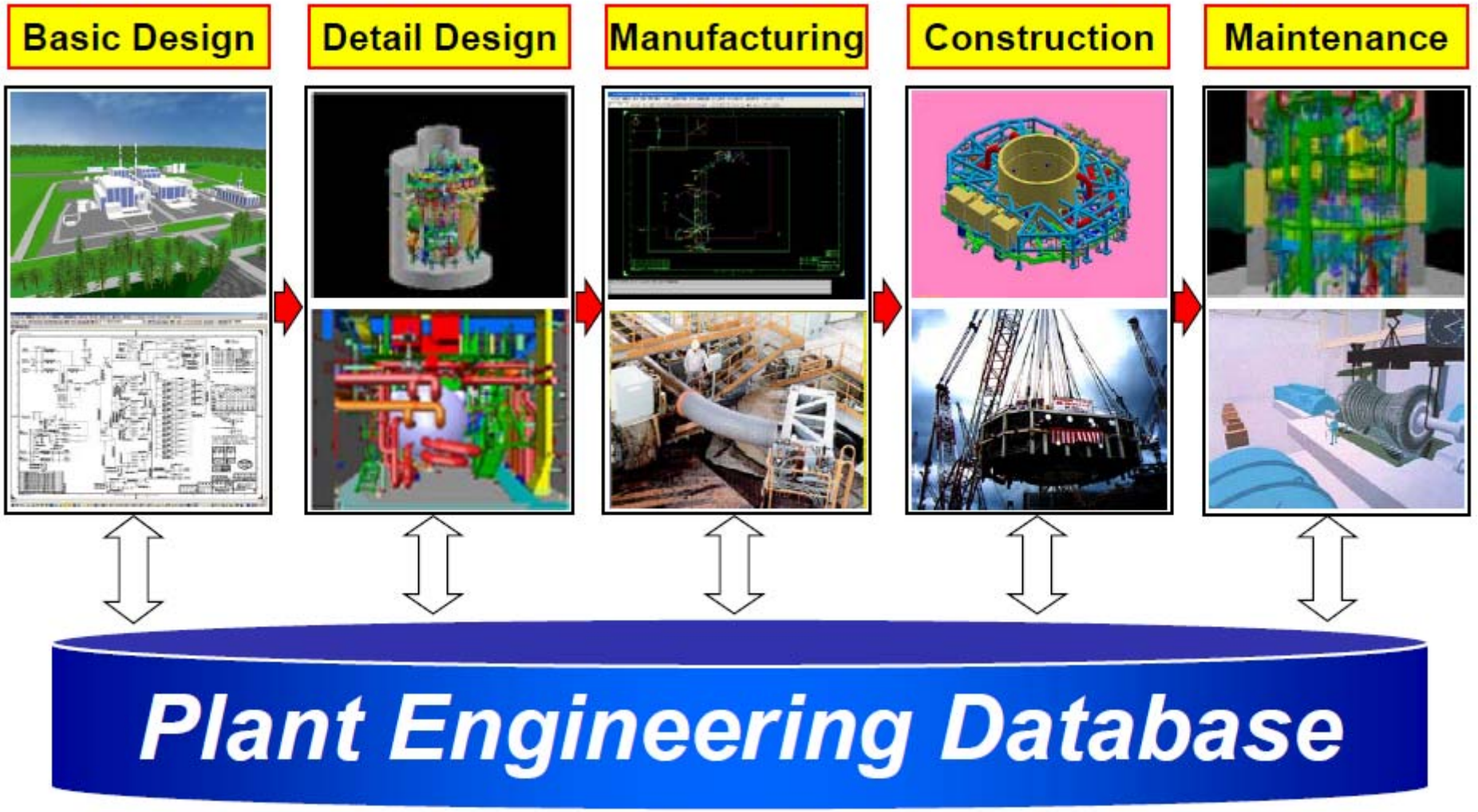


“Source: Kawahata, Hitachi-GE Nuclear Energy, Ltd., Intn’l Summer School of Nuclear Power Plants, Tokai-mura, Univ. Tokyo 2009"

Design by 3D CAD (1990's)

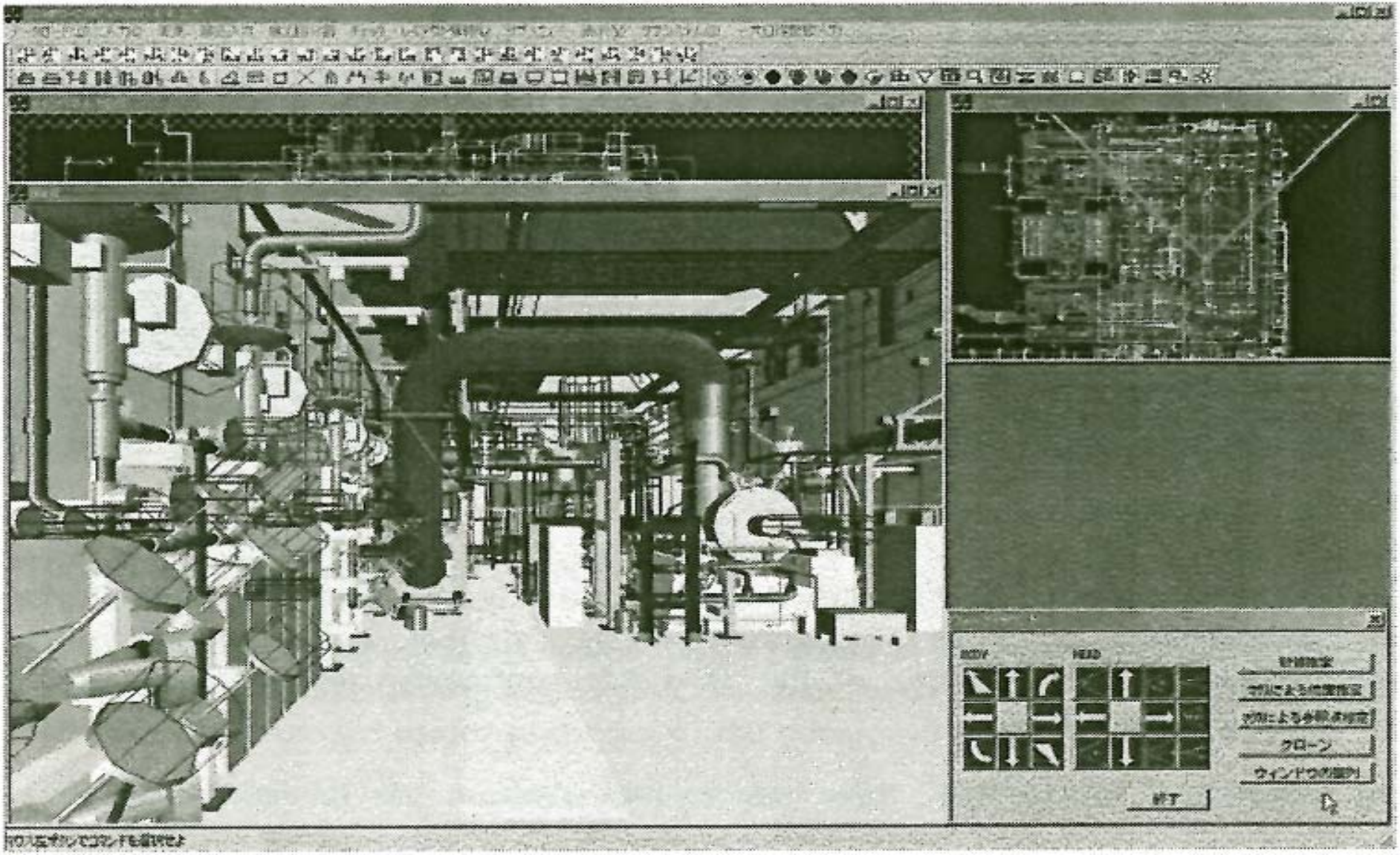
"Source: Kawahata, Hitachi-GE Nuclear Energy, Ltd., Intn'l Summer School of Nuclear Power Plants, Tokai-mura, Univ. Tokyo 2009"

Plant integrated CAE system (present)



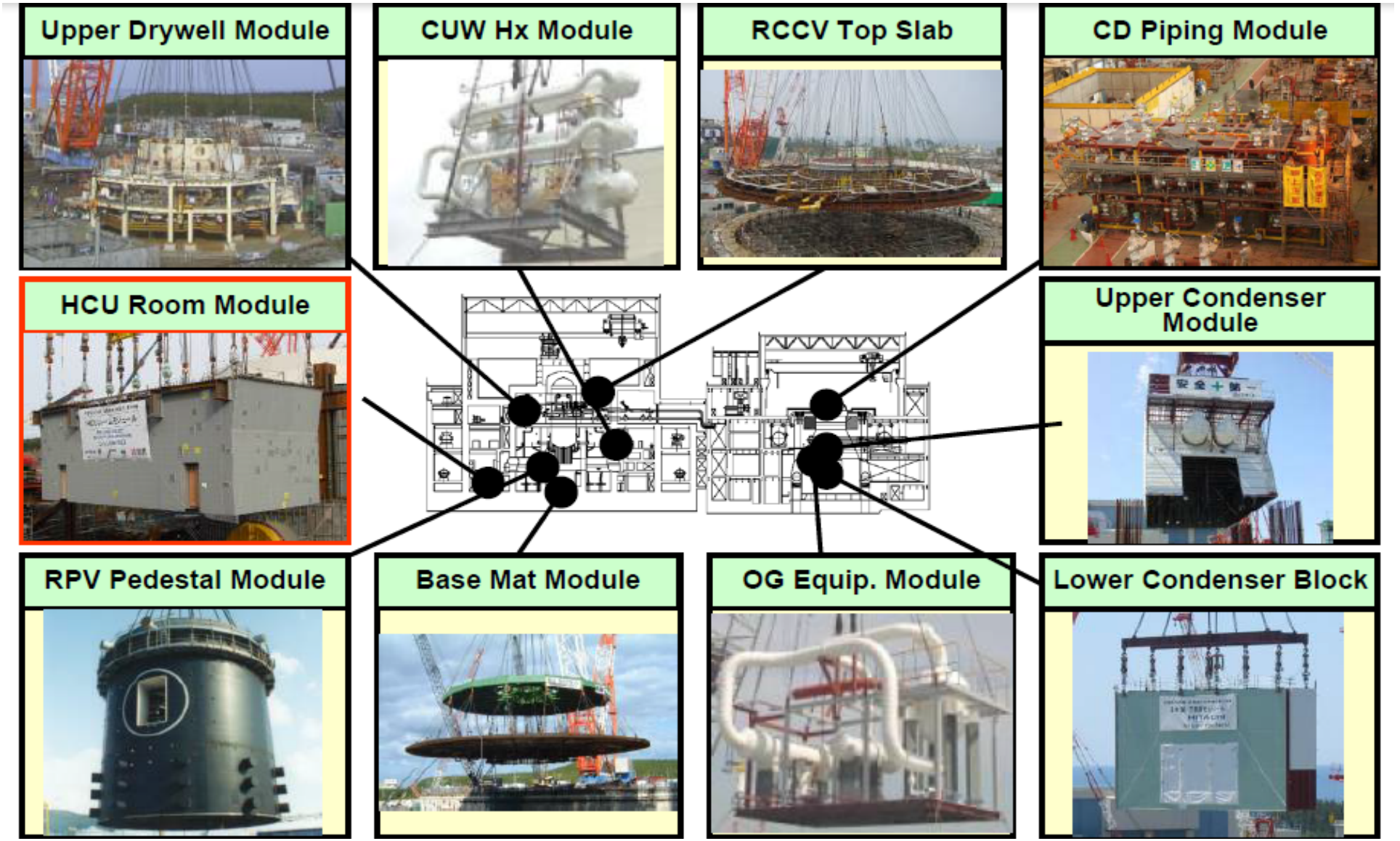
"Source: Kawahata, Hitachi-GE Nuclear Energy, Ltd., Intn'l Summer School of Nuclear Power Plants, Tokai-mura, Univ. Tokyo 2009"

Walk – through simulation with CAE

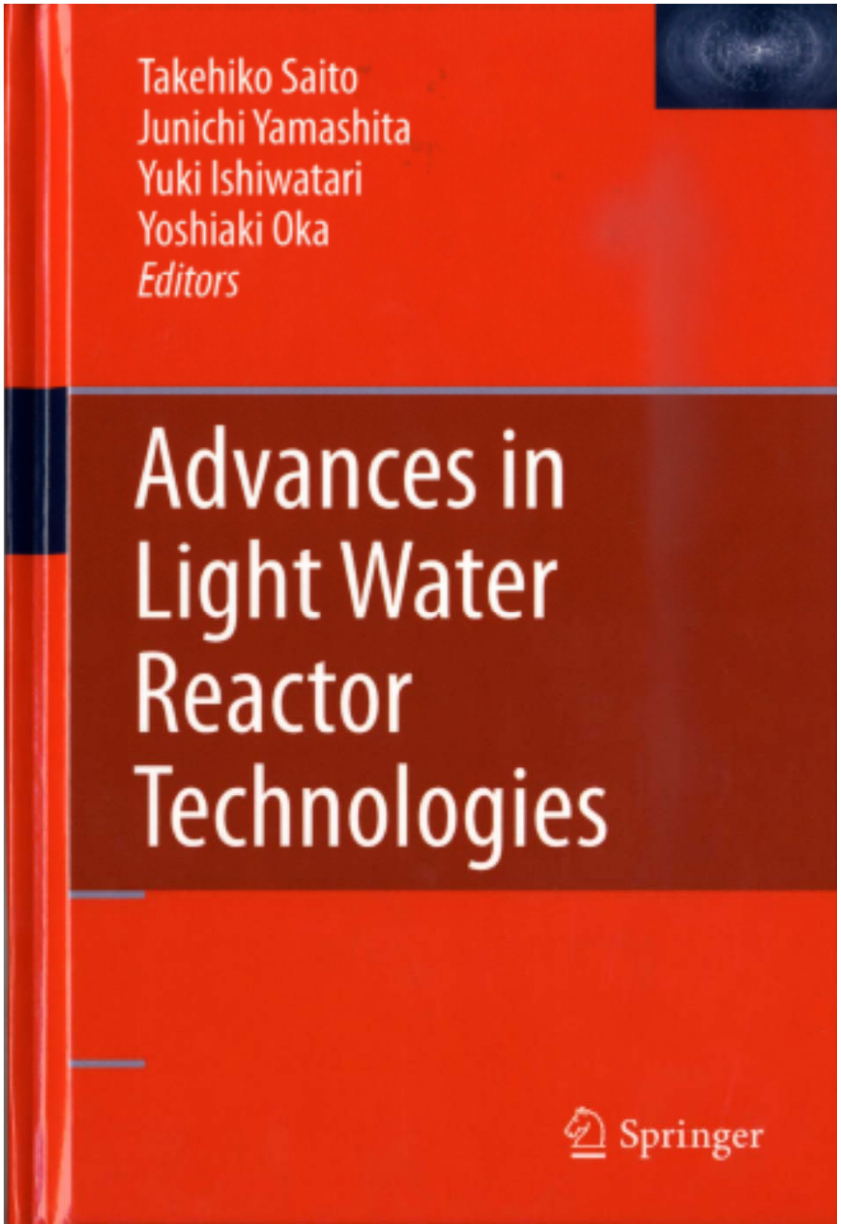


Source: Y.Oka (editor) “ Advances in light water reactor technologies”, Springer 2011

Modular construction



"Source: Kawahata, Hitachi-GE Nuclear Energy, Ltd., Intn'l Summer School of Nuclear Power Plants, Tokai-mura, Univ. Tokyo 2009"



Contents:
PSA in design and maintenance of ABWR, Passive ECCS of APWR, Severe accident mitigation features of APR1400, EPR core catcher, Severe accident research in China, Full MOX core design of ABWR, CFD applications, Digital I&C system, 3D-CAD application to construction, Progress in seisimic design

Available from Springer, 295 pages

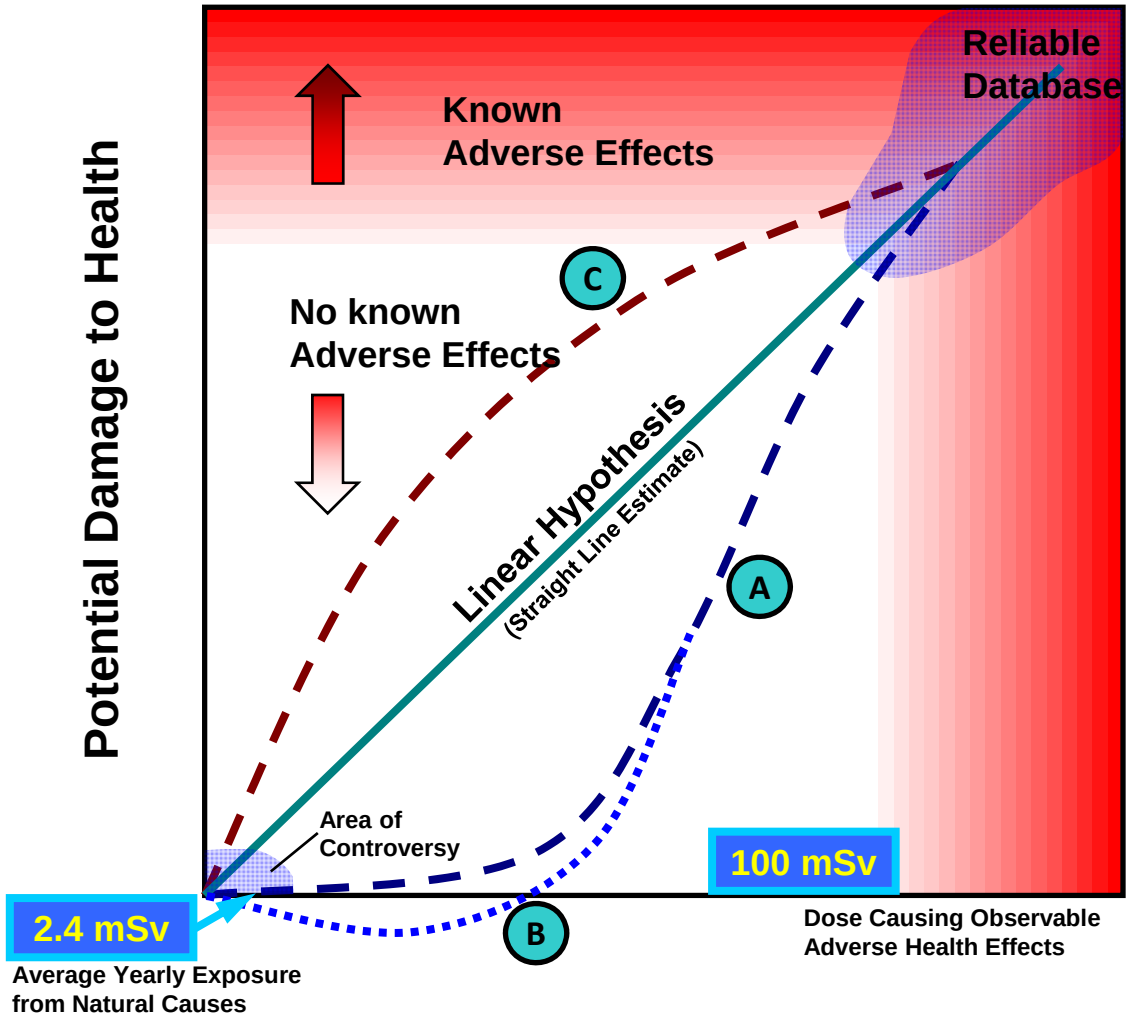
Based on the lectures of International summer school of NPP and young generation work shop“; Bridgeing fundamental research and practical applications” in 2009 in Tokai-mura Japan

http://www.springer.com/engineering/energy+technology/book/978-1-4419-7100-5

Risk communication/ public information

Health effect of low level radiation

- Acute health effect occurs above threshold (high) dose.
- Linear non-threshold model (linear hypothesis) is used for estimating latent health effect (cancer) at low dose



Source: A.E. Waltar

Health implications of radiation exposure of the public resulting from FDNPS accident (UNSCEAR 2013 Report, Appendix E)

- “No discernible risk”: An increased incidence of effects is unlikely. Consequences are small relative to the baseline risk and uncertainties.
- The most important health effects would appear to be on mental and social well-being as a consequence of the evacuation and their displacement to unfamiliar surroundings, and the fear and stigma related to radiation exposure. For example more than 50 hospitalized patients died either during or soon after the evacuation, probably because of hyperthermia, dehydration or deterioration of underlying medical problems. Upward of 100 elderly people may have died in subsequent months.
- Understanding full heath impact of accident forms an important context for the Committee’s commentary.

UNSCEAR: United nations scientific committee on the effects of atomic radiation

“Maintaining health” should be the goal

- Order of “sheltering” made most people escape from their homes, but those weak in disaster (single elderly people, patents etc.) were left and separated from outside area.
- Displacement worsen health of the evacuees. No working (farming) increases instability of legs, sugar disease, fatness, osteoporosis
- Displacement for avoiding low level of radiation exposure increased other health risks. It is effective, only when other risks do not increase.
- Lack of exercise and fatness increase cancer risk 1.2 times, equivalent to 100-200mSv of exposure.
- Telling only “radiation” risk increased fear of “radiation”. Radiation risk is a part of cancer risk. It is a part of health risk.
- “Maintaining health” should be the goal for avoiding mental and social health effects of nuclear accidents.

Source: Sae Ochi, Energy review pp7-10, April 2015,(in Japanese)

Lessons of risk communication and actions at nuclear accidents

- Risk communication should start from “Cancer risk of radiation exposure is NOT zero”. LNT model shows that risk is NOT zero. Start telling “no risk” was wrong, failed and increased fear of radiation. It is logically impossible to prove “zero risk”.
- Various cancer risks exist in human life. Cancer risk of low radiation exposure is within the uncertainty.
- Comparing various cancer risks such as radiation, chemicals, etc. is necessary, but will be not enough to manage mental and social effects.
- “Maintaining health” is good goal for managing the problems and taking actions at severe nuclear accidents.

Good practices for reducing mental/social impact of Great east Japan earthquake

- Single voice by the UK scientific advisor to British residents in Japan
- Temporary relocation keeping local communities/neighbors (Iwanuma city)
- Early recovery from temporary relocation
- Counseling of health, life, compensation etc.

We understand the scope of mental and social impact for the first time in Japan by TEPCO Fukushima accident.

It will be useful for considering what to do for "social safety".

It is necessary to study/summarize how to reduce the impact .

Public communication

successful examples of USA and UK:

- NEI (USA); communication with congress and central media: NEI Smart Brief (news), media training of utility people, poll, collaboration with university research(journalism dept.)
- Science media centre (UK): an independent press office helping to ensure that the public have access to the best scientific evidence and expertise through the news media when science hits the headlines.

Source: http://www.nei.org/Knowledge-Center

Source:http://www.sciencemediacentre.org/working-with-us/for-journalists/

Search by tag for journalists of UK science media centre

agriculture Alzheimer's animal research autism avian flu brain & neuroscience cancer climate change cloning dementia depression diet & nutrition disaster earthquake Ebola energy engineering epidemiology fertility flu food safety genetics GM crops heart infectious disease law mental health nuclear energy paediatrics & children pharmaceutical drugs policy pollution pregnancy & babies psychology radiation recreational drugs sea smoking sperm stem cells toxicology vaccines virology weather

Source:http://www.sciencemediacentre.org/working-with-us/for-journalists/

Comments on communication with general public in Japan

- Way of communication is different from that of local communities where person to person contact is possible.
- Information in English that meets the needs of understanding “why” is abundant, but scarce in Japanese.
- Need to explain why policy/decision/opinion are decided.
- Prepare/disclose reports, articles, opinions with evidence.
- Make the information easily found in internet.
- Secondary utilization of paper-based reports/opinions in internet will help the understanding.
- Meet/adapt/utilize internet needs will be the key of communication for future nuclear utilization in Japan.

Thank you for your attention