



Role of Nuclear Power for a Sustainable Future

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JAIF

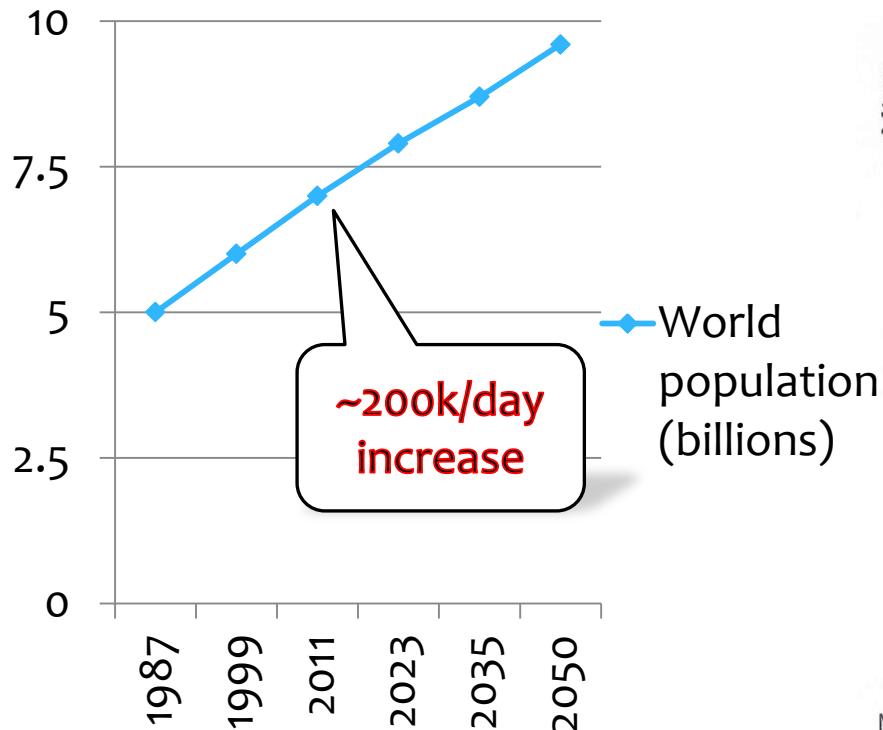
Global Challenges

- Environmental Pollution
- **Climate Change**
- Economic growth, Population explosion
- Water shortage, Drought
- Food crisis, Hunger
- **Poverty**
- Energy shortage
- **Infection, etc.**

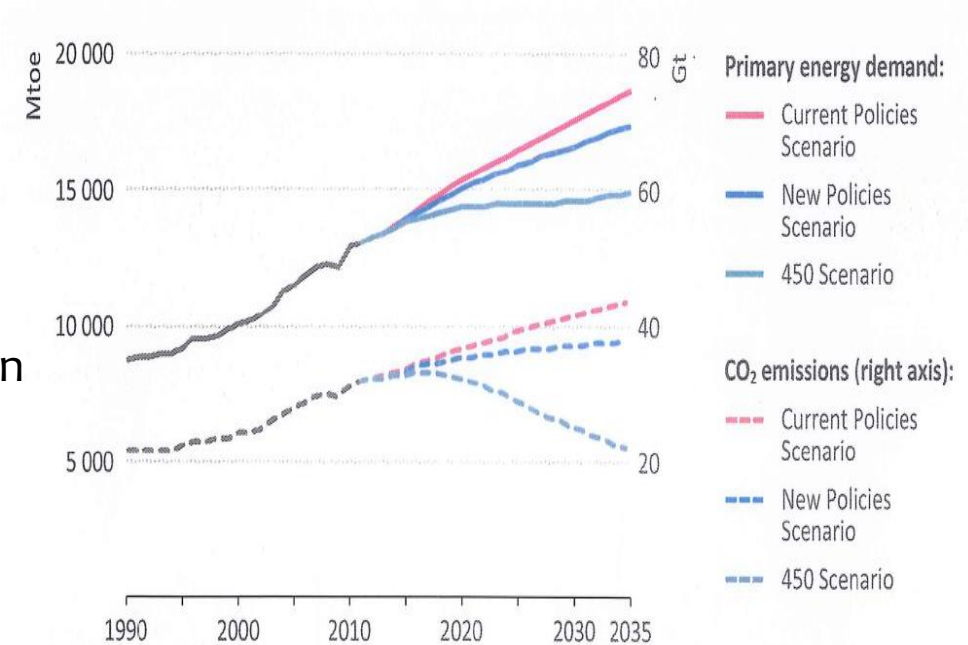


Energy demand growth is inevitable

Population explosion



Energy demand & CO₂ Emission

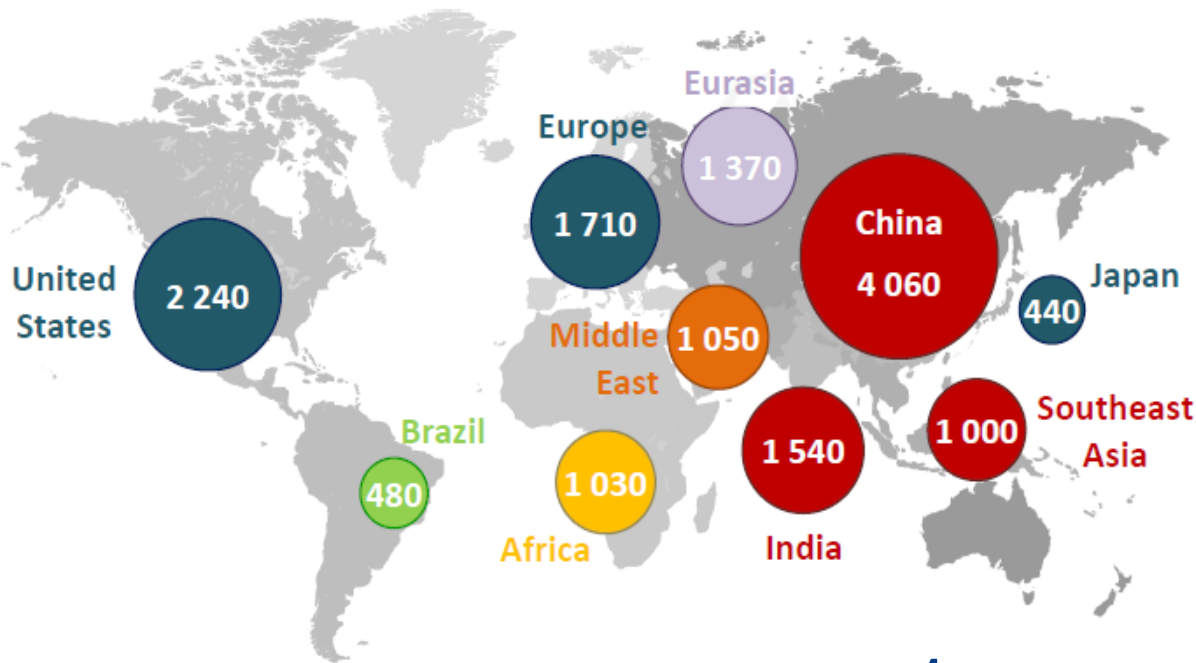


Note: Mtoe = Million tonnes of oil equivalent; Gt = gigatonnes.

source: IEA-WEO 2013

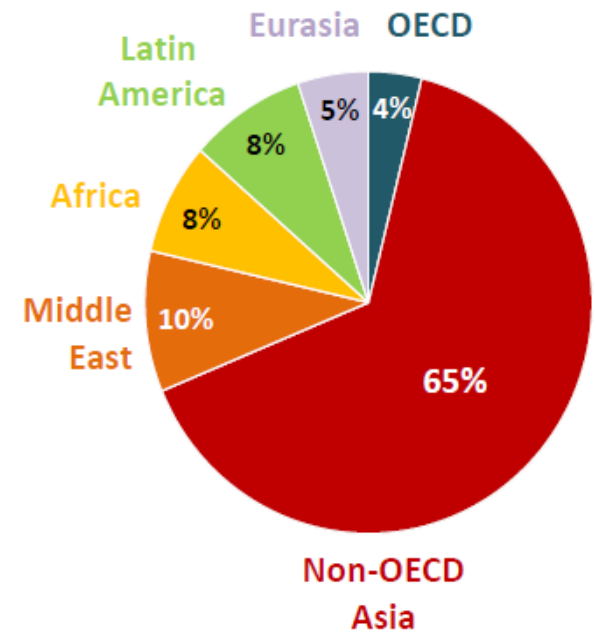
Asia : Main Driver of Energy Demand Growth

Primary energy demand, 2035 (Mtoe)



source: IEA-WEO 2013

Share of global growth
2012-2035



Increase of CO₂ emission and Climate Change

IPCC AR-5 WG1 report (Sep. 2013)

- Warming of the climate system is unequivocal.
- Human influence on the climate system is clear.
- Continued emissions of GHG will cause further warming.
- Most aspects of climate change will persist for many centuries even if emissions are stopped.



Measures to reduce CO₂ emission(1)

Dr. Kaya's Formula (RITE Japan)

CO₂ / Capita

=GDP / Capita

: **economic growth**

X energy consumption / GDP

: **energy efficiency**

X CO₂ / energy consumption

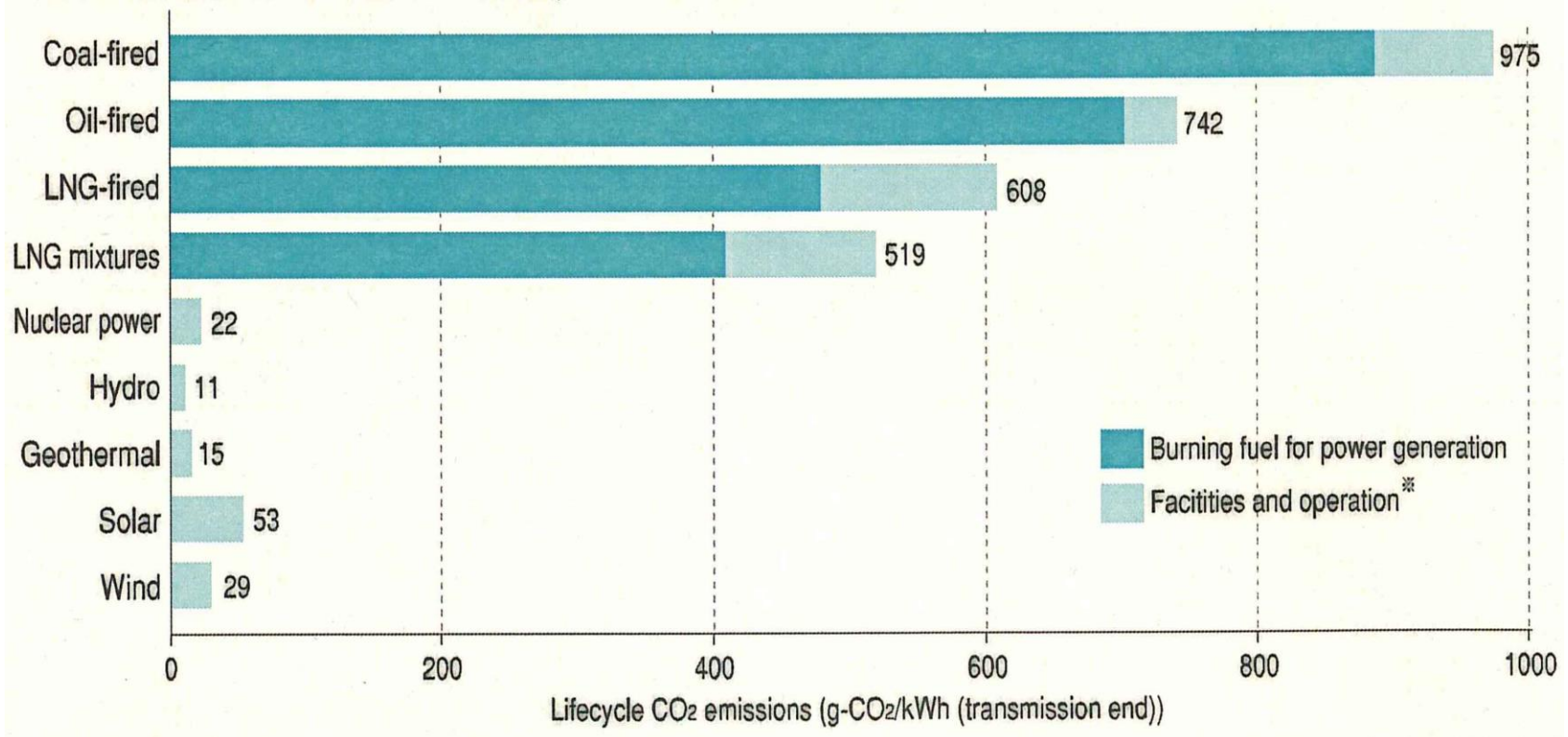
: **cleanliness of energy**



Measures to reduce CO₂ emission(2)

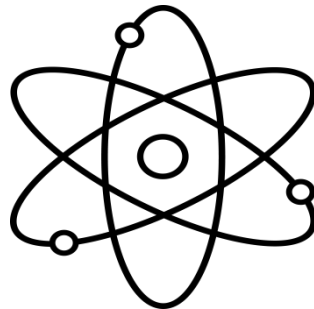
- **Economic growth** is inevitable
- Measures to reduce CO₂ emission are limited as follows ;
 - to improve **energy efficiency**
 - to introduce **clean energy sources**
- Power sector's **decarbonisation** is particularly critical
- **Clean energy power sources** :
 - Renewable(solar, wind, biomass, geothermal, hydro)
 - Clean coal with CCS
 - **Nuclear**

CO₂ emission (g-CO₂/kwh) by electricity generation



Measures to reduce CO₂ emission(3)

- **Nuclear power** is one of the key clean energy power sources.



- There is **no silver bullet** to realize **low carbon society**, but there would be **no solution without nuclear**.

Role of nuclear power in reduction of CO₂ emission

Nuclear Power

- **Zero emission** energy source during operation
- **Estimated effect** of reduction of CO₂ emission by 1Gw capacity NPP compared with coal fired plant
 - ~**6 Mt/y** of CO₂
 - assumption : 1Gw NPP generates 7 Twh/y of electricity
when capacity factor is 80%
- Globally nuclear power currently avoids release of more than **2Gt/y** of CO₂, compared with coal fired plant



Nuclear Power in the world

now and future prospect

- 2013 372.8 Gw (435 units in operation)
 68.4 Gw (72 units under construction)

- 2020 IAEA WEO
 L 390 / H 463 Gw 460/488 Gw

- 2030 L 400 / H 699 Gw 513/682 Gw

- 2035 527/792 Gw

- 2050 L 413 / H 1092 Gw

source : IAEA-RDS-1 2014

IEA-WEO 2013

Nuclear Future in Japan(1)

Basic Energy Plan of Japan (April, 2014)

- nuclear power is an important base load power as a low carbon and quasi-domestic energy source
- dependency on nuclear power generation will be lowered to the extent possible
- a volume of electricity to be secured by nuclear power generation will be carefully examined, taking Japan's energy constraints into consideration from the view point of stable energy supply, cost reduction, global warming and maintaining nuclear technologies and human resources



Nuclear Future in Japan(2)

--- my personal view ---

Electricity Demand of Japan ~ 1000Twh/y

Before Fukushima (2010) Now Future (2030)

Nuclear 30% 0% 15%~20%

Fossil Gas 30% 45% 40%

Coal 20% 25% 15%

Oil 10% 20% 5%

Renewable 10% 10% 25%~20%

Light and Shadow of Nuclear Power

● Light

- **reliable** : superiority in stable supply
- **affordable** : low and stable operational cost
- **clean** : free from GHG emissions during operation

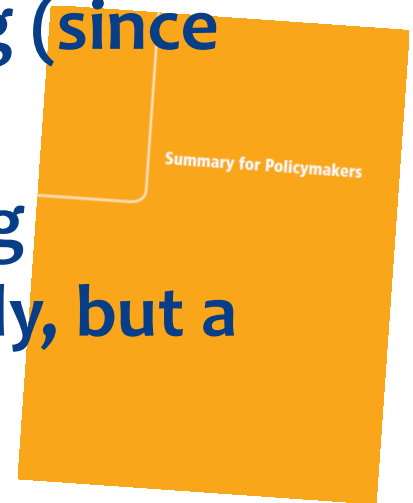
● Shadow

- **safety** : risk of severe accident
- **waste management** : siting of final repository
- **proliferation/security** : threat of terrorist attack

Evaluation on Nuclear Power as low carbon energy supply

IPCC AR-5 WG3 report SPM4.2.2 (Apr. 2014)

- **Nuclear energy is a mature low-GHG emission source of base load power**, but its share of global electricity generation has been declining (since 1993).
- **Nuclear energy** could make an increasing contribution to low carbon energy supply, but a variety of **barriers and risks** exist



For the Steady Development of Nuclear Power



- **Nuclear Safety**
- **Waste Management**
- **Public Support**



For the Sustainable Nuclear Future

Areas to be considered for **international collaboration** :

- **Harmonization** of safety regulation
- **Waste Management**
- **R&D** of future innovative technology
- **HRD** (Human Resources Development)



Thank you for your attention!

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