3E Challenges in Asia and the Role of Nuclear Power

50th Anniversary JAIF Annual Conference: "Bridging the Past and Present Toward the Future"

Session 1: "Roles of Nuclear Energy- Past, Present and Future"

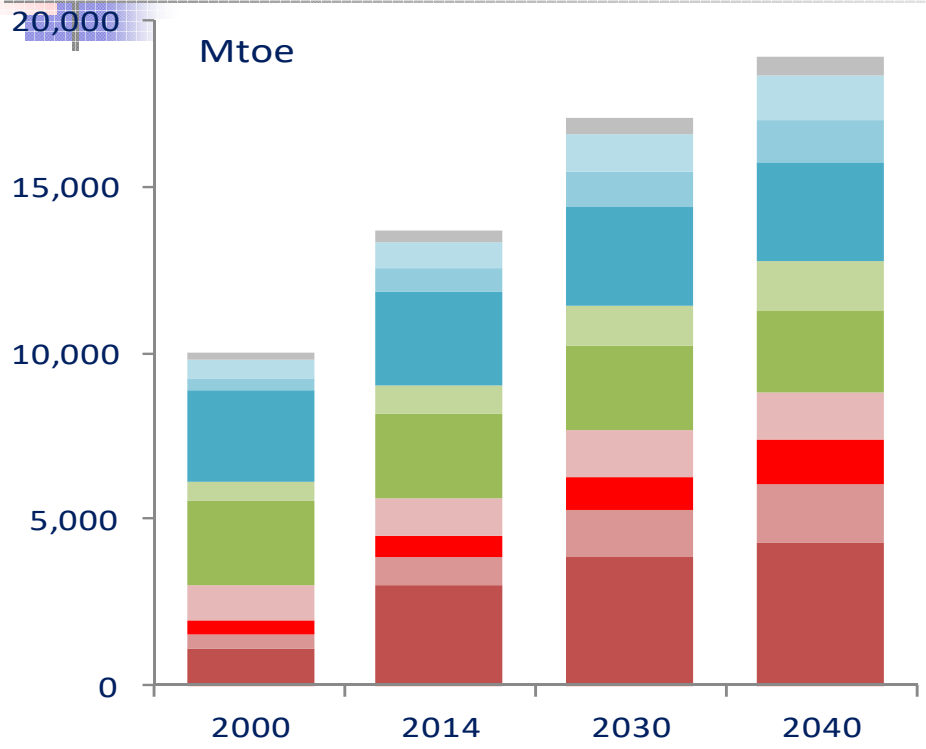
April 11th, 2017

Dr. Ken Koyama

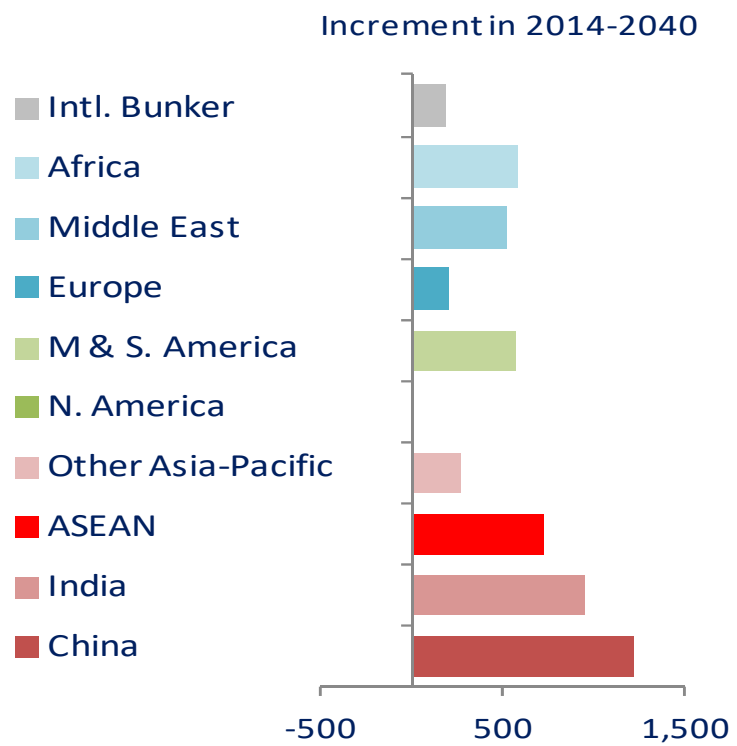
Chief economist and managing director
Institute of Energy Economics, Japan

Energy Market Gravity Shifts towards Asia

World's Primary Energy Demand



Increase of Primary Energy Demand

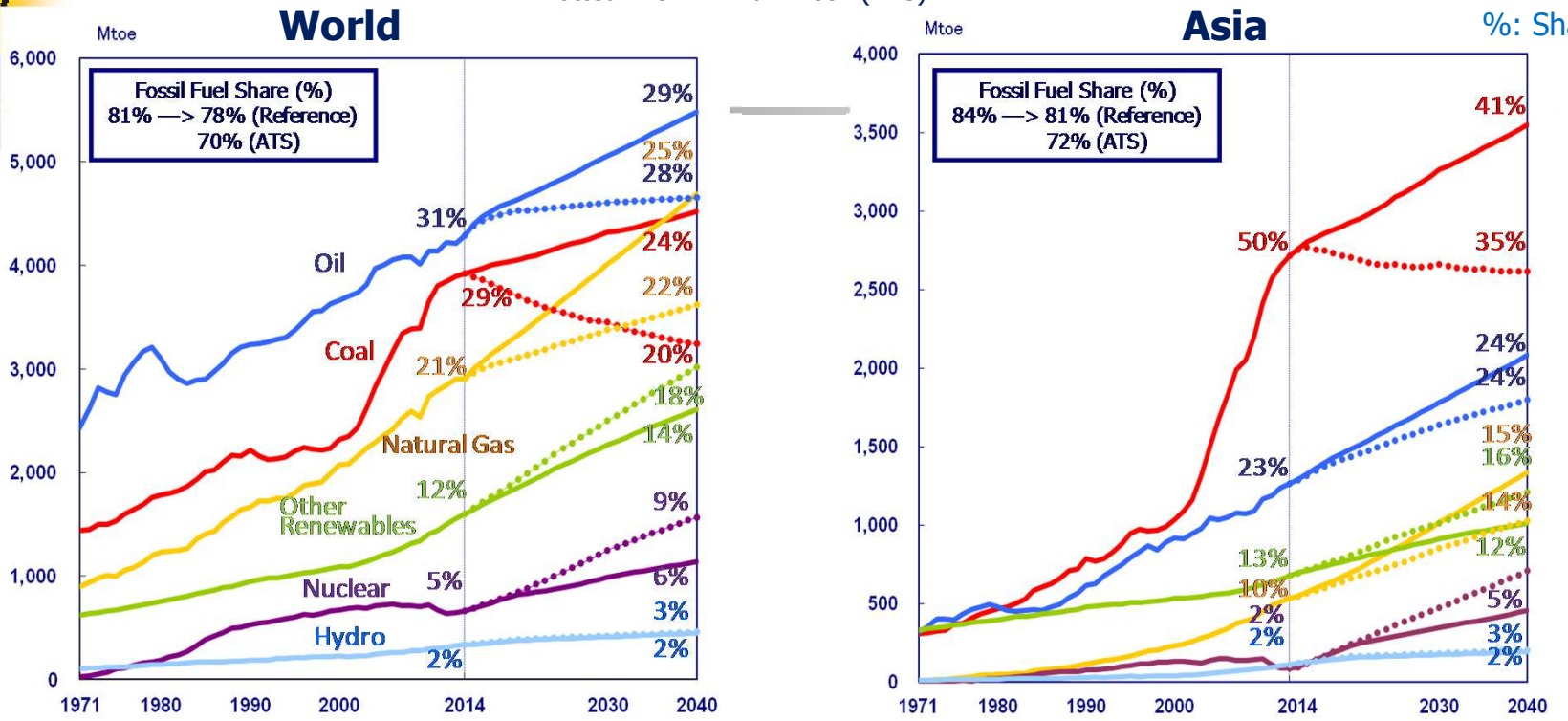


- Global energy demand increases by 1.4 times and 60% of the growth comes from Asia. Asia is the final destination for around three quarters of oil, gas and coal traded inter-regionally.
- ASEAN has the third largest demand growth, after China and India.

Source: IEEJ "Asia/World Energy Outlook 2016"

Outlook for Primary Energy Demand (by energy)

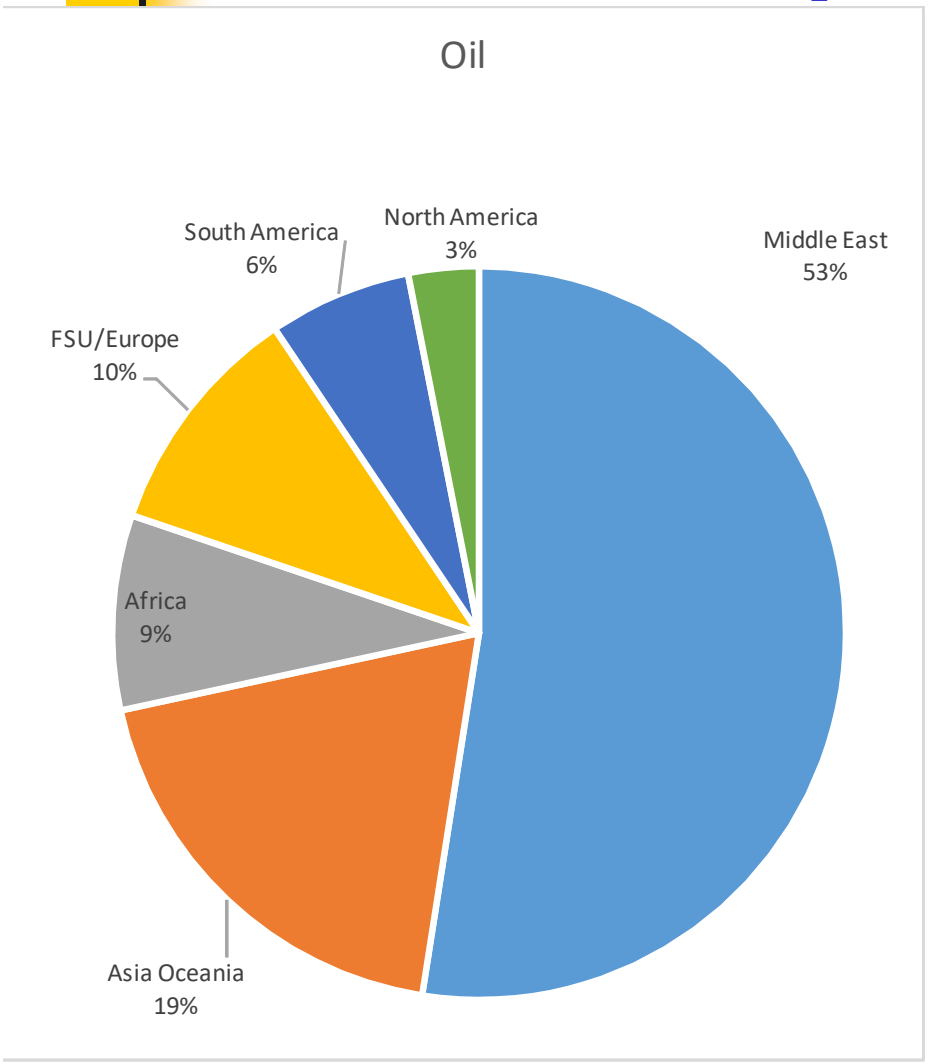
Line ..... Reference
Dotted line ..... Adv. Tech (ATS)

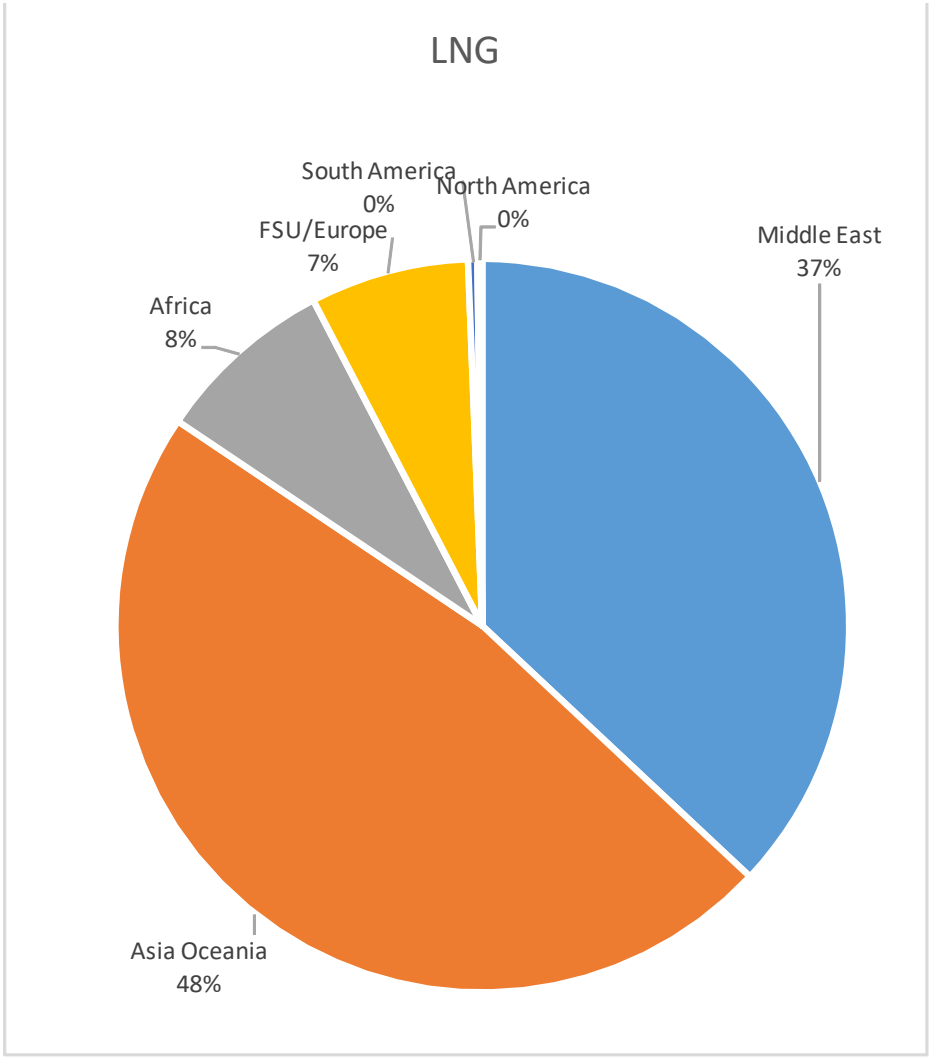


- Oil remains the most important fuel in the global energy mix for both Reference and ATS, even though the demand levels off in 2030's in the latter scenario.
- In Asia, coal demand keeps the largest among primary fuels, even though declining largely in ATS.
- Fossil-fuel dominates the both global and Asian energy mix, with 70% share even in ATS, although reducing from today's level.

Source: IEEJ "Asia/World Energy Outlook 2016"

Asia's Middle East Dependence (2015)





Source: Prepared from "BP Statistical Review of World Energy 2016"

Instability in the Middle East

Terrorist Attacks In Paris, Brussels, etc.

Uncertainty over Middle East Peace issues

Iraqi situations after the war

Tensions on Iran Nuclear development

Post-sanction Iran?

Immigrants to Europe

Gaza crisis

Russia-Turkey Tension

Rise of Islamic State

Impacts of "Arab Spring"

Tense Saudi-Iran Relations

Syria, Yemen, Egypt…

- Uncertainties and unpredictability
- No concrete details about policy
- The meaning of "America First"?
- Opposite direction to Obama policy
- Implication on the stability of world energy market?
- Policy versus Market reality?

Growing Anti US sentiments in Arab and Islam society

Domestic challenges for existing rulers and regimes

Terrorism, threats to energy production and exports

Source: Prepared by IEEJ

Environmental Challenges in Asia

- ***Climate change, as a long term strategic challenges***
- ***Air pollution, as an immediate crisis***

NDC under Paris Agreement

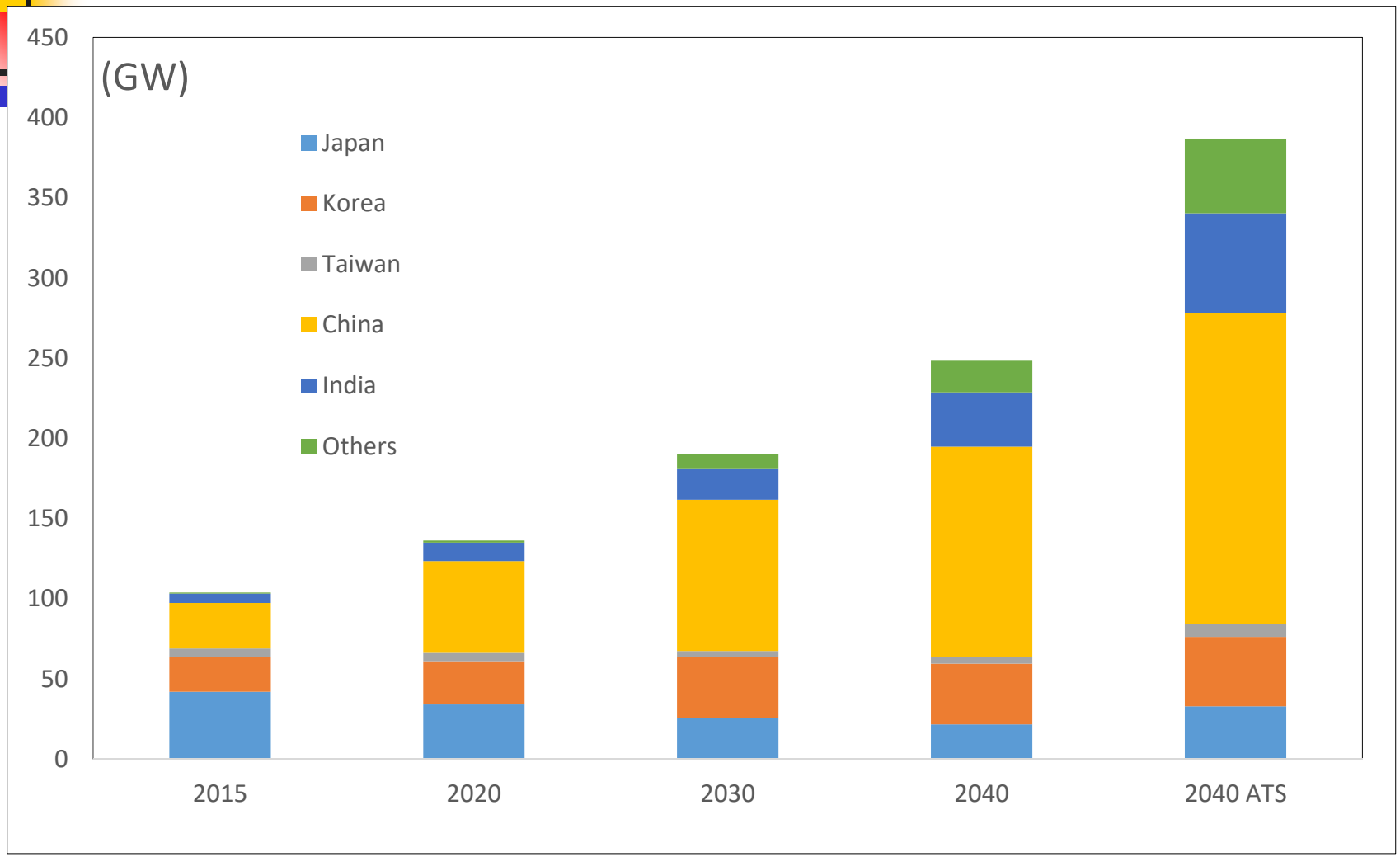
Party	Submission date (2015)	Target type	Reduction target	Base year	Target year	Coverage
EU	Mar 6	Absolute emissions	40%	1990	2030	GHG
United States	Mar 31	Absolute emissions	26～28%	2005	2025	GHG including LULUCF
Russia	Apr 1	Absolute emissions	25～30%	1990	2030	GHG
China	Jun 30	GDP intensity	60～65% Total emission peak out before 2030	2005	2030	CO_2
Japan	Jul 17	Absolute emissions	26%	2013	2030	GHG
Indonesia	Sep 24	Reduction from BAU	29%	BAU	2030	GHG
Brazil	Sep 30	Absolute emissions	37% (43% for 2030)	2005	2025	GHG
India	Oct 1	GDP intensity	33～35%	2005	2030	GHG

Air pollution in China

Source: IEEJ "Asia/World Energy Outlook 2015" and others

Nuclear Power Outlook in Asia

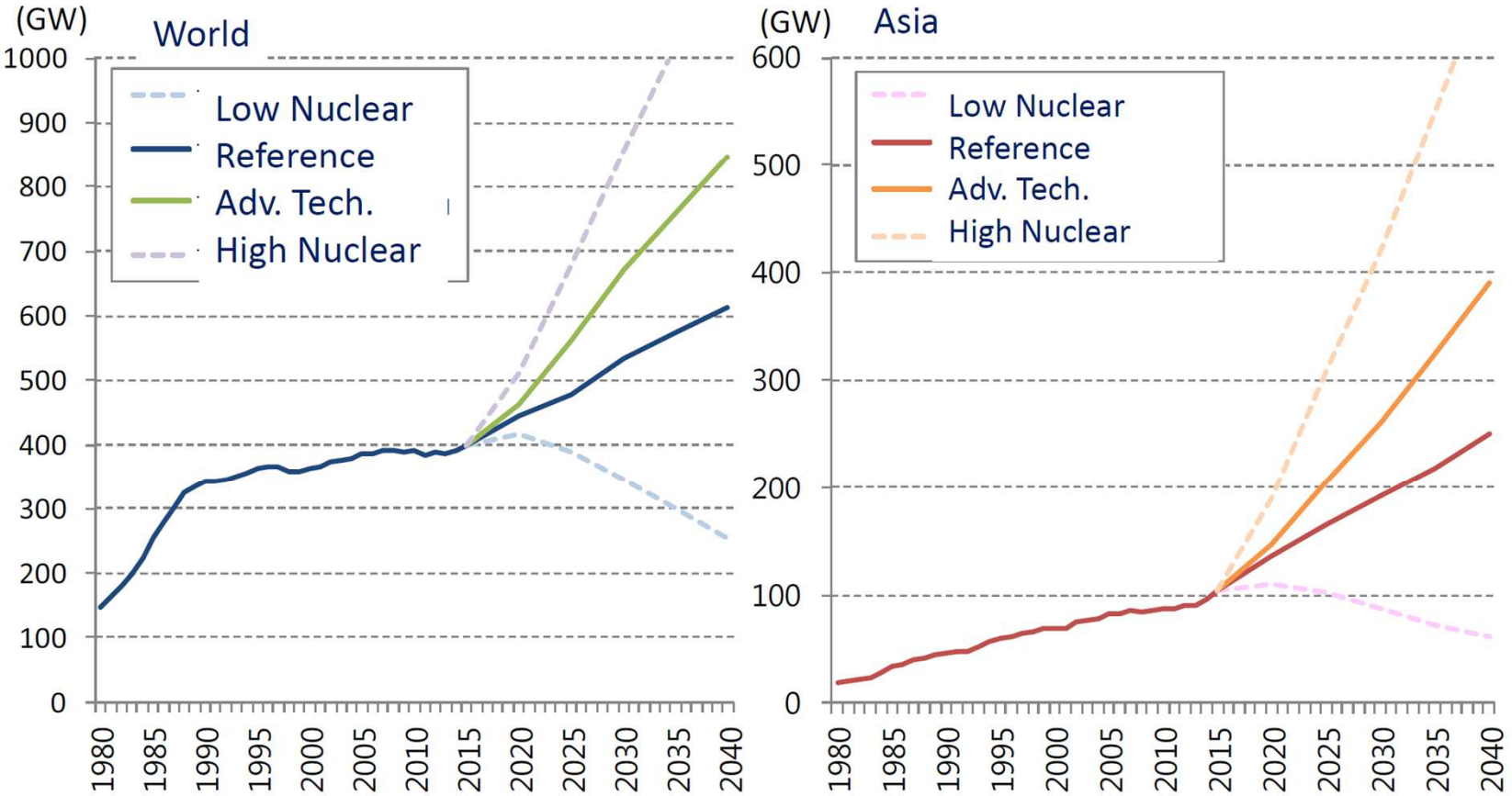
Substantial growth expected in China and India



Source: Prepared from IEEJ "Asia/World Energy Outlook 2016

Sensitivity Analysis of 4 Nuclear Scenarios

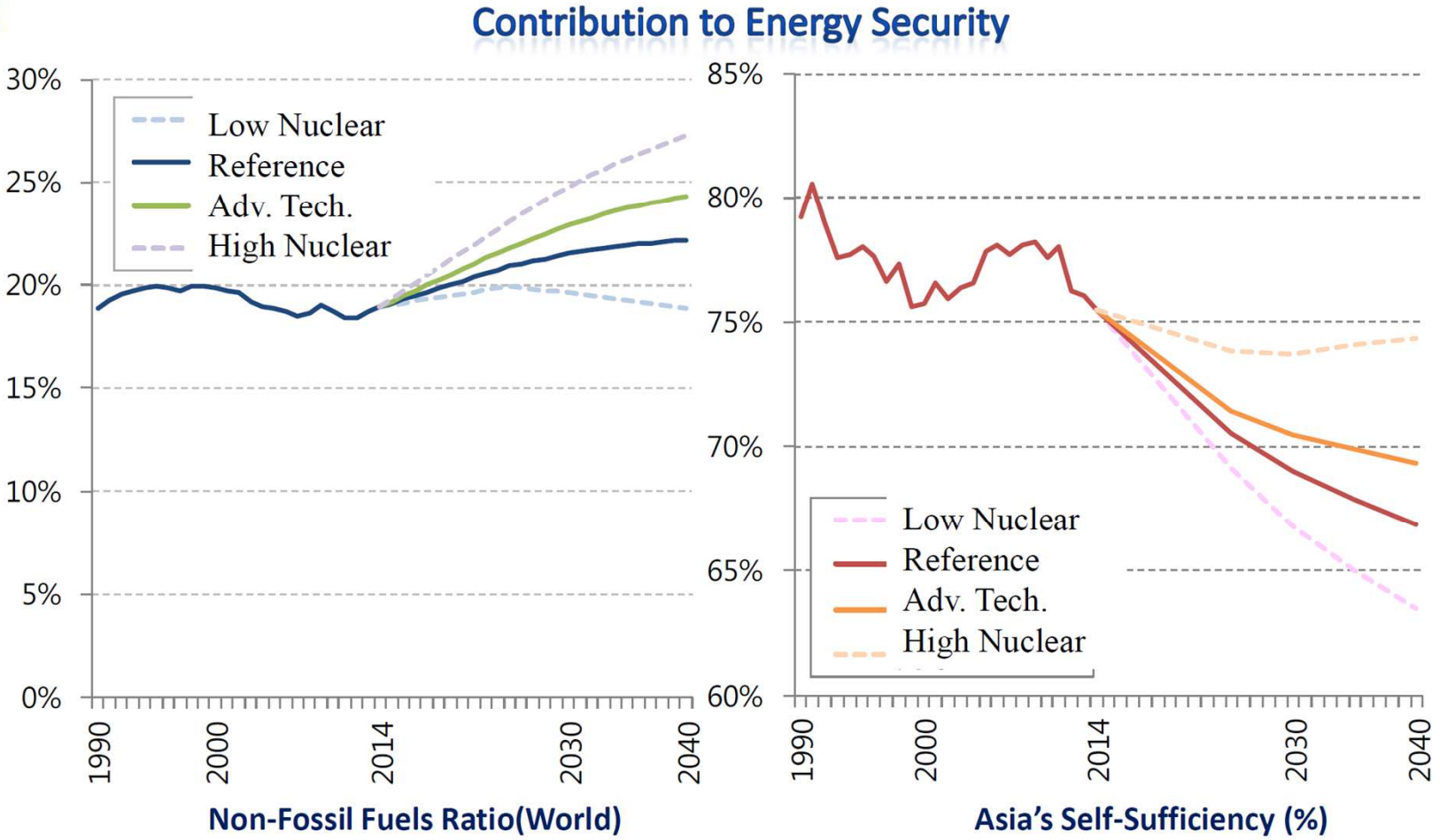
- High Case Nuclear capacity will increase by 2040: World : tripled, Asia: septupled
- Low Case: Nuclear capacity will diminish by 50% both in the World and in Asia



Source: IEEJ "Asia/World Energy Outlook 2016"

Sensitivity Analysis of 4 Nuclear Scenarios:
Impact on Non-fossil Fuel Ratio and Energy Self-sufficiency

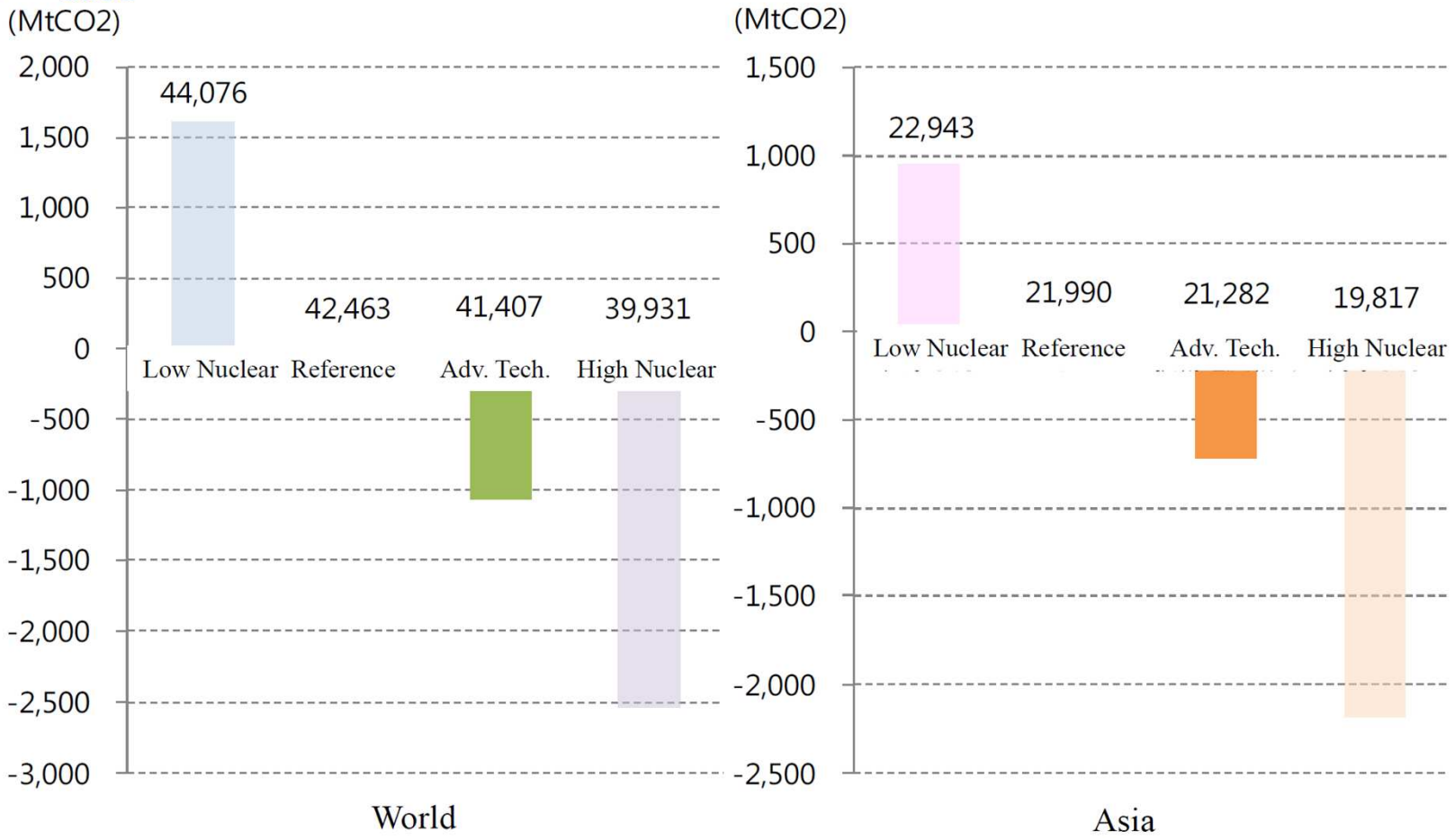
- High Case: Non-fossil fuel ratio is significantly higher
- Low Case: Self-sufficiency in Asia goes down to 60%



Source: IEEJ "Asia/World Energy Outlook 2016"

Sensitivity Analysis of 4 Nuclear Scenarios: Impact on CO_2 emission

- High Case:
  Asian CO_2 emissions deminishe by 10% (2 billion t-CO_2) compared to Reference Case

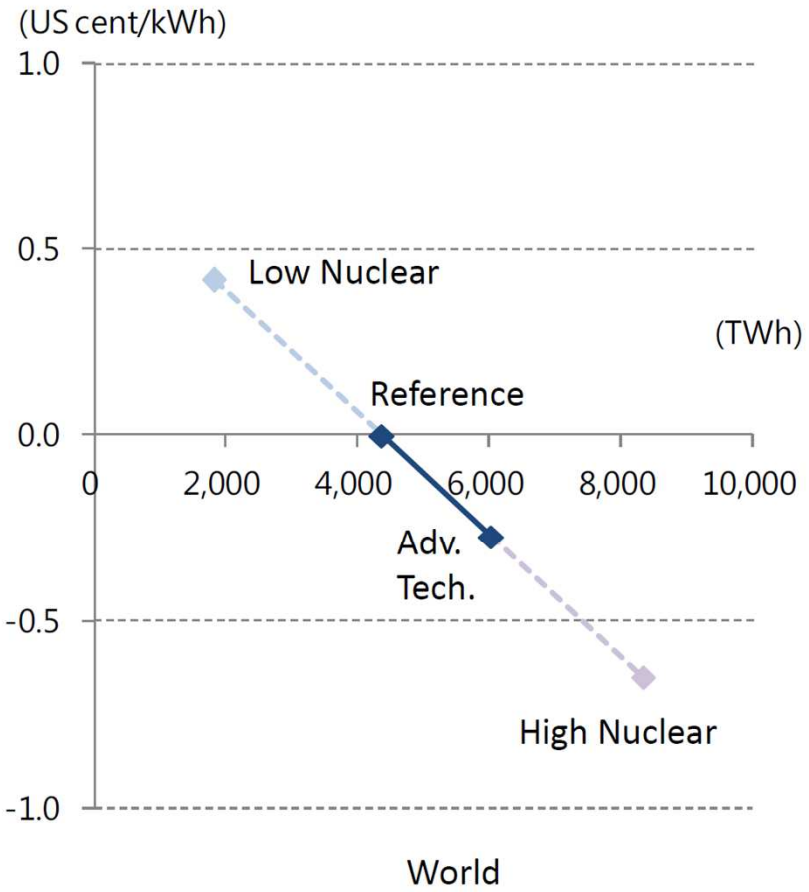


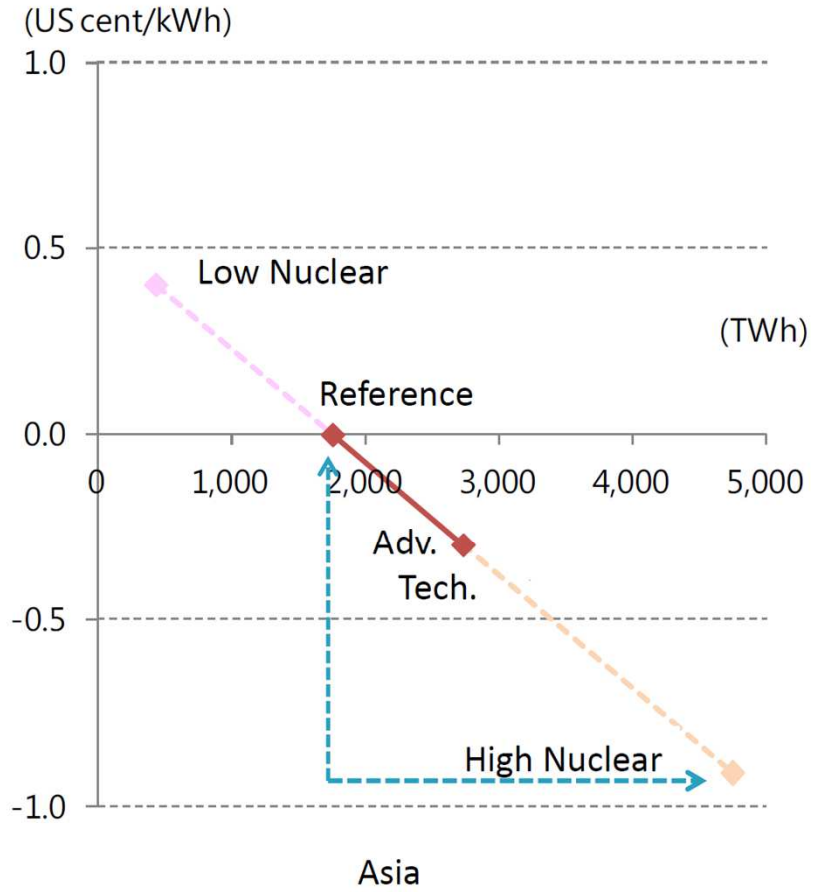
Source: IEEJ "Asia/World Energy Outlook 2016"

Sensitivity Analysis of 4 Nuclear Scenarios: Impact on Power Generation Costs

- High Case: Generation cost is lower than Reference Case by 0.9 ¢/kWh

Nuclear largely contributes to reduction of power costs





Source: IEEJ "Asia/World Energy Outlook 2016"

Conclusion

- **Asia will face increasingly difficult and complex 3E (energy security, environment protection and economic efficiency) challenges.**

- **Nuclear energy, with its strength such as efficient and cost competitive base load power with no CO2 emission, can address the 3E challenges simultaneously, if it is operated in sustainable and safe manner.**

- **Thus Asian countries need to make serious efforts to enhance nuclear safety individually by establishing reliable nuclear safety regulation and safety culture. International cooperation should be promoted to supplement the individual effort to achieve "3S" of nuclear energy.**