



LIVE WEBINAR

# GLOBAL ENERGY TRANSITION IN THE POST-CORONA WORLD

DATE: 21<sup>st</sup> OCTOBER 2020

TIME: 1030 – 1130 (GMT +8 KL)

**PROF. DR. KEN KOYAMA**

CHAIR IN ENERGY ECONOMICS OF ENERGY COMMISSION AT IEPR<sub>e</sub>, UNITEN



# SPEAKER

- Chair in Energy Economics of Energy Commission at UNITEN
- Managing Director of the Institute of Energy Economics Japan (IEEJ)



# Global Energy Transition in the Post-Corona World

Energy Talk Webinar

October 21<sup>st</sup>, 2020

Prof. Dr. Ken Koyama

Chair in Energy Economics of Energy Commission at UNITEN  
Senior Managing Director & Chief Economist, Institute of Energy Economics, Japan

# Global energy transition

---

- **19<sup>th</sup> century: Coal became dominant under Industrialization**
- **20<sup>th</sup> century: “the century of oil”**
  - ✓ Background factors: economic competitiveness, supply potential, convenience, technology advancement, etc.
- **1970s: Oil crisis and oil substitution policy**
  - ✓ Enhancement of energy security policy in OECD resulted in energy diversification (away from oil)
- **21<sup>st</sup> century: What’s next after “the century of oil”?**
  - ✓ Need to address environment and energy security problems
  - ✓ Technology development/deployment in renewable, ZEV, Hydrogen, etc.
  - ✓ Possibility to develop new unconventional energy sources
- **Impact of post-corona world transformation on the global energy transition**
- **Technology supremacy may decide the winner in the global energy transition**

# Emerging global energy landscape

---

- Unprecedented impact of COVID-19 pandemic
- Emerging over-supply and lower energy prices
- Impacts of US “Shale Revolution”
- Asia as a gravity center of world energy demand
- Energy Geopolitics revisited
- Climate change and air pollution as emerging risks
- Expectation for advanced and innovative technology

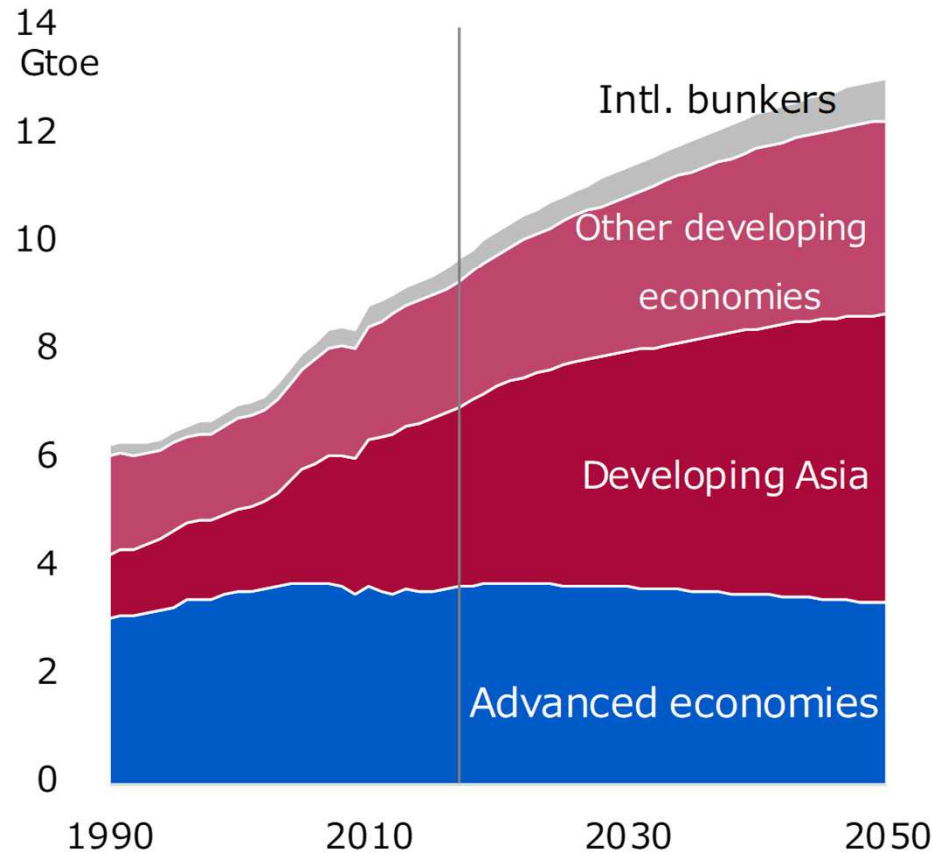
# Asia's Challenges for "3E"

---

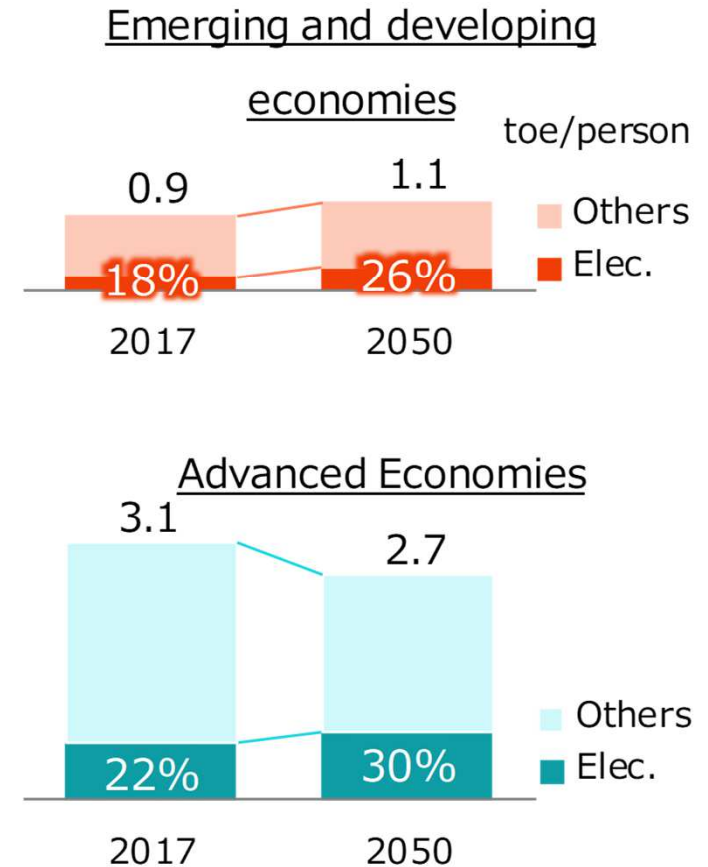
- **Rising import dependence and energy security**
  - High oil import dependence. Gas import dependence rising
  - High Middle East dependence, Sea-lane dependence
- **High coal dependence and environment loads**
  - Challenges for both climate change and pollution problems
- **Need for energy market reform as well as affordable energy prices**
  - Japan leads the way. Reform for both energy market and NOCs

# Per capita demand still low in developing economy

## Final energy demand



## Energy demand per capita



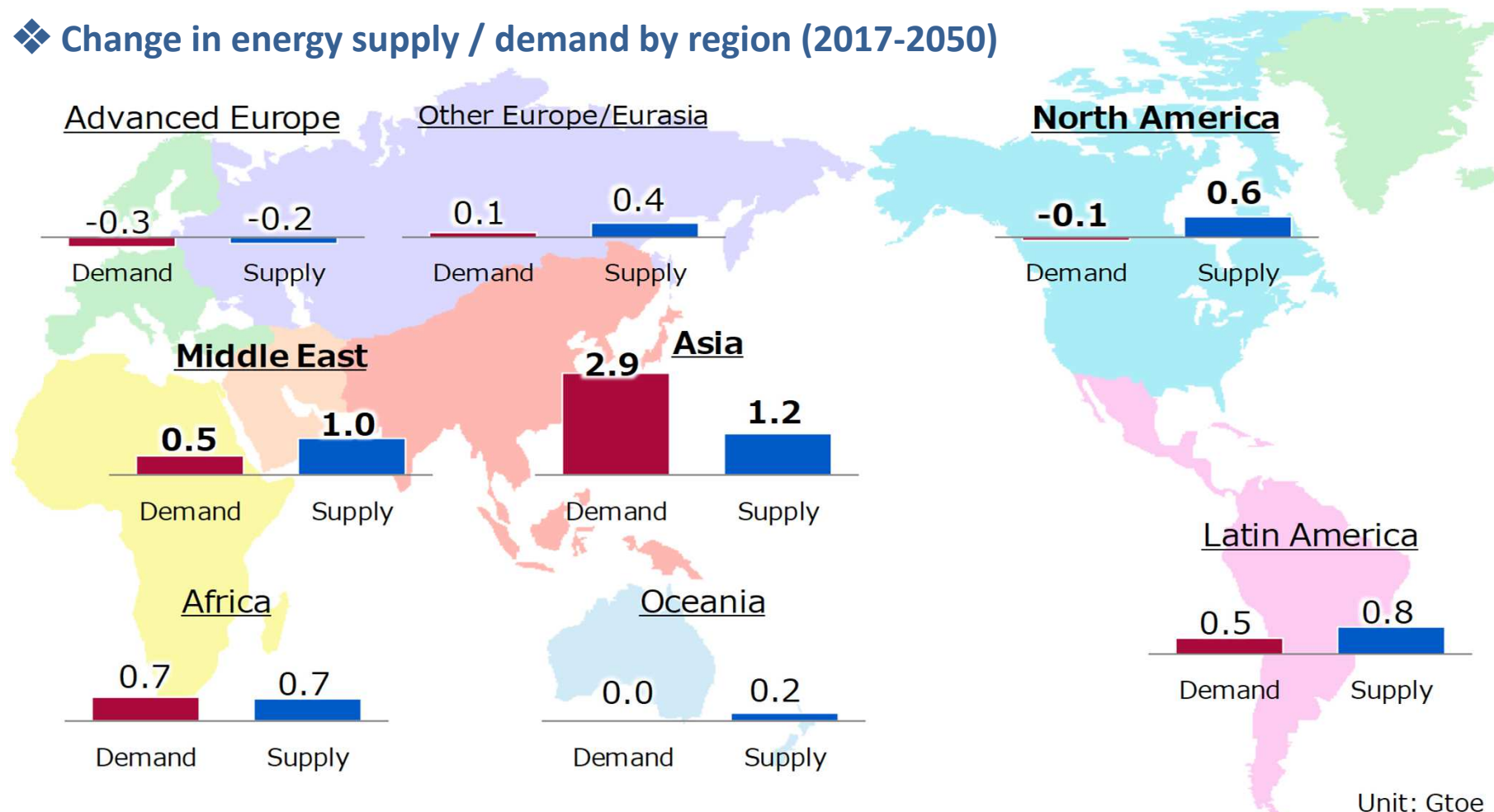
Global final energy demand increases by 30% by 2050 while advanced economies reduce demand.

In emerging and developing economies, demand per capita remains under half of advanced economies even in 2050.

Electricity demand continues to increase, and electrification rate rises in final energy demand.

# Demand overwhelms supply in Asia

## ❖ Change in energy supply / demand by region (2017-2050)

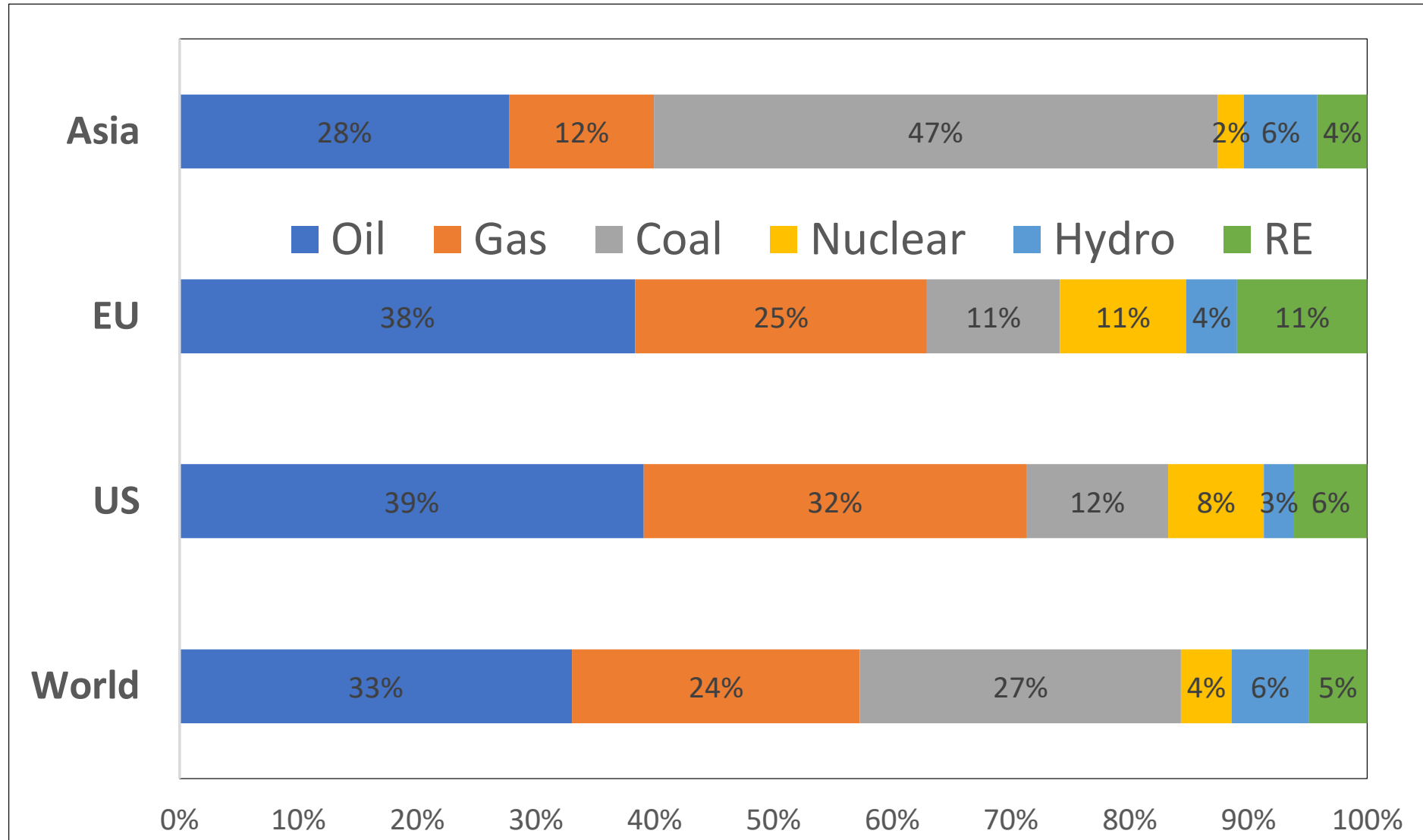


Over 60% of global demand growth comes from Asia. Meanwhile its energy supply cannot catch up, resulting in dropping energy self sufficiency from 72% to 61%.

North America and the Middle East increase surplus export capacity and enlarge their presences as energy suppliers.



# Asia, heavily dependent on coal



Source: Prepared from "BP Statistical Review of World Energy 2020"

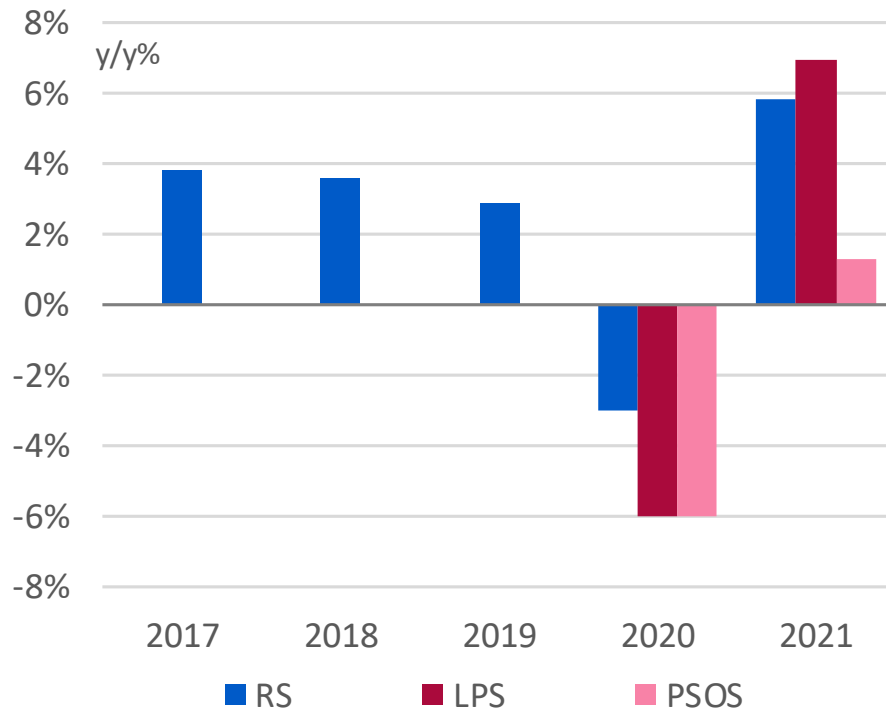
# Viewpoint of world energy market under pandemic

---

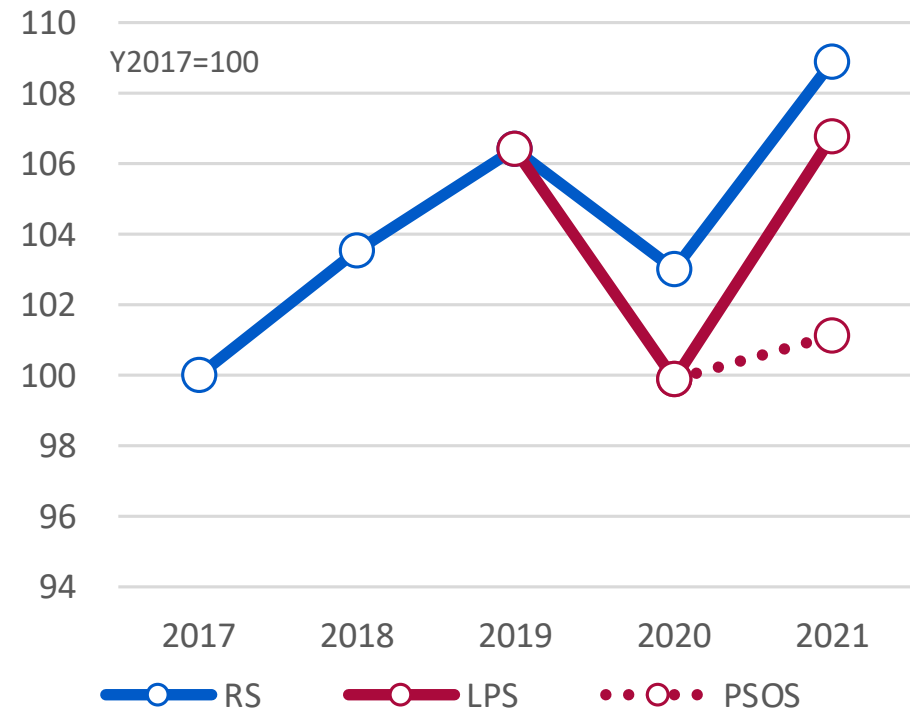
- **Pandemic peak out? Second/third waves?**
- **World economy: how bad can we go?**
- **Future of “lockdowns”?**
- **Supply responses to low prices/over supply?**
- **Demand responses to low prices?**
- **Impacts of low price on investment, industry and producing countries?**
- **Structural changes caused by the pandemic?**

# World GDP up to 2021

### World GDP growth

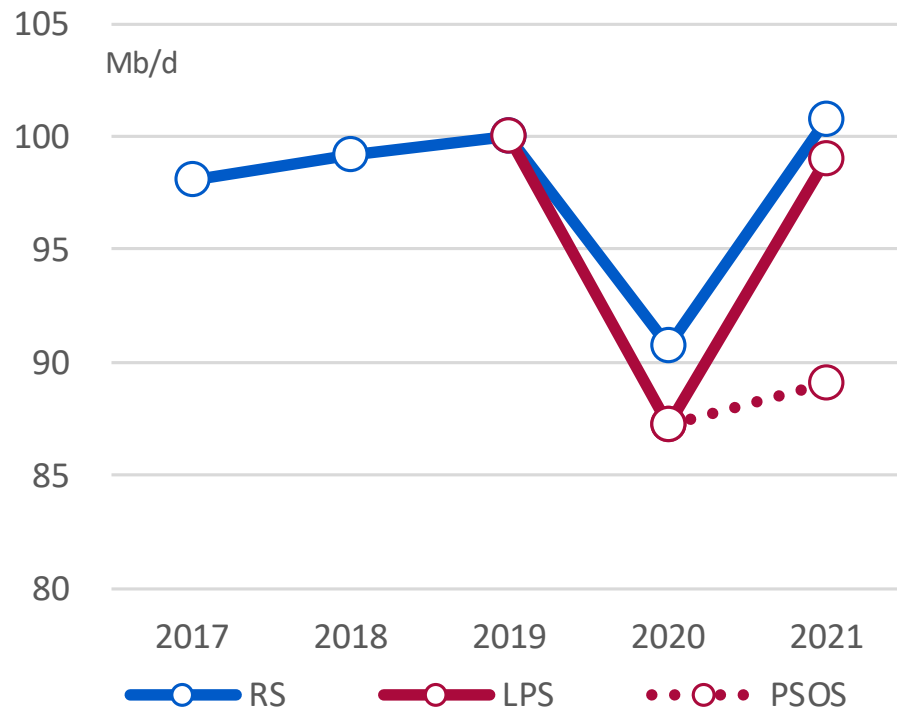


### GDP trend by quarter

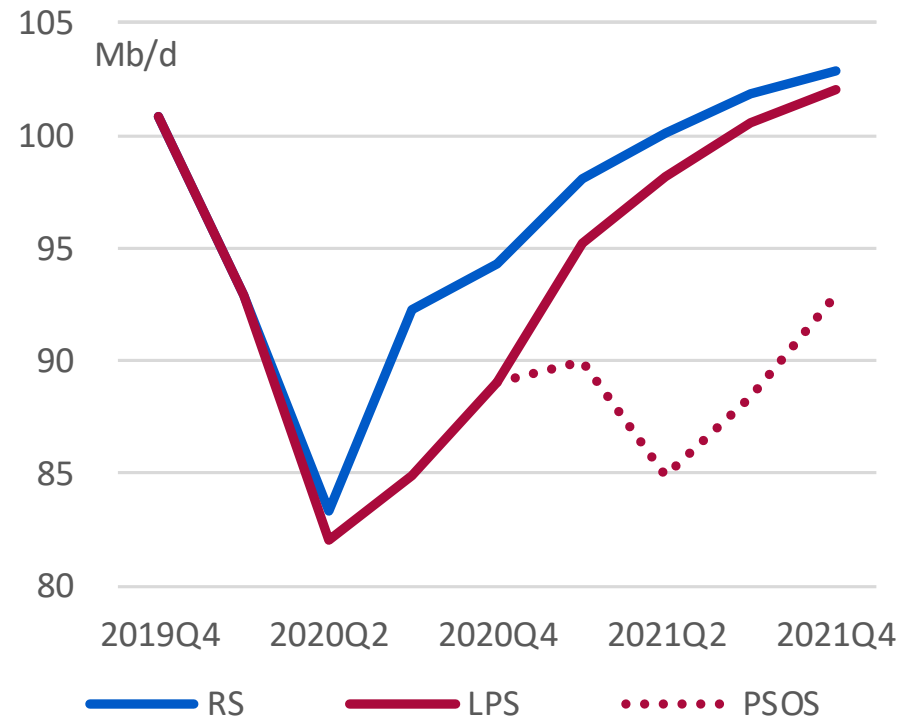


# Oil demand up to 2021

### World oil demand

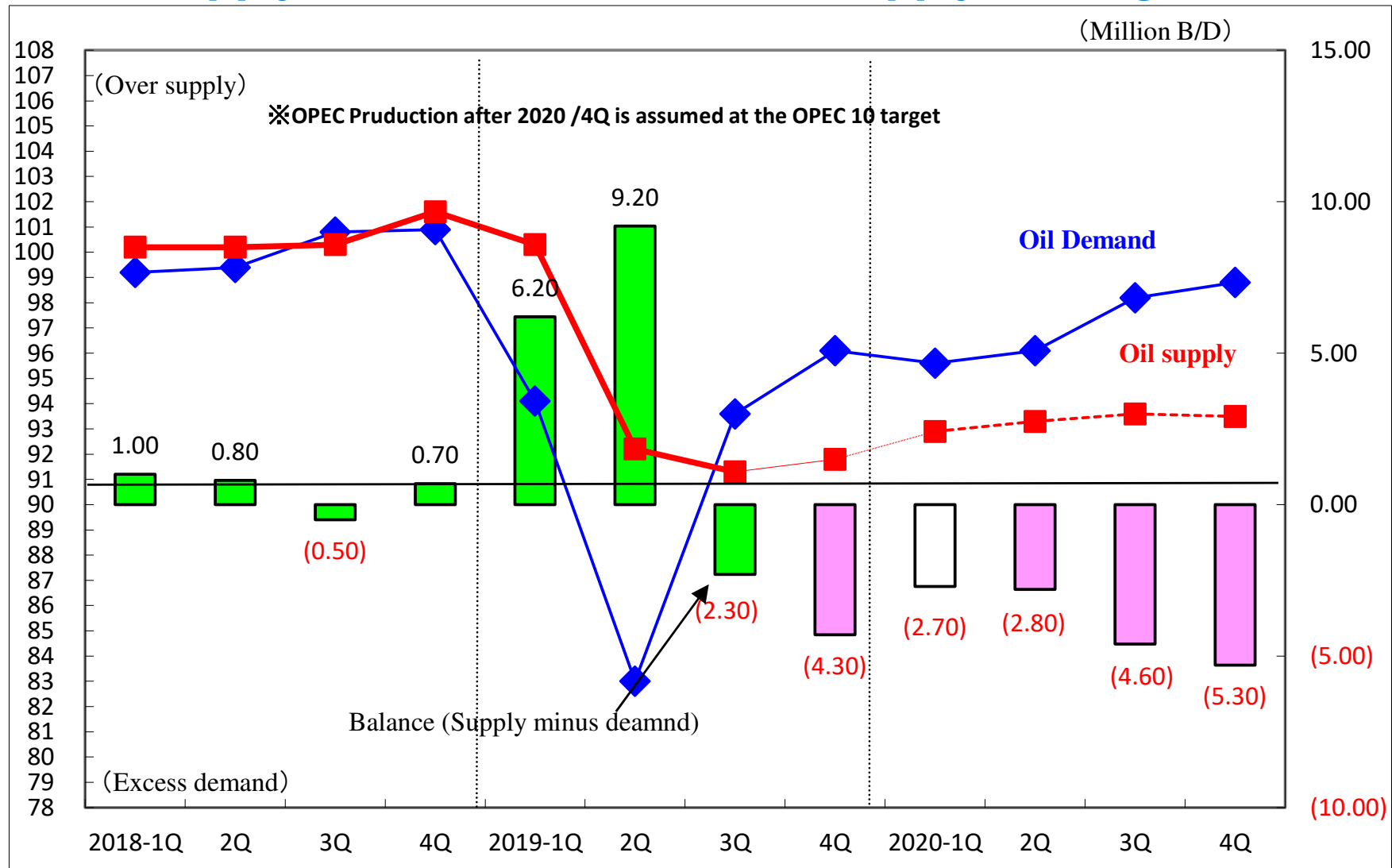


### Oil demand by quarter



# World Oil S-D Balance up to 2021

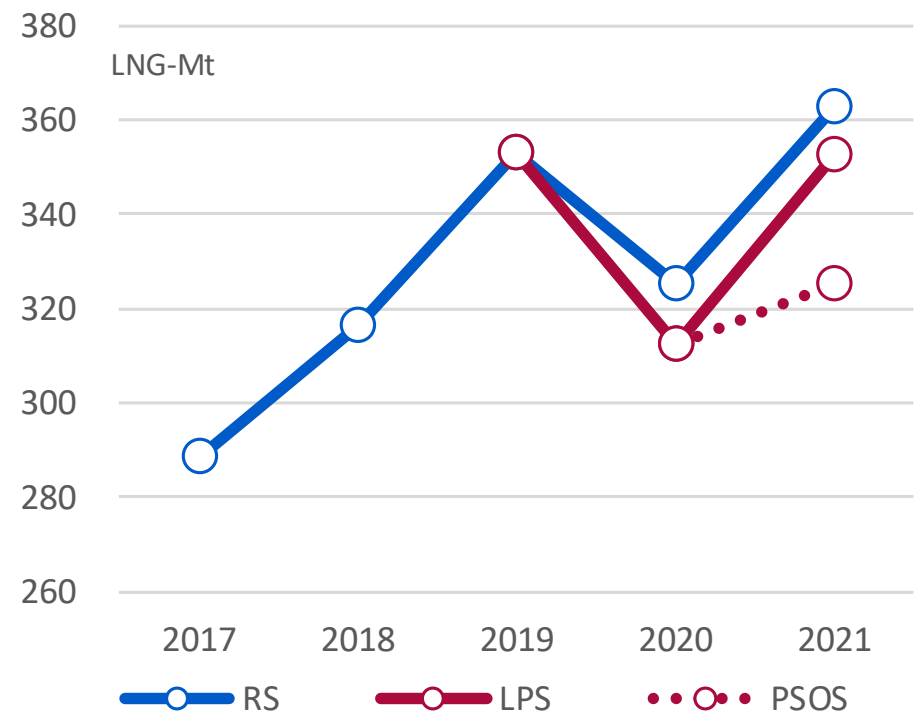
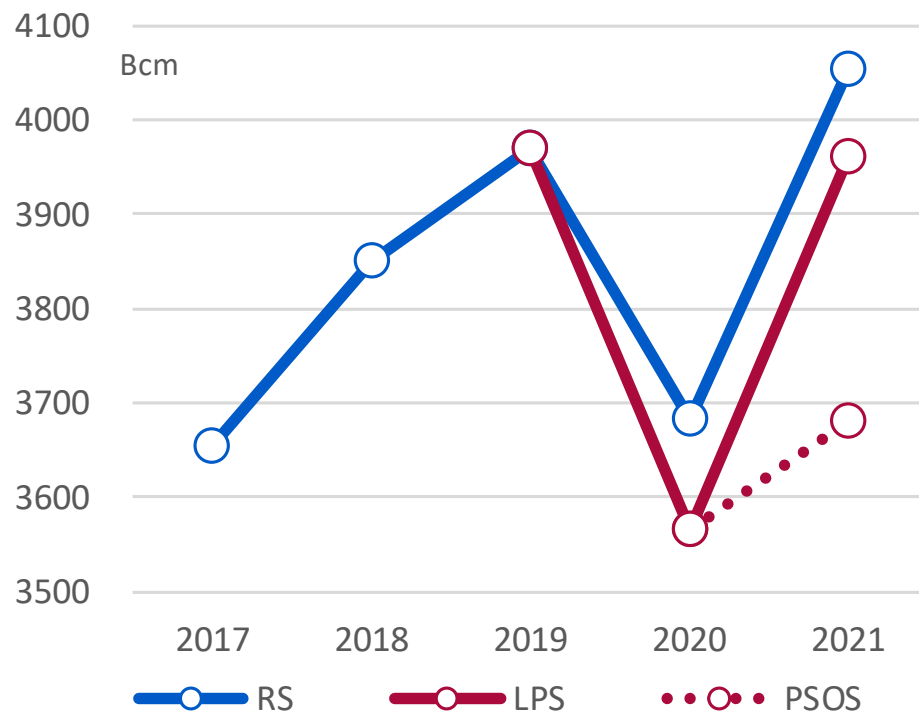
## Over-supply until 2Q 2020, but then supply shortage?



# Gas/LNG demand up to 2021

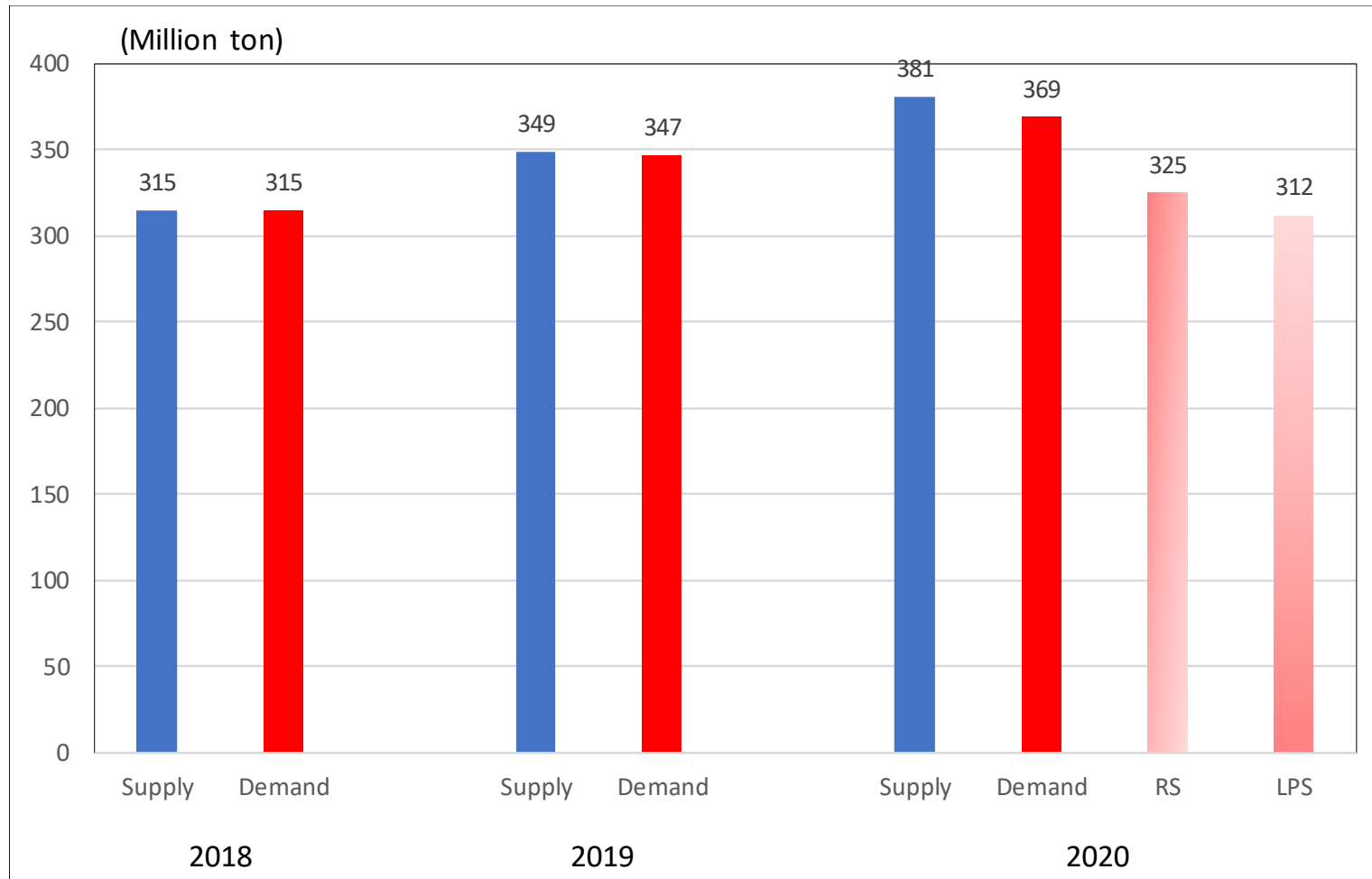
### Natural gas

### LNG



# Reduced LNG demand accelerates supply glut

Even without pandemic, 2020 market sees supply surplus...



Note: 2020 RS assumes 3% minus for world GDP, while LPS assumes 6% minus

# Supply/Demand response to low price

---

## ■ Supply response

- Oil: Strategic response by OPEC plus
- Oil: Low price gives economic pressure to high cost production
- Gas/LNG: There is no “OPEC plus” function
- Gas/LNG: low price gives economic pressure to high cost supply

## ■ Demand response

- Oil: Strategic response by major consumer countries to build SPR
- Oil: Future of lockdown is a key determinant. Low price stimulus rather limited?
- Gas/LNG: Low price stimulus may work
- Gas/LNG: Relative price competitiveness vs coal and others?



# Impact on industry and producing countries

---

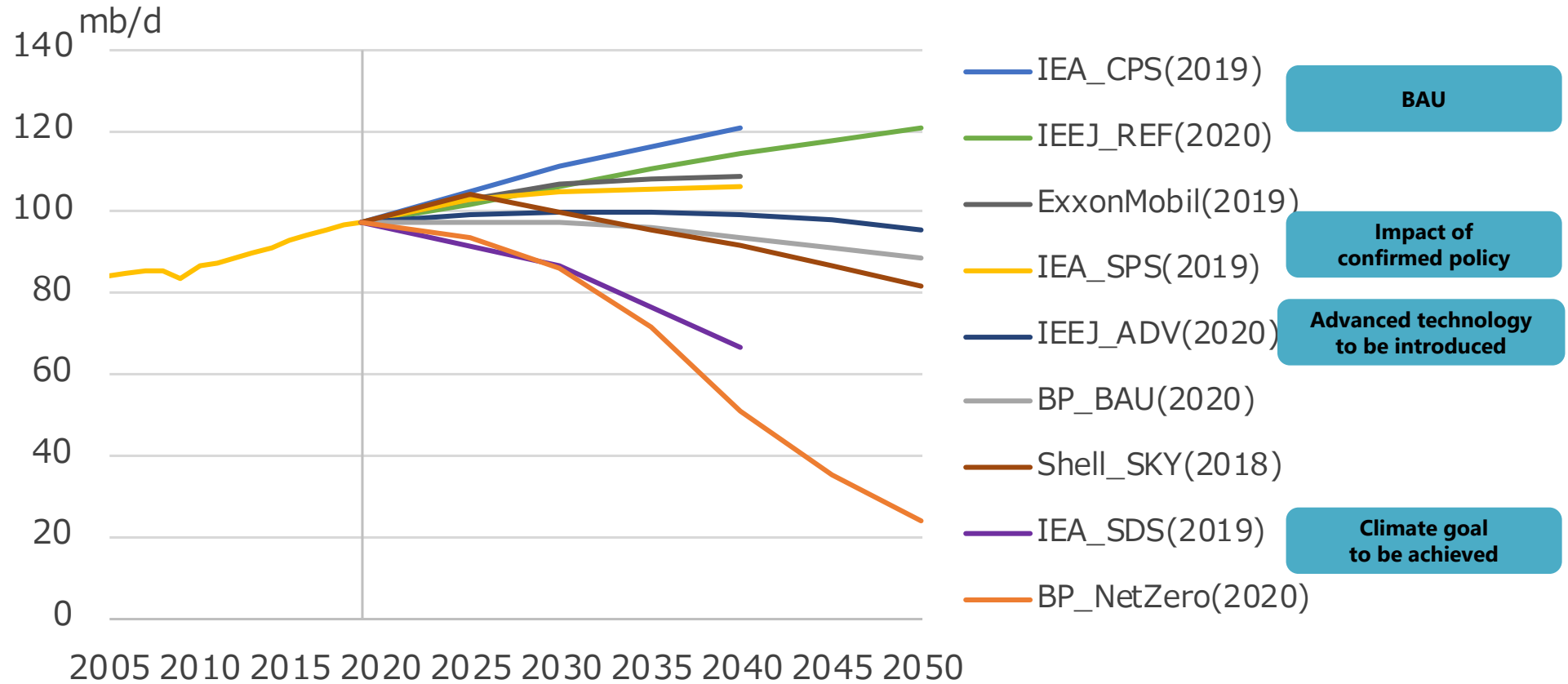
- Demand reduction/low price caused big damages to IOC/NOC
- Investment seriously reduced
- Duration of pandemic may cause further damages
- Economic deterioration worsened in major producing countries
- COVID-19 expansion makes things more difficult
- Risk of political and social instability?
  
- Current over-supply may be a source of future instability

# Structural problems: Key Questions

---

- **Oil demand structurally restrained? To what extent?**
- **Electrification accelerated? What that mean?**
- **Relation between “Post Corona” recovery and decarbonization?**
- **Impact of “Post Corona” geopolitics on global energy market?**
- **Impact on “Energy Transition” and “Technology supremacy” ?**

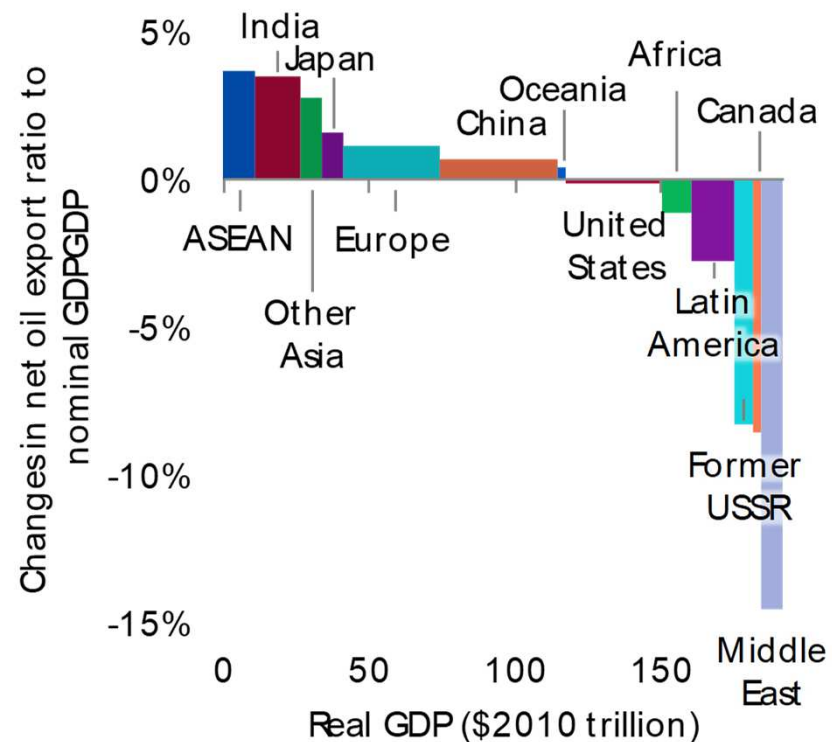
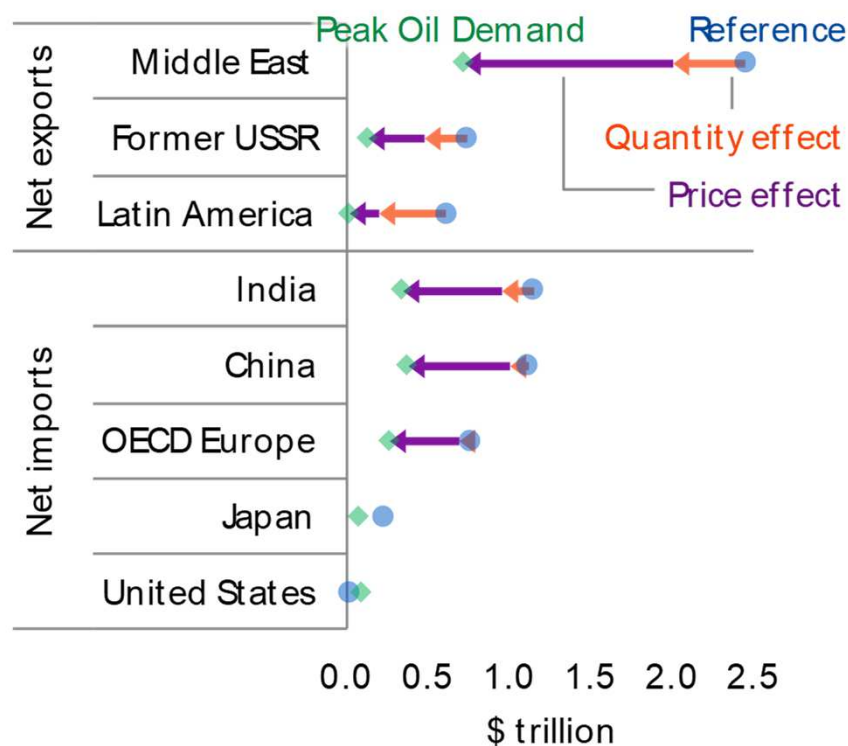
# Comparison of oil demand outlook



Source: Yasuaki Kawakami(IEEJ, October 2020) with some additions by the author

# Economic impacts of peak oil demand

## Changes in net oil exports/imports and ratios to nominal GDP [2050]

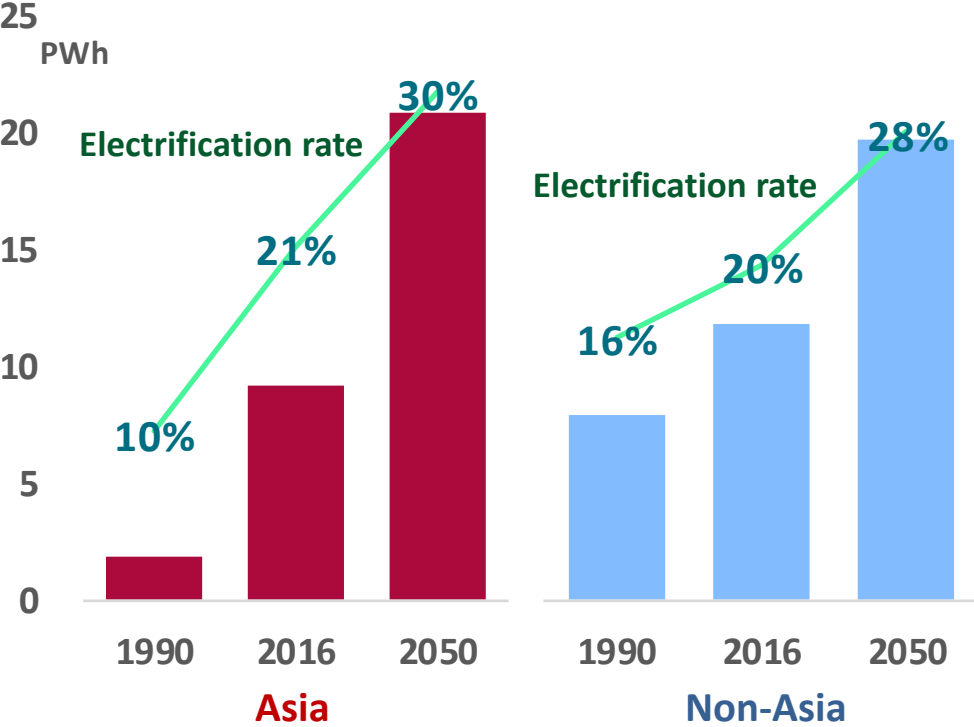


NOTE: Europe excludes the former Soviet Union

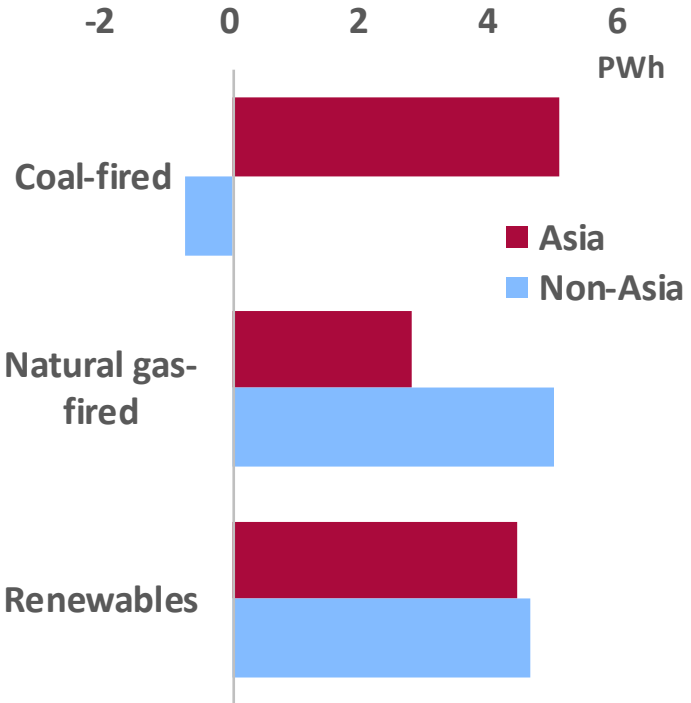
Although the Middle East obtains the relative gain, its net oil export decreases of \$1.6 trillion or 13% of nominal GDP is significant. On the other hand, the most benefiting country from net oil import decreases is India, the second largest oil consumer, followed by China, which has more car fleet than in any other countries. The United States has little impact despite of its consumption scale since it is almost oil self-sufficient.

# Growth of dependence to electricity

## ❖ Electricity demand and electrification rate



## ❖ Change in electricity generation (2016-2050)



\* Electrification rate: Share of electricity in the final energy consumption

- ◆ 60% of the increment in the primary energy demand will be consumed for power generation.
- ◆ The global electricity demand will double in 2050, and 60% of the increment will occur in Asia.
- ◆ In Asia, electrification rate will increase to 30% in 2050, and 40% of electricity demand will be covered by coal, which can be obtained plentifully and inexpensively.
- ◆ Except for Asia, natural gas-fired power generation will be applied more than the coal-fired.

# “4D challenges” in the electricity sector

- **Decarbonization : How to tackle with ambitious GHG reduction**
- **Deregulation : Response to changes caused by market reform/liberalization**
- **Digitalization : Electricity as increasingly important in digital society, but...**
- **Decentralization : Need to respond to shift to decentralized society**
- **Complicated relations among “4D challenges”, including “trade-off” relations**
- **At the same time, price affordability and supply stability/security in electricity continue to be a top priority**
- **Large scale increase in VRE, implications of market reform, cyber security, etc. have emerged as new risks/threats to electricity security of supply**

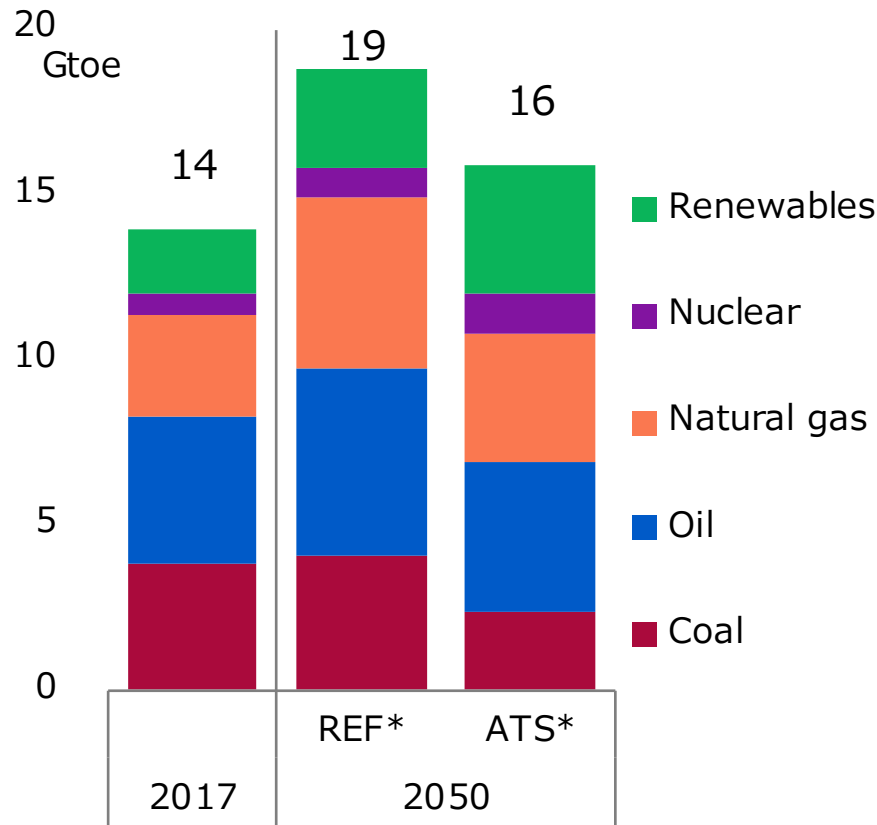
# Issues for decarbonization and “Green deal”

---

- **Low/Decarbonization efforts continue to be an important agenda**
- **But, decarbonization agenda may be “relativized” because of the increase in the importance of recovery, survival and security**
  - **Decarbonization trend can differ greatly by region/country in the world**
- **Effectiveness of Green investment on recovery and employment?**
  - **Attentions paid to the result of “EU model”**
- **Promotion of Green investment (RE, hydrogen, etc.) requires strong policy support**
  - **Importance of technology development, cost reduction and cost sharing**

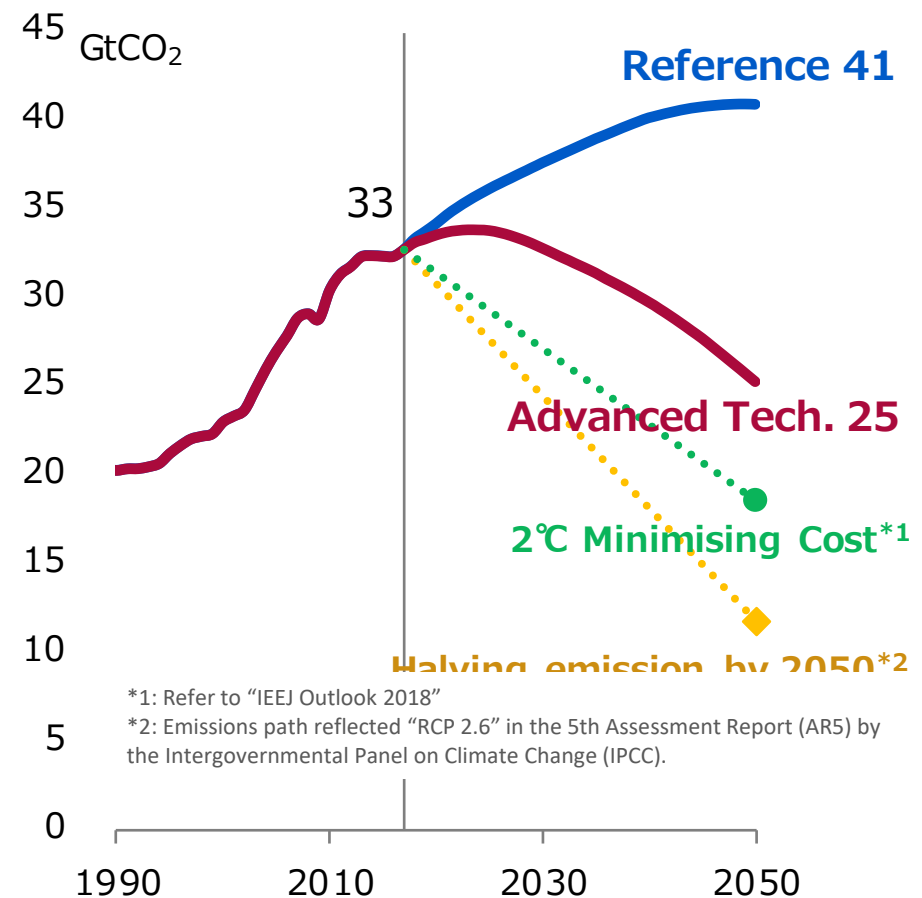
# ATS sees large reduction, 2°C goal still far

## Primary energy demand



\*REF: Reference Scenario, ATS: Advanced Technologies Scenario

## Energy-related CO<sub>2</sub> emissions



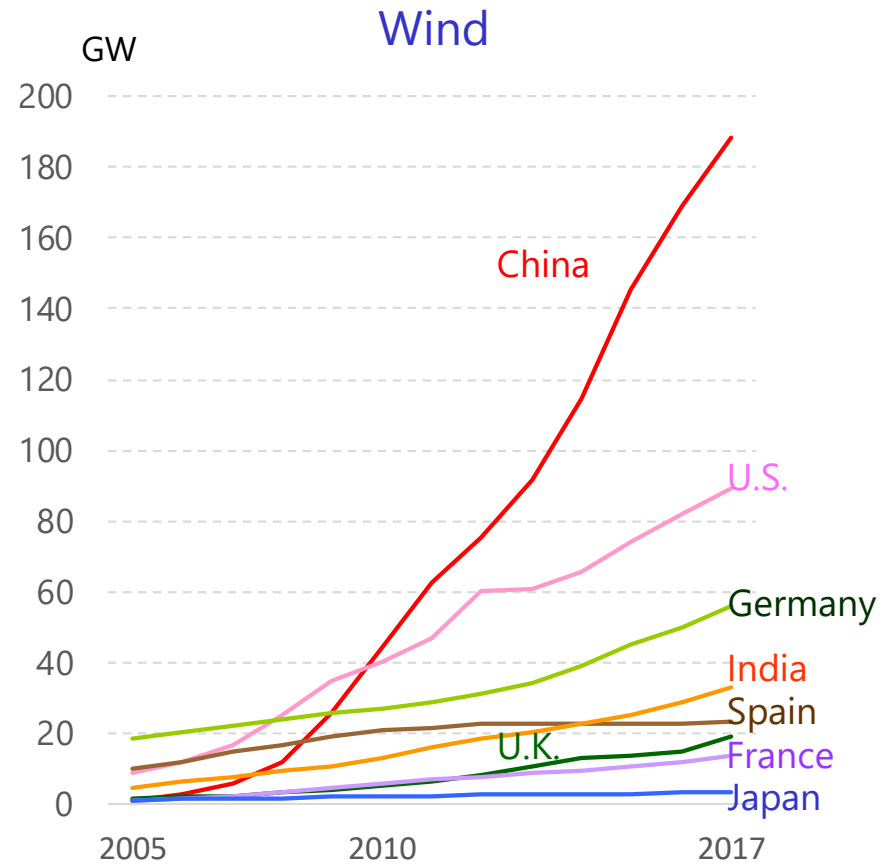
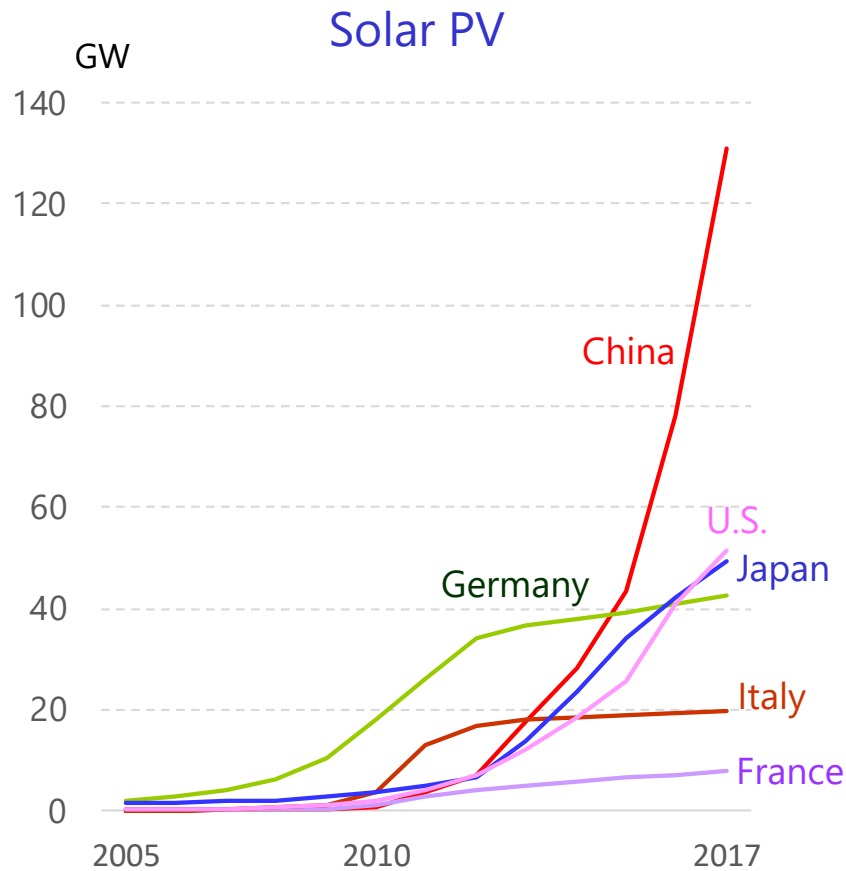
\*1: Refer to "IEEJ Outlook 2018"

\*2: Emissions path reflected "RCP 2.6" in the 5th Assessment Report (AR5) by the Intergovernmental Panel on Climate Change (IPCC).

In the Advanced Technologies Scenario, dependence on fossil fuels drops to 70%, still high level.  
 Energy-related CO<sub>2</sub> emissions peak at the middle of 2020s and decrease by 23% vs. 2017 in 2050.  
 To keep temperature rise to below 2 degrees Celsius, additional programs and innovative technologies are required.

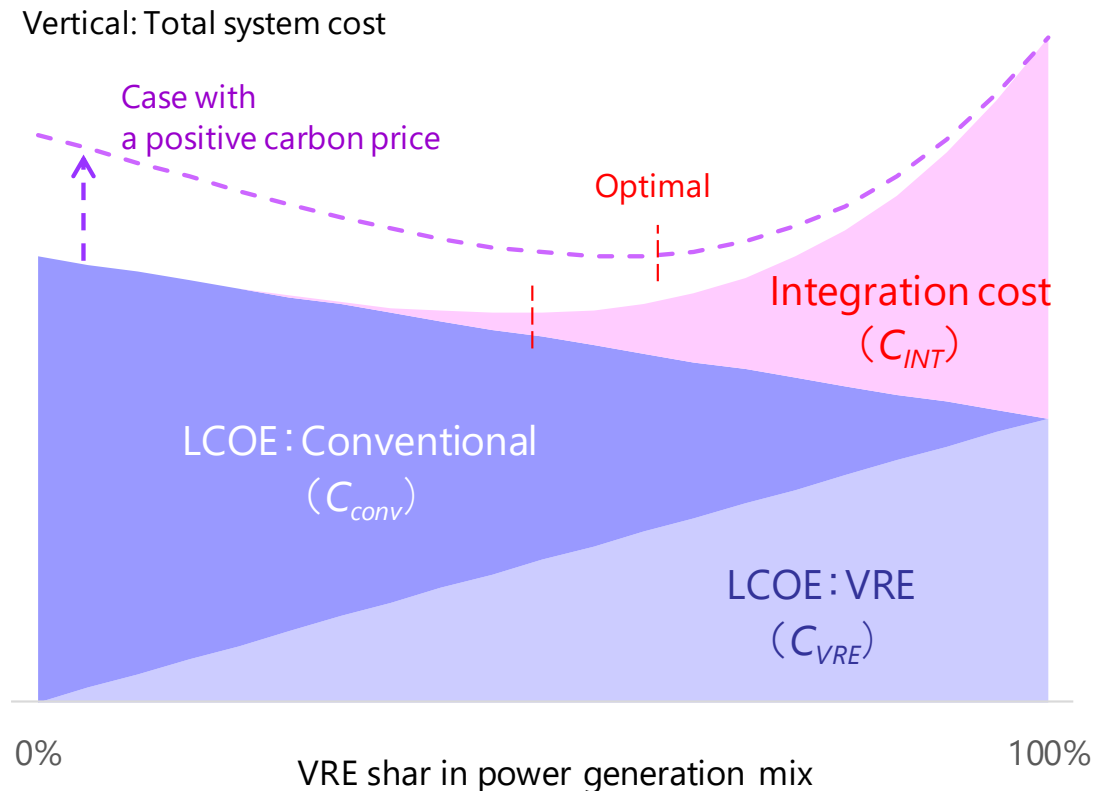


# Expanding installed capacity of VREs



- Recent trends exhibit rapid expansion of the power generating capacities of **Variable Renewable Energies (VREs)**, such as solar and wind, due to growing concerns over climate change issues and continuous cost declines.
- VREs are expected to continue the rapid expansion in the long-term, although we should anticipate several challenges as stated below.

# System integration cost: A conceptual illustration



- If the LCOE of VRE is smaller than that of conventional power sources, the “traditional” power generation cost, which represents the costs proportional to the LCOEs, shown as  $C_{conv} + C_{VRE}$  in the above figure, declines with increasing share of VRE.
- However, high penetration of VRE requires additional cost related to the necessity of power storage, VRE output curtailment, and grid extension, etc., known as **system integration costs**, indicated by  $C_{INT}$  as illustrated above.

# Energy market with higher geopolitical tensions

- Priority shift from “economic efficiency” to security and geopolitics
- Cost-up caused by the shift tolerated
- Revision of global supply chain based on “cost minimum concept”
- “Me-first” and priority on “alliance” and “sphere of influence”
- Downward pressure on global economy(deviation from economic optimum)
- Global energy demand to be reduced
- Differed patterns of energy demand trend by region/country
- Enhanced efforts to energy security (self-sufficiency, diversification, strategic alliance)
- Possibility of “relativization” of decarbonization and diversified energy option based on availability/accessibility (nuclear, hydrogen, fossil fuels with CCS, etc.)

# Why is Hydrogen Important ?

---

## Hydrogen

- Hydrogen is **another zero-carbon energy**.
- Hydrogen can be produced from various resources (e.g. fossil fuels, renewable energy, nuclear energy and wastes)
- Hydrogen can be used for many purposes (e.g. Power generation, Transportation, Heating and Industrial Use)

## Important Role of Hydrogen: Addressing C.C

- Introducing new abundant zero-carbon Energy
- Continuing to **the further development of fossil fuel rich economies including Middle East** in Post-Oil-Age by de-carbonizing fossil fuels together with CCS (CO<sub>2</sub> Capture and Storage)
- Enabling to use coal fired plants in a more ecofriendly manner

# Middle East and Japan Connected by Hydrogen

- CO<sub>2</sub>-free hydrogen and ammonia produced with CCS/EOR represent one of the low-carbon technologies cited in the “**Saudi Japan Vision 2030**”
- The technology benefits both countries.
- IEEJ is continuously conducting research in collaboration with Saudi Aramco (2017~)

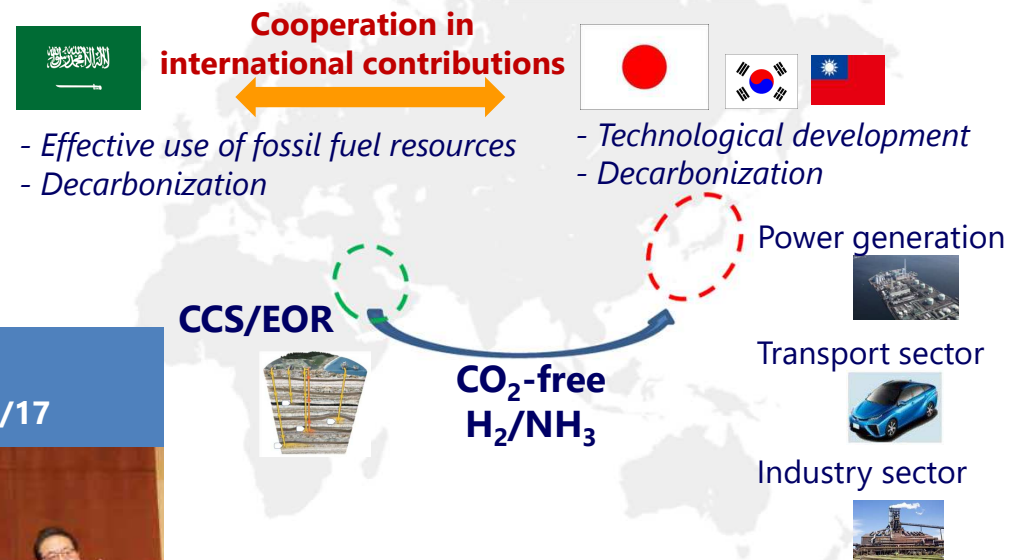
## Saudi Japan Vision 2030 الرؤية السعودية اليابانية 2030



## MOU (CO<sub>2</sub>-free Ammonia) Saudi-Japan Vision 2030 Business Forum : 2019/6/17



## CO<sub>2</sub>-free Hydrogen/Ammonia Supply Chain



# Conclusion

---

- **Big uncertainty over the future of the pandemic**
- **Future of world economy is also uncertain**
- **2020 market is characterized by over supply and low price**
- **Risk to the future instability**
- **Attention to be paid to “Post corona” energy choice**
- **Oil demand peak and electrification will be the key**
- **Impact on decarbonization initiatives is still uncertain**
- **Geopolitical tension may lead to world energy transformation**
- **Technology supremacy, strategically important**
- **Global energy transition, complicated by the above factors**



# SESSION

# THANK YOU



- Institute of Energy Policy and Research
- +603 8921 3400
- syarifah.mardhiah@uniten.edu.my
- <https://uniten.edu.my/research/institute-energy-policy-and-research-iepre/about-us/>