



*International Symposium Panel Discussion*  
*The Role of Transmission lines for  
expanding Sustainable Energy  
in Asian Countries*

***Ryuichi YOKOYAMA***

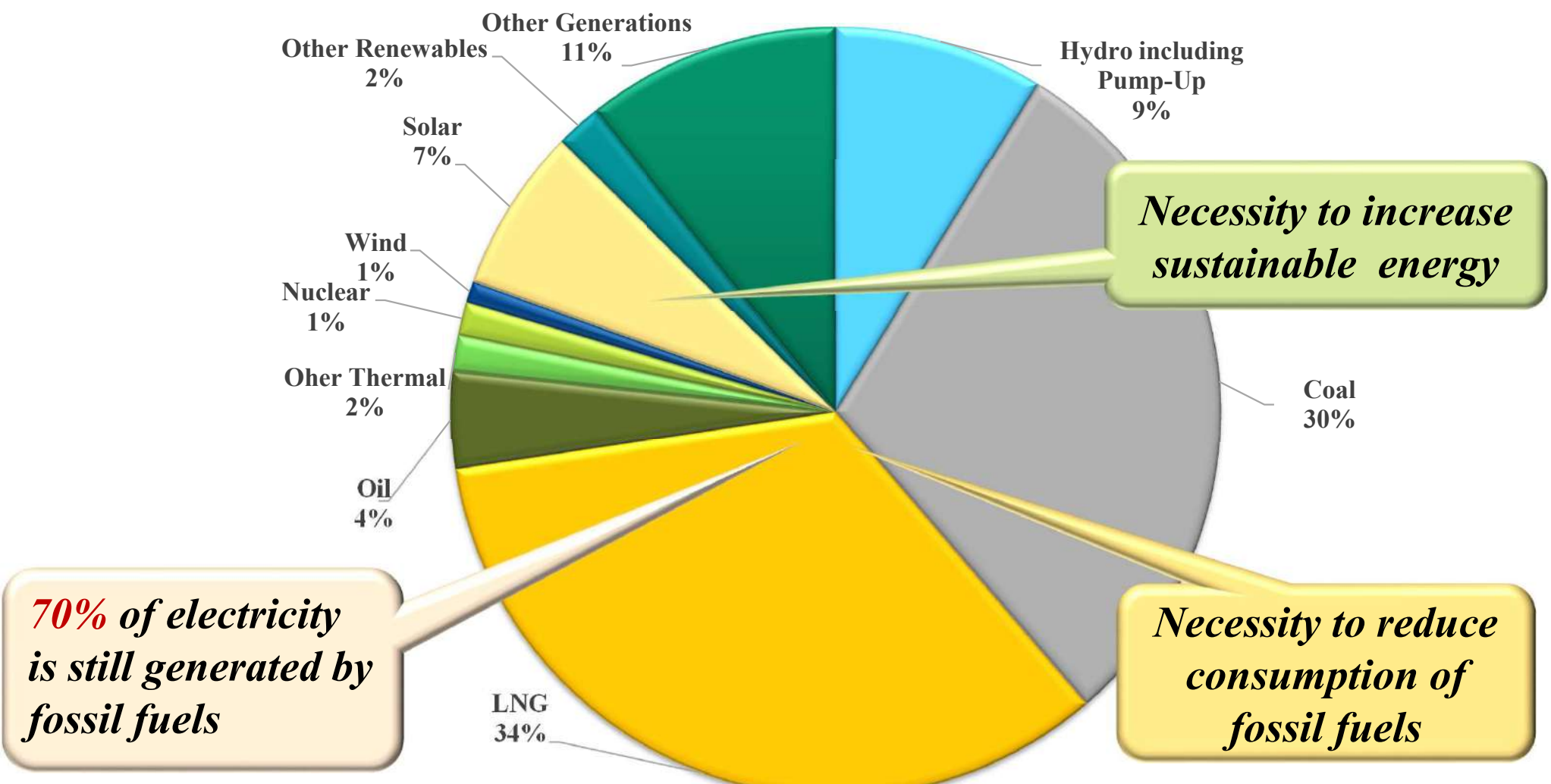
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# Transition of Generation Mix and Estimate in 2020

*Generation Mix in 2020 (Estimate by OCCTO, 2016, KWh-Base)*



# International Grid Connection Projects in Asia

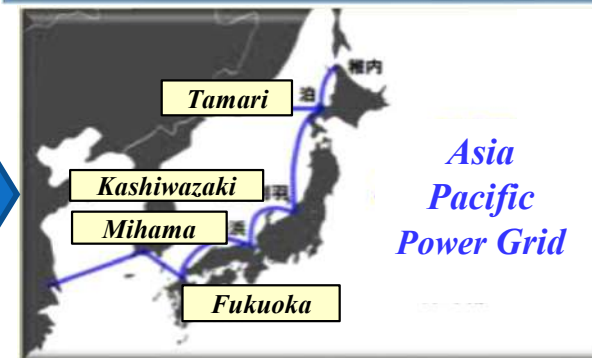
**Japan-Russia Power Bridge Project (2000)**



**ASEAN Power Grid Connection (2007)**



**Asia Pacific Power Grid by JPC (2011)**



**Global Energy Interconnection Vision proposed by SGCC (2015)**



**Asian Super Grid by REF (2011)**



**Suagrid, Smart Energy Belt (2014)**



# Asian Super Grid Proposed by REF

## International Grid Connection in Asian Countries



Wind Farm in Mongolia



The Gobi Desert



Solar Thermal Farm



Renewable Energy Institute has proposed an *Asia Super Grid* based on renewable energy. The goal is to utilize renewable energy across Asia by connecting China, South Korea, Russia, and Japan via an international power grid using solar and wind power generated in Mongolia as the main power supply.



AC Transmission Lines



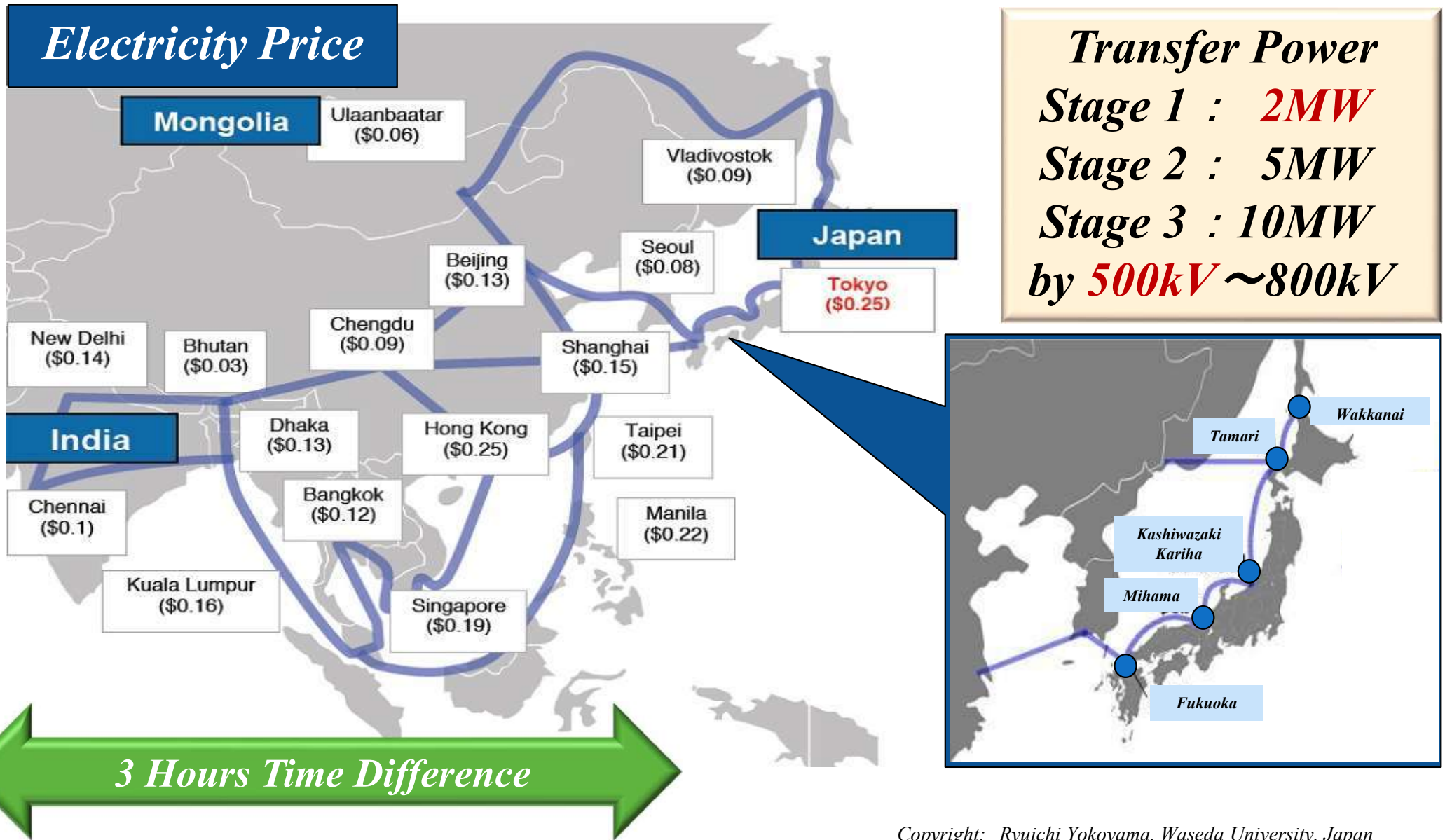
Converter Station



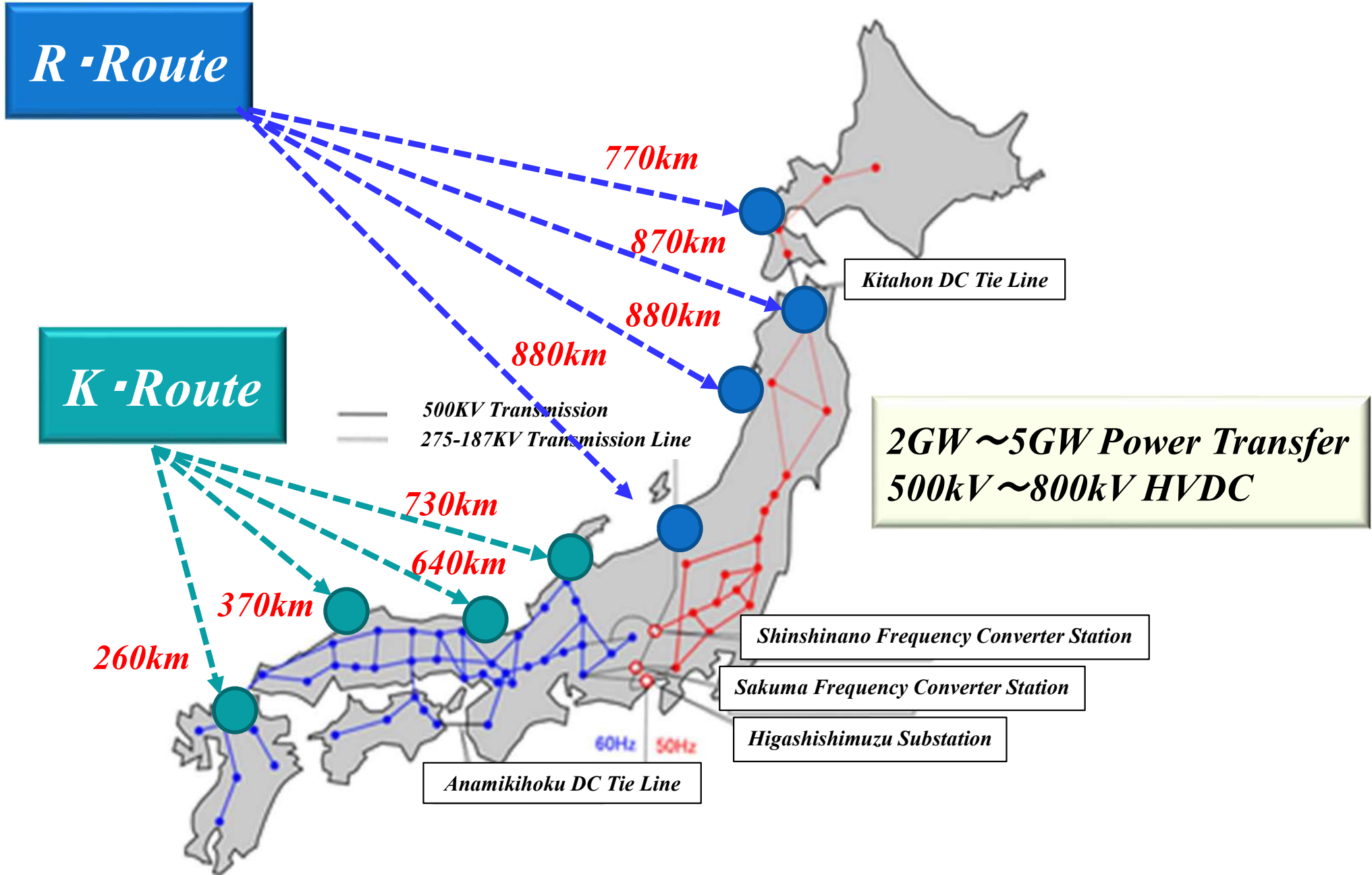
HVDC Cable

# Benefit of Asian Super Grid

## Difference of Time and Electricity Prices



# Feasibility of International Grid Connection in Japan

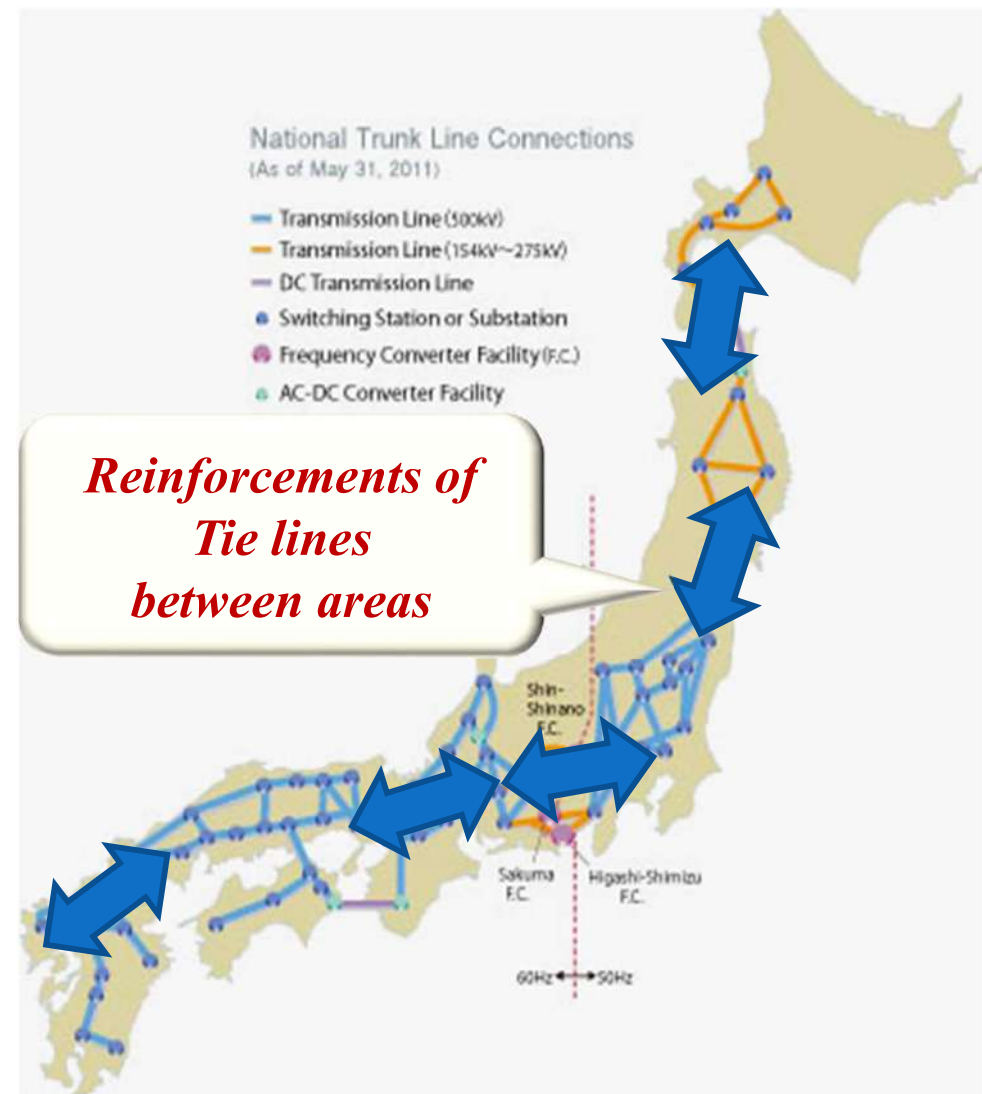


# *Reinforcement of Tie lines for Cross-Regional Cross regional Operation Toward Super Grid in Japan*

## *Increase of Cross-regional electricity transfer*

- *To avoid **blackout** occurred by natural disasters by transferring electric power between areas*
- *To mitigate **output fluctuation** of large scale renewable energy installation by enhancement of nationwide demand and supply balancing capability*
- ***Establishment of OCCTO: Organization for Cross-regional Coordination of Transmission Operators, Japan***

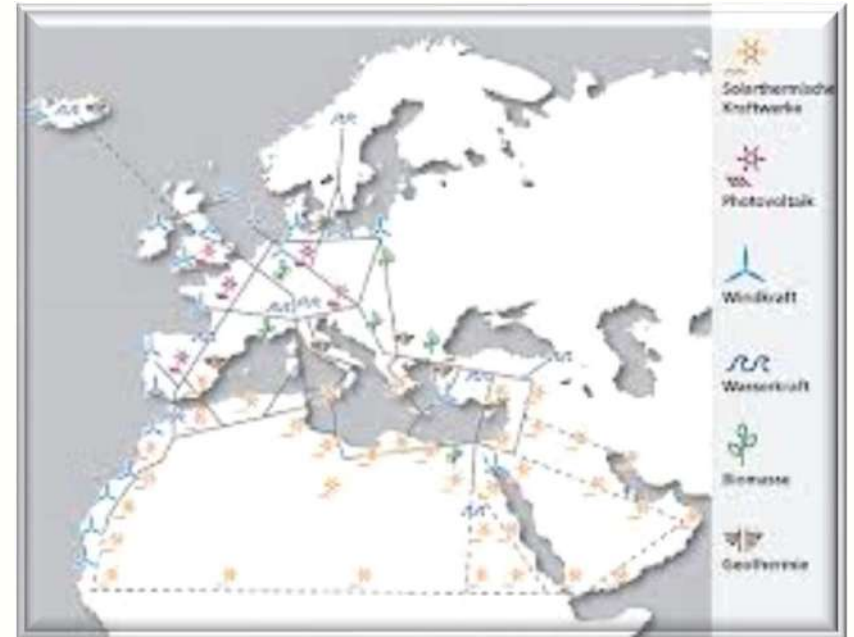
Reference: OCCTO, Summary of electricity supply plan in2015, June 2015



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# Mandatory Conditions for Realizing Super Grid

- *In the DESERTECH Project of European countries including the Middle East and the North Africa,*
  - *Solar Thermal energy in deserts of the North Africa and the Middle East*
  - *Wind power energy in the coast of the North-West Africa, the North and West Europe*
  - *PV generation in strong solar radiation, such as Spain*
  - *Hydro energy in mountain areas of the Alps mountains, Pyrenees, Atlas Mountains*
  - *Biomass energy in the middle of Europe, such as, Germany and France*
- *International interconnections between Africa, the Middle East and Europe by low loss, long distance HVDC*



- *Diversification of energy resources in different areas*
- *Countries are stable politically, Economically and Socially*
- *Interconnecting countries have cordial relations each other*



# Coordination of Goals of Electric Power Sector for Stable Energy Supply

## Objectives

**Stable, Reliable, and Clean Power Supply for All Customers with Reasonable Price**

**Stable Supply and Self-Sufficiency**

**Best Energy Mix and Domestic Energy**

**Resiliency**

**Cost Reduction** **Decentralized and Autonomous Grid** **Clean Electricity Supply**  
**Efficient Operation and Facilities** **Renewal Energy Use** **and Clean Energy Technology**

**Energy Saving, Peak Cut and Load Leveling**

**Efficient Use of Facility by Smart Technology, DR**

**Resiliency and Renewal Energy Expansion**

**Smart Community**

**Regional Microgrid**

**Super Grid & GEI**



*Thank you for your attention*

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