

Overview of Wind Programs (JAPAN)

March 2009

THE FEDERATION OF ELECTIC POWER COMPANIES
HOKKAIDO ELECTRIC POWER CO., INC.



10 Electric Power Companies

Encompassing All of Japan—The Ten Electric Power Companies by Service Area

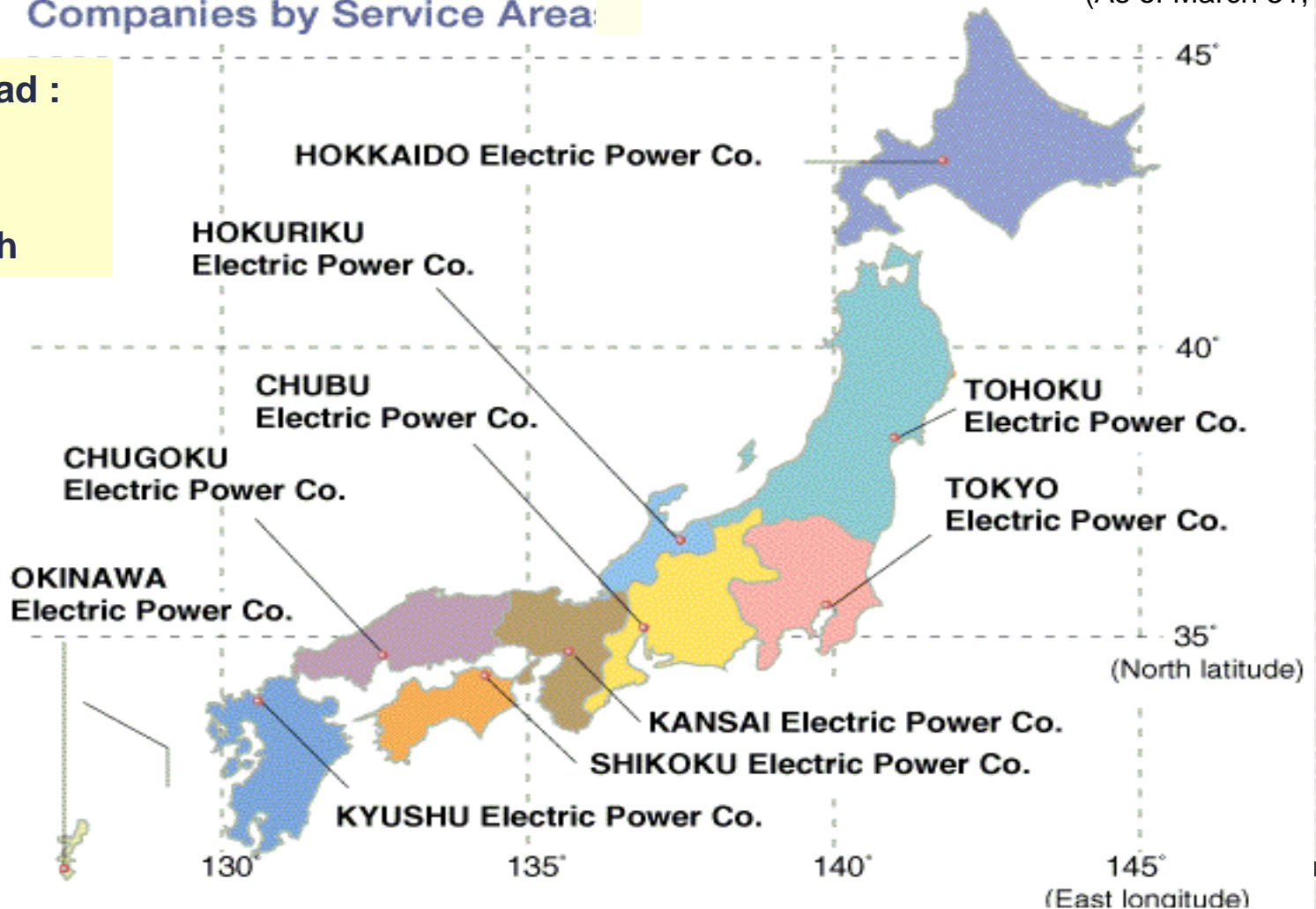
(As of March 31, 2008)

System peak load :

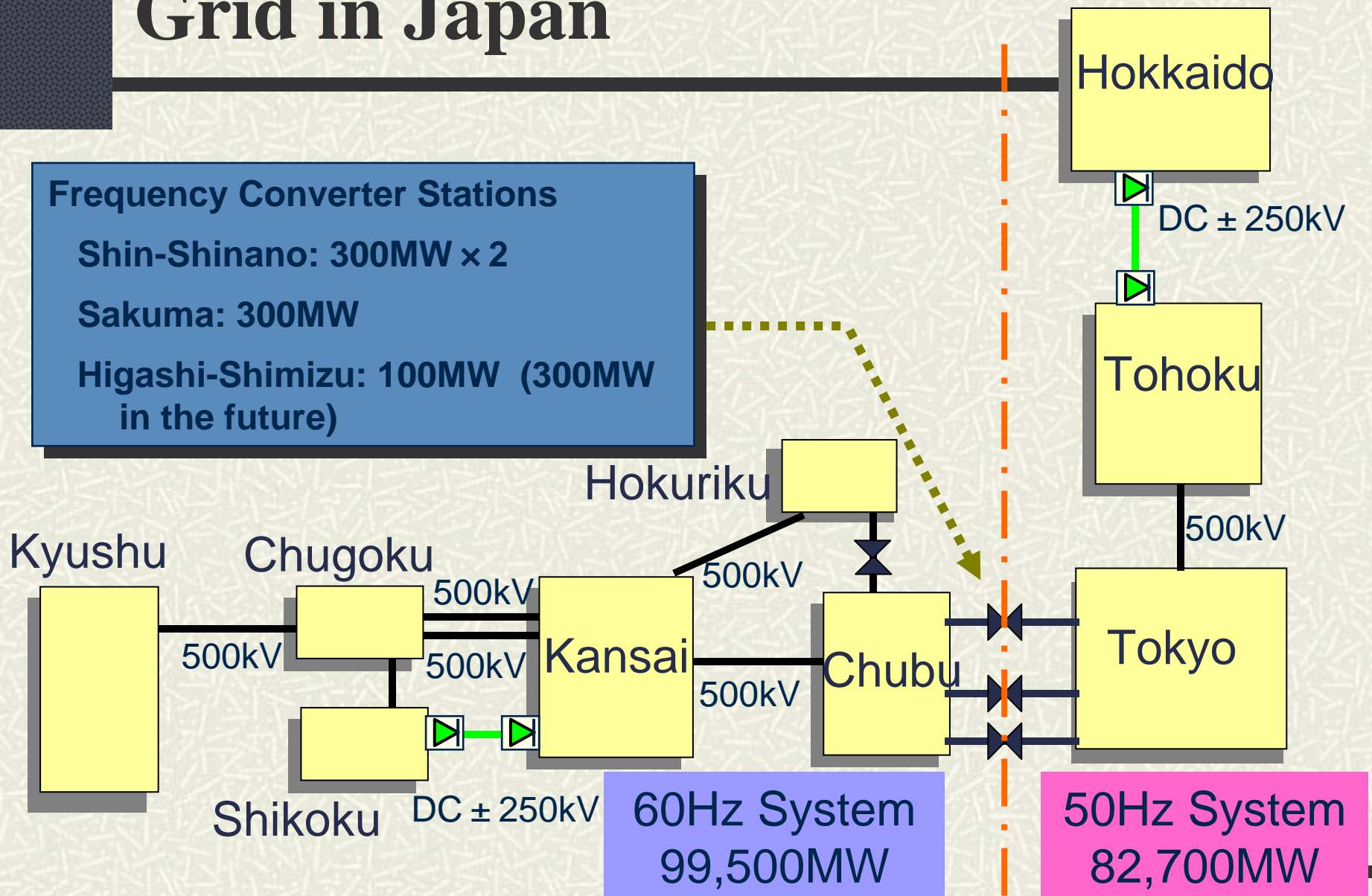
179,282MW

Power sales:

919,544GWh



Grid in Japan



Outline of Power Facilities in Japan

Power Plants (10 Electric Power Companies)

<Number of Plants×Installed Capacity (MW)>

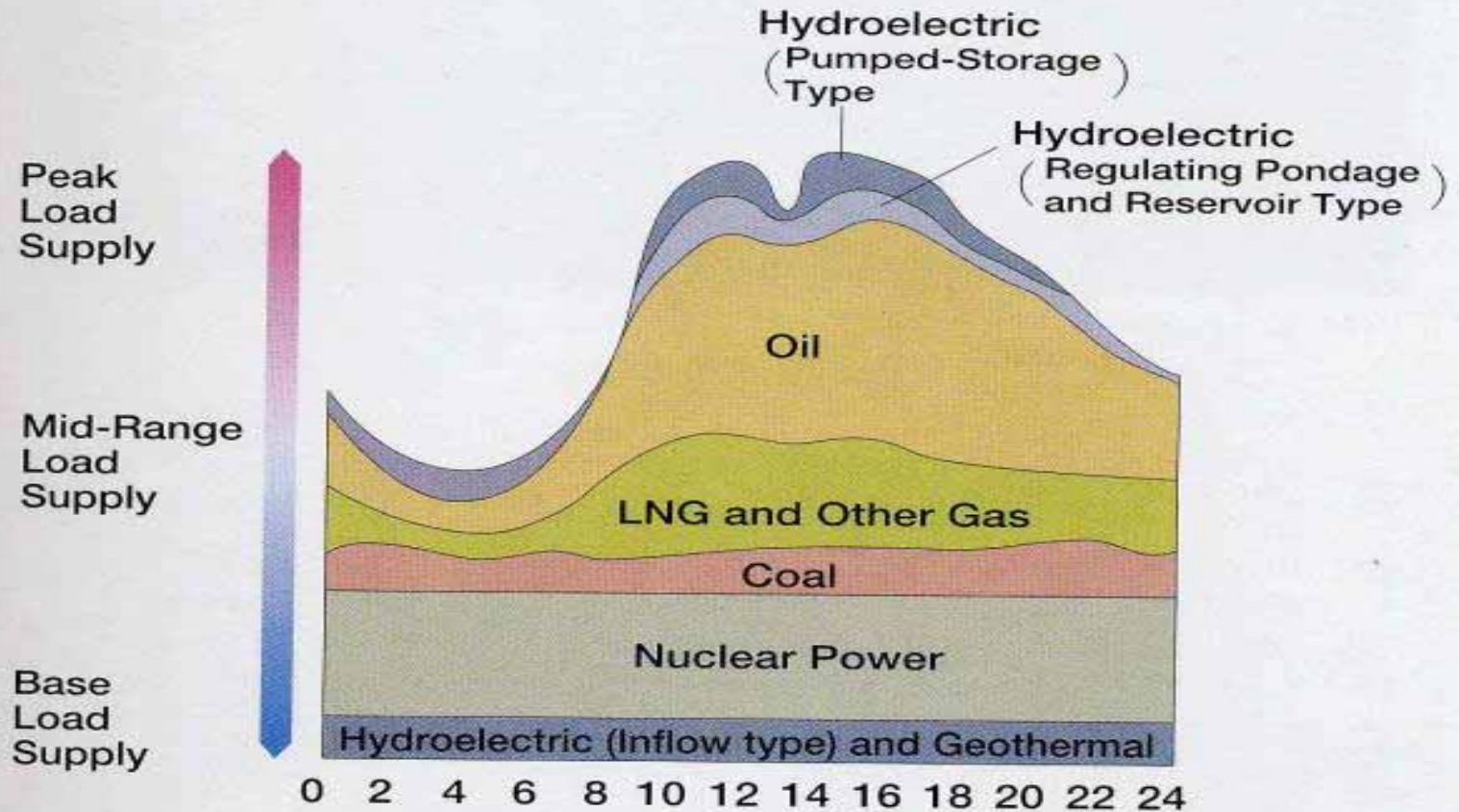
Hydroelectric	1,162	34,579	(17.2%)
Geothermal	11	485	(0.2%)
Thermal			
Steam Power	83	117,542	(58.4%)
Gas Turbine	9	656	(0.3%)
Internal Combustion	69	741	(0.4%)
(Total)	161	118,939	(59.1%)
Nuclear Power	15	46,850	(23.2%)
Wind Power*	43	331	(0.2%)
Solar Cell Power	1	-	(-)
Total	1,393	201,184	(100%)



*including subsidiary companies

(Example)

Combination of Power Sources



Hydroelectric and nuclear power provides base load supply, while coal and LNG are major power sources for mid-range load supply. Oil-fired and pumped-storage hydroelectric power respond to peak demand variation and contribute to consistent stable supply of electricity.

Renewable Energy in Japan

Power Purchase from Wind / Solar Cell Power

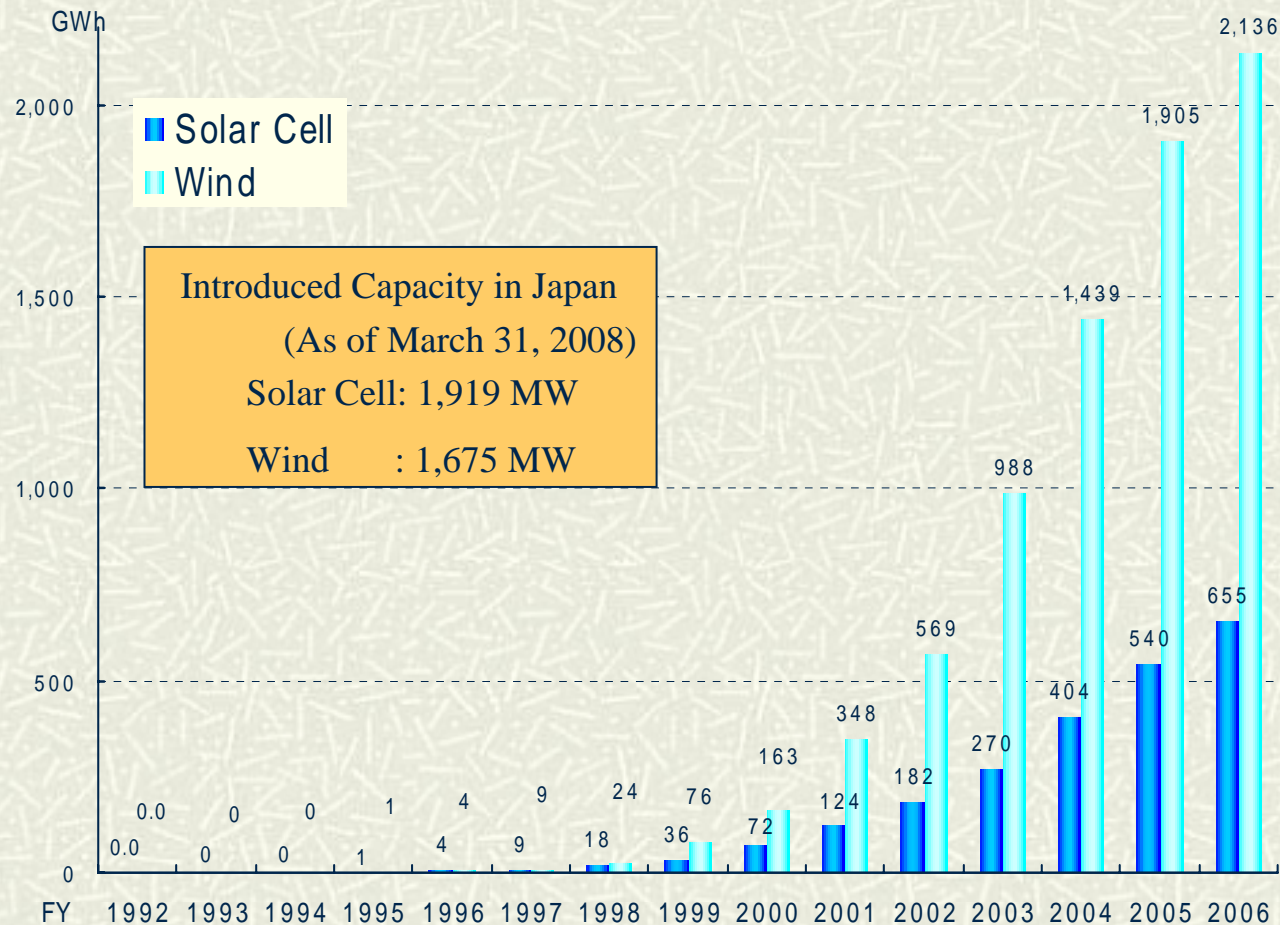
Mega-Solar Project by 10 Power Companies

30 Projects,
Total 140MW by 2020

(Ex.) Ukishima Solar Power Plant

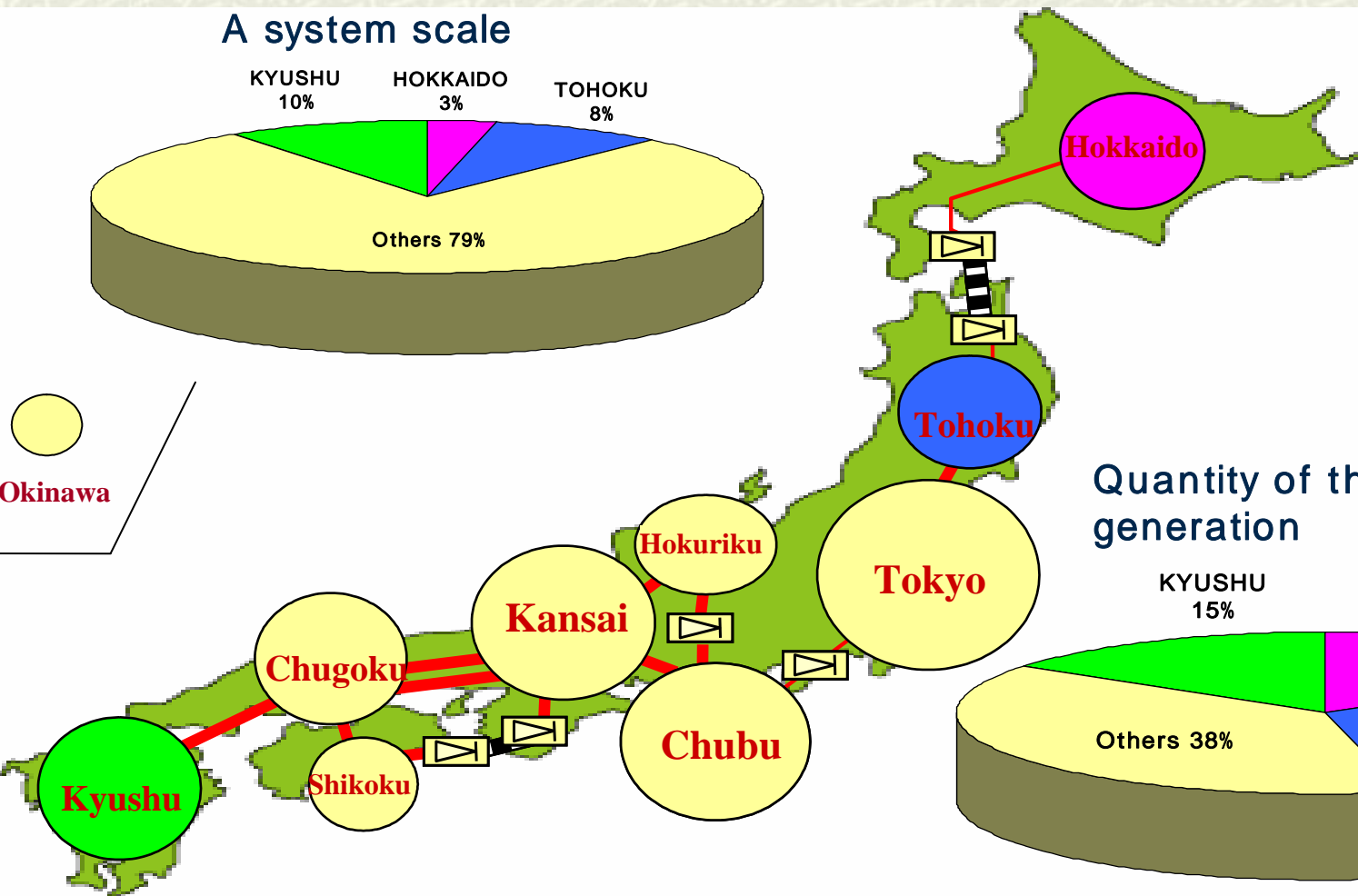
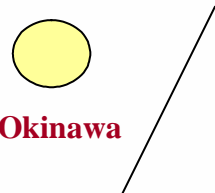
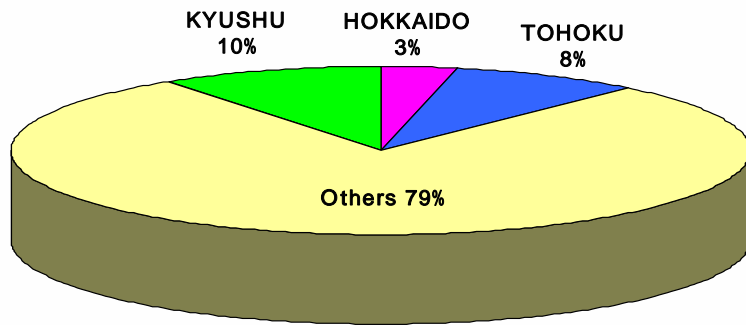


(7MW by 2011, Tokyo Electric Power Co.)

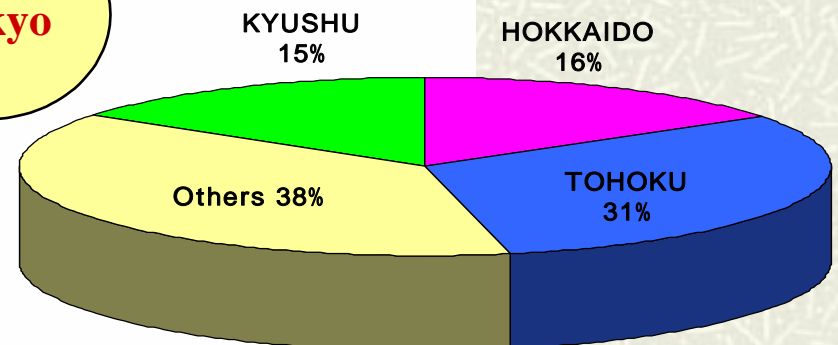


Uneven distribution

A system scale

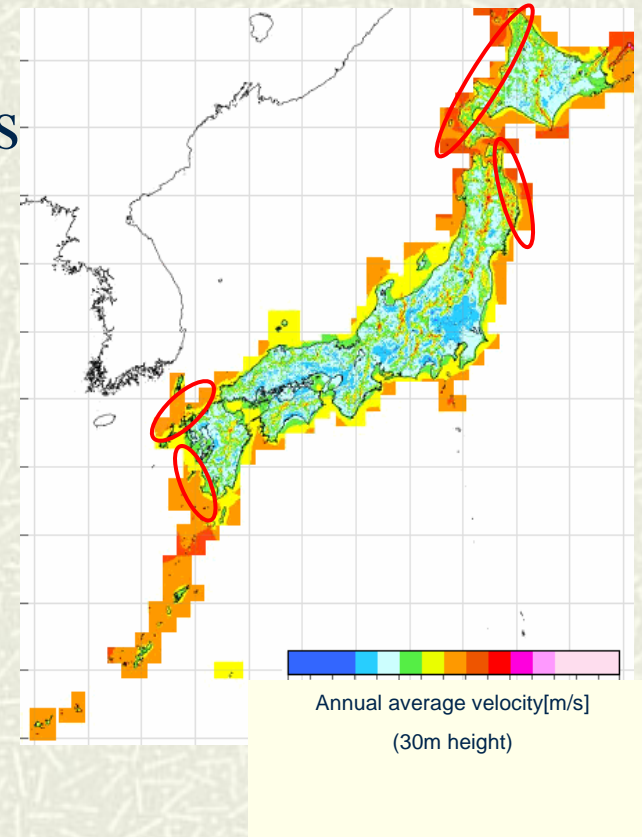


Quantity of the wind generation



Characteristics of Power System Integrated Many Wind Generations in Japan

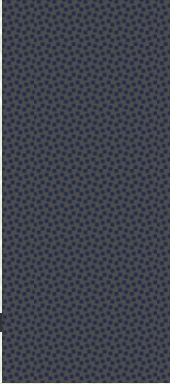
- Coast regions and mountain regions have good wind conditions in Japan.
- Those regions are rural.
 - The voltage maintenance ability : Low
 - A long distance from large power plants
 - The installed capacity : Low
 - A location as an end of a power system





Coast regions
Mountain regions





One of problems occurred
near the point of interconnection

The power change

The voltage change

- There are technical requirements for a generating plant interconnection.

The guideline of interconnection technical requirements to
maintain power quality

(Provided by the Agency for Natural Resources and Energy)

The Standard of the Voltage Change

The proper range is approximately $\pm 2\%$ of its normal voltage.

If the voltage change exceeds this range, the generation installer must adjust the voltage automatically.

Measures

- Equipments which compensate a reactive power
 - Specified proper power factor
 - Restrictions on the number of generators
-

The flow of integrating a wind power plant (an example)

