# Japan's Challenge for 21st Century Grid

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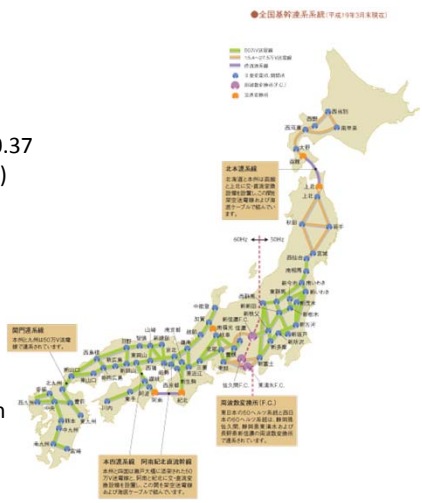
## Japan's Electricity System Outline

- 10 Vertical Integrated Private Electricity Power Companies (EPCs) and PPSs
  - Deregulated above high voltage customers(over 50kW)
  - Average electricity price in household is 20.37 yen/kWh in 2010. (24.60 yen/kWh in 1995)
- Frequency
  - Western part: 60Hz
  - Eastern part: 50Hz
    - Hokkaido(peak demand: about 5.7 GW) is connected by DC line.
- Voltage
  - High voltage distribution line is generally in 6.6kV
  - Household voltage is 100V/200V
    - In regulation 101V +/-6V



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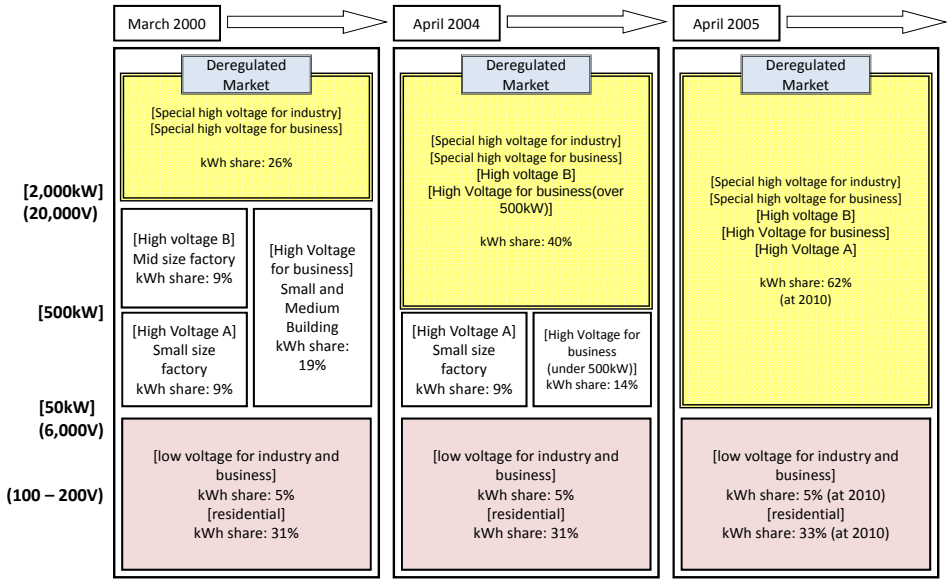
# Deregulated market in Japan




* **The deregulated market in Okinawa was expanding to special high voltage customer (over 2,000kW) at April 2004, from 20,000kW and 60,000V.**

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# Summary of Demand and Supply in 2011 Summer

| | Tokyo EPC area | Tohoku EPC area | Kansai EPC area | Kyushu EPC area |
|---|---|---|---|---|
| Target | - 15 % | - 15 % | - 10 % and more | - |
| Peak Demand decrease from last year | - 19 % | - 18 % | - 8 % | - 6 % |
| Large Customer | - 27 % (with Government Order for peak cut) | - 18 % (With Government Order for peak cut) | - 10% | - 7% |
| Small Customer | - 19 % | - 17 % | - 10 % | - 7 % |
| Residential | - 11 % | - 18 % | - 4% | - 7 % |

**[Source] METI**

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# Smart Meter Deployment Plan of each EPC in Japan (Nov. 2011)

| | Hokkaido EPC | Tohoku EPC | Tokyo EPC | Chubu EPC | Kanasai EPC |
|---|---|---|---|---|---|
| Target in 5 years | About 60% | About 60% | About 80% | About 80% | About 80% |
| For High Voltage Customer | Full installation in 5 years | Full installation in 5 years | Full installation in 5 years | Full installation in 5 years | Full installation in 5 years |
| For Low Voltage Customer | Future subject | Future subject | Full installation in about 10 years from 2013 | Full installation in about 10 years from 2013 | Half installation in 5 years Full installation in 10 years |

| | Hokuriku EPC | Chugoku EPC | Shikoku EPC | Kyushu EPC |
|---|---|---|---|---|
| Target in 5 years | About 70% | About 60% | About 60% | About 60% |
| For High Voltage Customer | Full installation in 5 years | Full installation in 5 years | Full installation in 5 years | Full installation in 5 years |
| For Low Voltage Customer | Future subject | Future subject | Future subject | 100,000 to 300,000/year in 5 years, 500,000/year after 5 years, and 60% installation in 10 years |

**[Source] METI**

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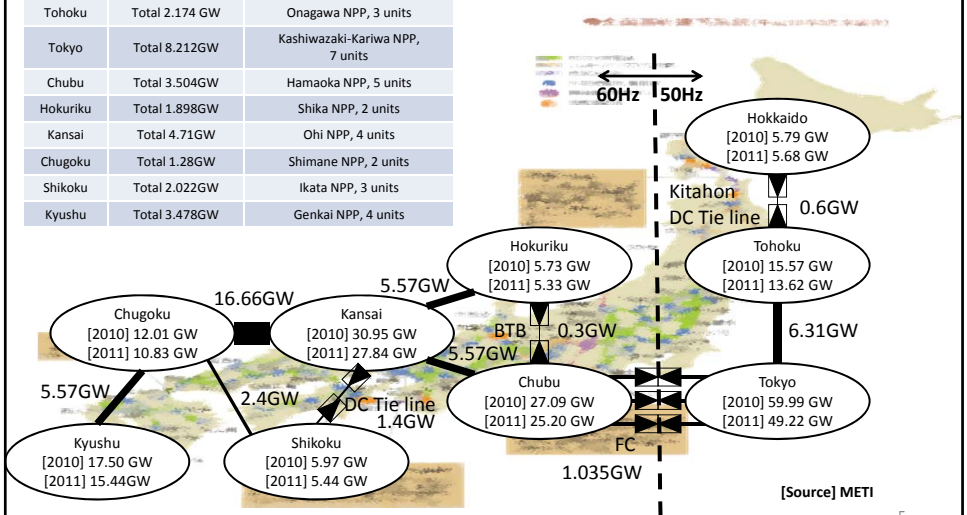
# Peak Demand and Tie Line capacity in Japan

| EPC | Maximum NPP Site Total Capacity | Site Name |
|---|---|---|
| Hokkaido | Total 2.07 GW | Tomari NPP, 3 units |
| Tohoku | Total 2.174 GW | Onagawa NPP, 3 units |
| Tokyo | Total 8.212GW | Kashiwazaki-Kariwa NPP, 7 units |
| Chubu | Total 3.504GW | Hamaoka NPP, 5 units |
| Hokuriku | Total 1.898GW | Shika NPP, 2 units |
| Kansai | Total 4.71GW | Ohi NPP, 4 units |
| Chugoku | Total 1.28GW | Shimane NPP, 2 units |
| Shikoku | Total 2.022GW | Ikata NPP, 3 units |
| Kyushu | Total 3.478GW | Genkai NPP, 4 units |




**[Source] METI**

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## Renewable Energy Promotion Policy in Japan

- Buyback program was started in 1992. (at 24-25 yen/kWh)
  - Only for excess electricity from renewable.
- National RPS was started in 2003.
- Subsidy for residential PV was re-started in 2009.
  (70,000 yen/kW)
- Buyback program was doubled in November 2009 (48 yen/kWh).
  (Now 42 yen/kWh)
- Feed in Tariff will be started in July 2012
  (including Priority Connection Rule for Renewables) .
  National RPS will be ended after the FIT introduction.

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## Taskforce for Electricity System Reform (1)

- Internal Report by TESR (Chaired by Minister of Economy Trade and Industry) issued at Dec. 27th ,2011.

- Basic concept: "Affordable and stable electricity supply" and "More competitive and open power market" with
  - Power market for creating incentive to decrease demand and facilitate supply under tight supply and demand situation
  - Power market for maximize of customer choice and creativity
  - Next generation smart society for demand and supply management by demand side
  - Fair and clear competition environment for power market

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## Taskforce for Electricity System Reform (2)

- 10 subjects were also raised by TESR.
  - New way for demand decreasing
    1. Smart meter, market mechanism, new tariffs and new services
  - Customer choice
    2. Deregulation for residential customer
  - Supply diversify
    3. Facilitation of power market
    4. Improve the Grid access rule and wheeling rule
    5. Reserve Margin
  - Facilitate competition and widen market
    6. Wide area competition
    7. Wide area grid operation and management
    8. Neutrality of transmission and distribution
  - Stability and Efficiency
    9. Investment for transmission and distribution, universal service and supply responsibility
    10. Time flame
- "Special Committee for Electricity System Reform" was started from Feb. 2nd, 2012.
  - "Study Group for Master Plan of Strengthen inter-regional tie line" was started from Feb. 16th, 2012.

## Study Group for Master Plan for Strengthen Inter-regional Tie Line

- Reliability
  - Recent Capacity Shortage
    - <u>What 1 should be appropriate for "N-1"?</u>
- Renewables
  - Evaluation as capacity
  - Potential of Wind Power
- Facilitate of competition
- Other issues (Frequency Unify?, International Tie Line?)
- Cost, cost sharing and time flame
- Cooperative Operation
- Road map
  - Such as FC: 1.035GW (now) 1.2GW in 2012, and 2.1GW in 2020 and 3.0GW
  - Kitahon DC tie line: 0.6GW (now) to 0.9GW
- Internal Report was issued April 25th, 2012

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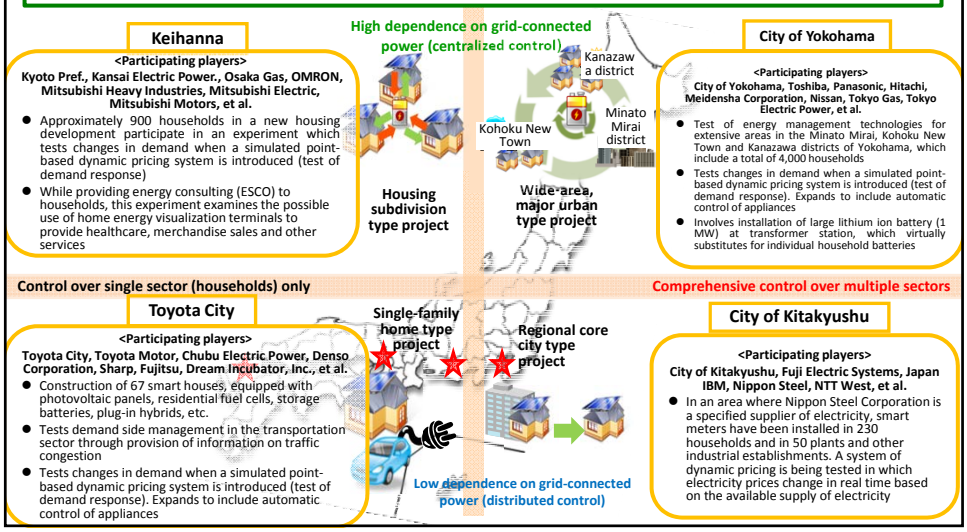
## Test Projects for Next-generation Energy and Social Systems (2011-2014)

- The need for societies to rely more heavily on renewable energy poses significant challenges. Meeting these challenges requires the development of "smart grids"—those technologies which enable societies to control not only the supply side of the equation, through utilization of IT and battery storage, but also the demand side, which has been much more difficult to deal with.
- The next-generation energy and social systems that are developed on the basis of these new energy management technologies—transportation systems, cities, and even new lifestyles—make up what are called "smart communities."




# Thank you for your attention!

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