China’s Energy Transition: 
Developing the Energy Internet to 
Combat Climate Change

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Overview: A Modern “Smart Grid”
-- Challenges of Clean Energy Integration into Power Grid

Source: Anderson et al, Proceedings of the IEEE, June 2011
1. China’s Energy Transition

Renewable Energy Development in China

The Goal of China's Energy Transition is to build a Clean, Low-carbon, Safe, Efficient and Sustainable modern Energy System by the year 2050 (Renewable Energy 64.5 %)

In 2014, the installed capacity of China reached 1350 GW.

In 2015, 35 GW PV and 150 GW Wind Power integrated to grid in China (24% Renewable Electricity). The penetration has been more than 30% for some provinces in north area.
Great Challenges for Chinese Grid Operator

The 3 structure problems just like 3 mountains: the Chinese Grid Operator is bearing 3 mountains when operating the power system.

- Generation Structure Problem
  - Fast response
  - Energy Storage
  - Far Location

- Grid Structure Problem
  - Grid Reforming
  - Inter-connection
  - Resilience

- Consumption Structure Problem
  - Demand response
  - Distributed Energy
  - Retail Market

- Safe
- Reliable
- Low Cost

Keep Lights On!
2. Fast Development of HVDC in China Power Systems

By the end of 2015, a total of 27 HVDC projects were in operation.

Note: A High-Voltage, Direct Current (HVDC) electric power transmission system (also called a electrical super highway) uses direct current for the bulk transmission of electrical power, in contrast with the more common alternating current (AC) systems. For long-distance transmission, HVDC systems are less expensive and suffer lower electrical losses.

- The **Smart Integrated Energy Systems** is the concept expansion of Smart Grid to “Integrated Energy System”, is a New Generation of Energy System (**Energy Internet**); a new evolution trend of traditional power systems.

- In 2016, the China’s National Energy Board issued guidance on promoting the development of **Energy Internet -- Internet + Smart Energy**

2. **IoT for Energy**: Smart Meter, Energy & Information Management System, Big Data, etc.


Green: Investment in Electric Grid; Red: Investment in Generation; Blue: Investment in Distribution Grid;

Summary:
China’s Smart Grid Development & Expansion (Energy Internet) provides solution of Clean Energy Integration into grid and aims to Achieve Environmental Sustainability!

Note:
Exchange rate 1(USD): 6.7(RMB)
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