

# Renewable energy in China

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# Long term energy development strategy

- Key points of Chinese Energy Revolution:
- Energy conservation first, reasonable consumption pattern promoted
- Reduce the coal as continuous effort
- Green and low carbon transition started, long term energy development target
- Renewable energy is the key for low carbon energy
- Renewable Energy Law promulgated and effective since 2006
- Renewable energies are given priority in energy development

# Renewables' significance

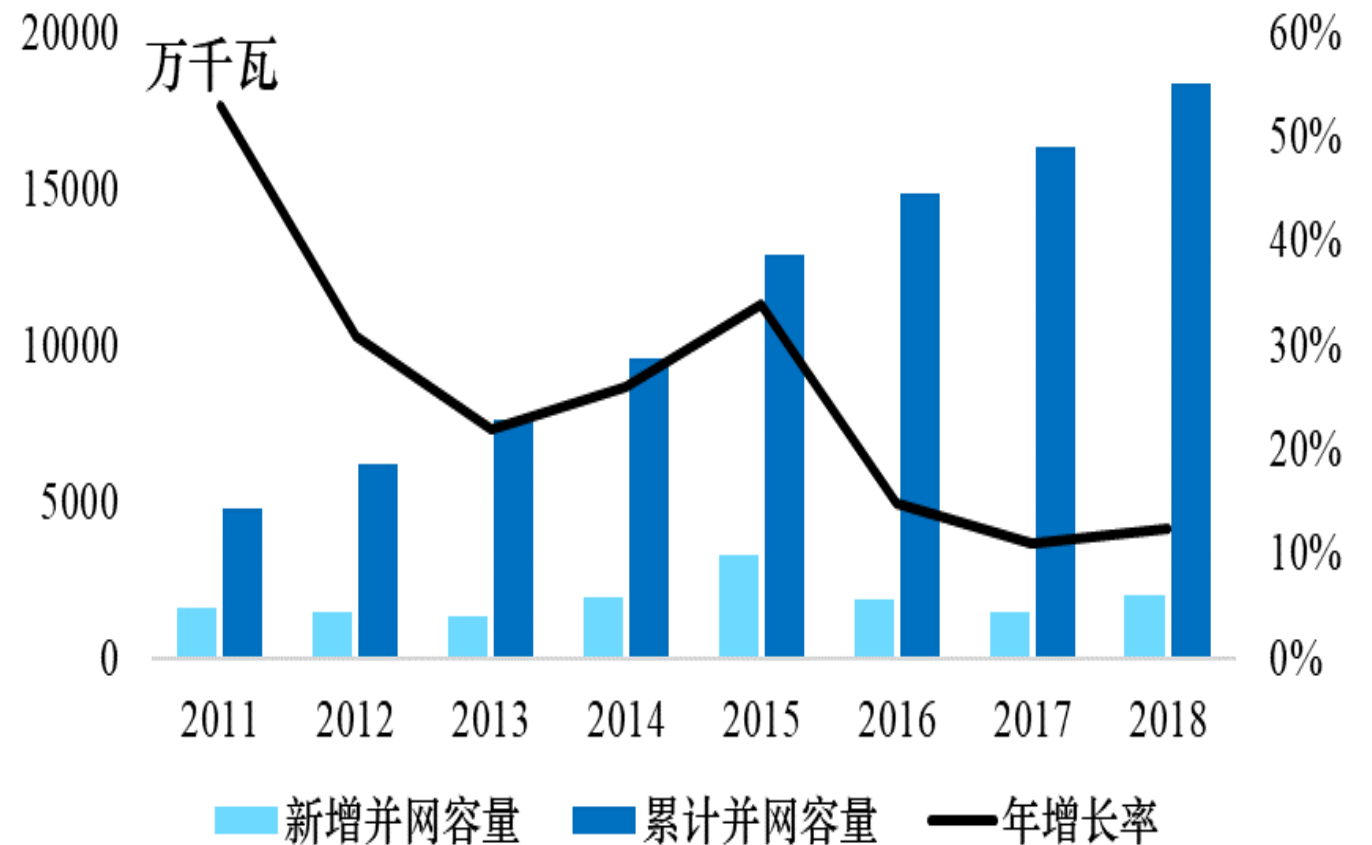
- Key solution for zero-carbon energy, to mitigate the climate change
- Sustainable energy resource
- Clean energy for pollution control
- Important alternatives for energy security
- More economical in the future
- Important technology and product market

# Great progress of renewables in China

- Hydro power is the first contributor among renewables in China
- By the end of 2018, 350 Gw hydro power generators in operation, generating 1.2 trillion kwh of electricity a year
- Created many records, including the highest dam, the biggest size, the biggest generator, etc.
- Technology competition and engineering capacity of the world bests
- Help other countries to develop hydro power: about 320 hydro power plants with total 81 Gw capacity commissioned or under construction in other countries

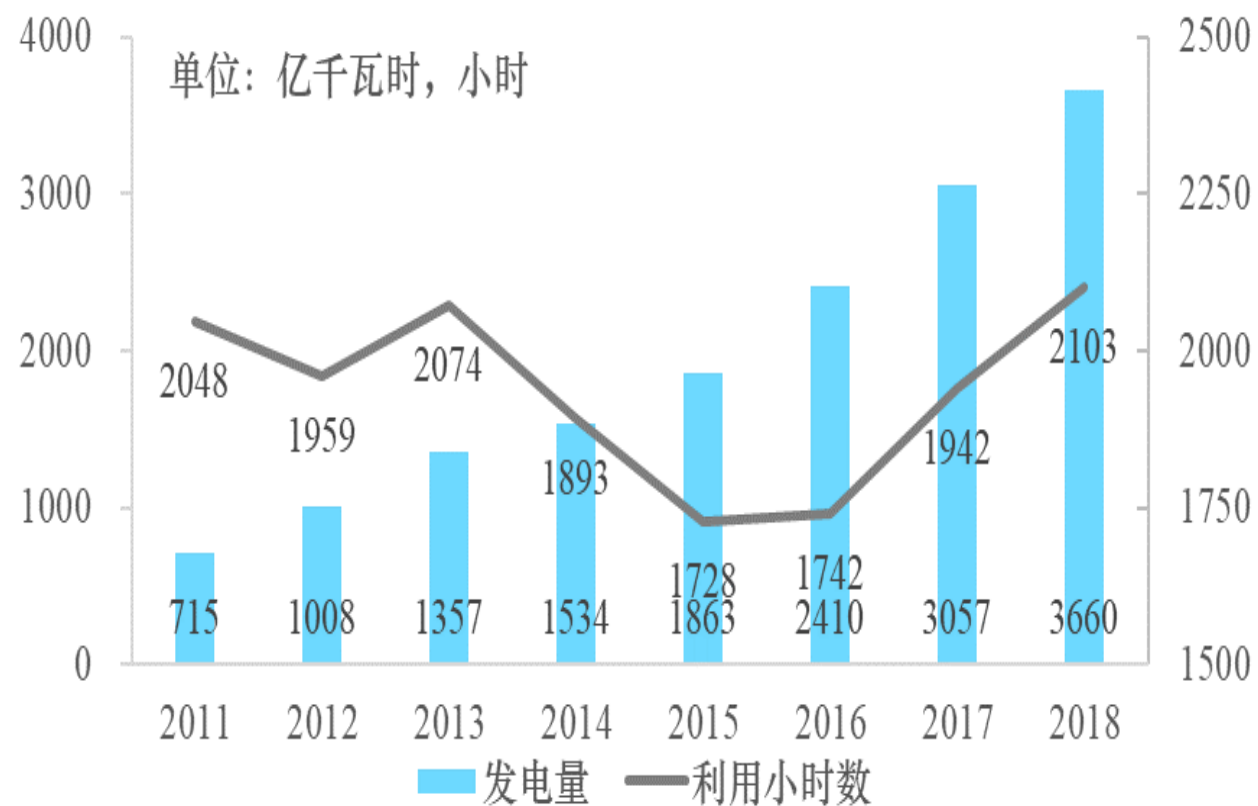
# Wind power increase steadily

- Total capacity 184 Gw by 2018,
- More than 20 Gw added in 2018,
- Highest annual increase 34 Gw ( in 2015),



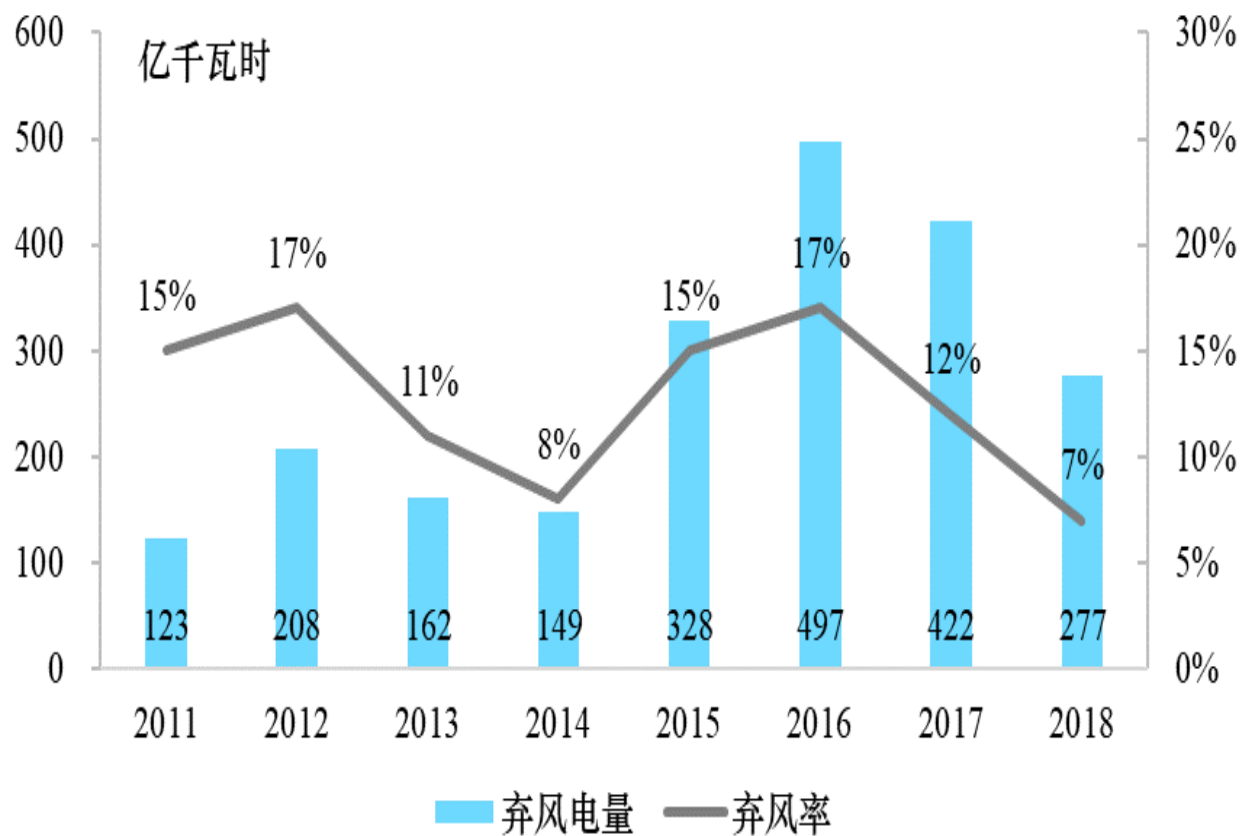
# Load factor improved

- Total wind generation 366 Twh in 2018,
- 19.7% increased a year
- Load factor improved significantly



# Spare wind generation capacity

- Spare capacity were high, but improved
- Due to power capacity over supply
- Some wind power mills far from consumption centers
- Insufficient collection of renewable fund
- Faster expansion of renewables than planned



# Solar power development speed up

- Total solar power generators 174 Gw by the end of 2018
- 53 Gw increased in 2017, a growth of 68%
- 44 Gw increased in 2018, still growth of 34%
- Distributed solar power capacity contribute 29% of the total
- Already exceeded the planned target of 2020



# Technology improvement

- The biggest production capacity established in China for wind generator and solar power module
- Manufacture companies are of the best in the world
- Technology innovation fast, and competition intense, very few companies can keep in top ten for ten years
- The production cost for wind generator and solar PV decrease significantly
- Wind power and solar PV is becoming competitive with coal fired power by the price of kwh

# Machine development for renewables

- 120 meters high wind power is popular
- New wind power is 140 meters high
- New crane can lift 110 tons wind generator to 140 meters for installation



# Preferential policy continued, and modified

- Grid connection guaranteed, favorable feed in price, and all consumer cover the added cost as basic preferential policy for renewable energy
- Due to over supply of the power generation capacity, integrated wind mill and solar farm need to follow the plan if need favorable price
- Competitive wind and solar power are encouraged and no constraint
- Distributed solar and wind power no constraint, and many local government apply additional subsidy
- Preferential policy combined with other objectives:
  - Distributed renewable power generator subsidized as measures for poverty elimination
  - Wind power heating to replace coal heating encouraged by pollution control program
  - Introduce bio-ethanol gasoline for whole country declared

# Further development of renewables

- Renewable energy have huge room for development
- Suggested targets for 2050 by influential studies:
  - Hydro power generation capacity 500 Gw
  - Wind power capacity 1350-2600 Gw
  - Solar power capacity 1900-2800 Gw
- Higher electrification in end use energy, new technology to be developed to replace fossil fuel by electricity
- Energy storage, heat pump, electric car and smart transport system, etc.

# Green development in the next 5 years

- Green development will become more significant flag
- Pollution control will be continued to achieve high level
- Energy mix transition will be strengthened
- Coal consumption decrease further more
- Climate change mitigation will become important objective of green development
- Non-fossil energy ( renewables and nuclear ) development will keep the momentum and accelerated