



# Beyond Border

## — Lessons learnt from China

by Li Junfeng

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# Overview of China Renewable Energy Sector



# Sectors review-Renewable Energy

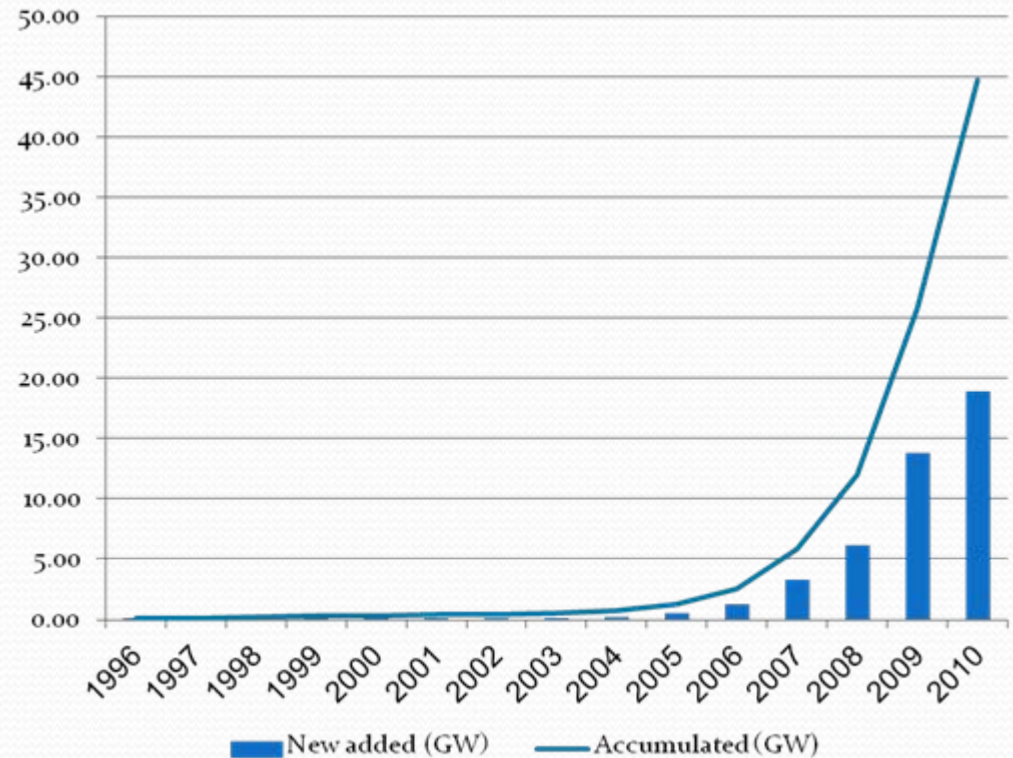
Table of Summary of renewable energy market development in China ( 2005 -2010)

Content	2005	2010 target	2010 actual	Growth rate (%)
Power generation (GW)	120.53	205.8	251.97	15.9
Hydro	117	190	213.4	12.8
wind	1.26	10	31	89.8
Solar PV	0.07	0.3	0.9	66.7
Biomass	2.2	5.5	6.67	24.8
Thermal supply				
Biogas (billion m3)	8	19	160	82.1
Solar collector (million m2)	80	150	168	16.0
Geothermal (Mtoe)	2	4	5	20.1
Bio-liquid fuel				
Ethanol (million tons)	1.02	5	1.8	12.0
Bio-diesel (million tons)	0.05	0.2	0.5	58.5
Total energy production(Mtoe)	116.2	210	230	14.6

# Sectors review-Renewable Energy

## ***Wind Power***

- total installed capacity reached 44.73 GW, among which 31 GW connected to grid
- more than 100 developers and 15 of them with more than 700 MW.
- more than 80 manufactures of wind turbines and another 100 components supplier. 4 of them are listed in the TOP 10 of the world
- China has attracted US GE company, Denmark Vestas, Germany Nodex, Spain Gamesa, India Suzlon and other global wind power companies



**Figure of Wind power market in China**



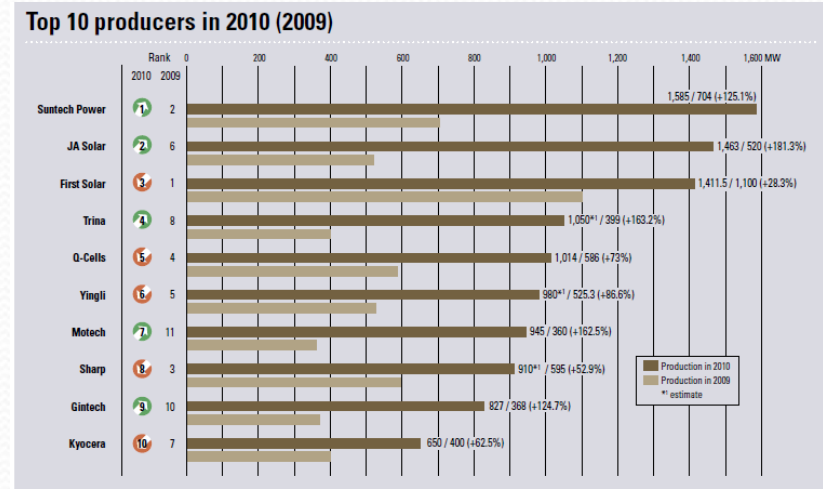
# Sectors review-- Renewable Energy

## Solar PV

- PV market still depends on export seriously.
- in 2010 China installed new solar PV capacity is about 500MW, the cumulative installed capacity 800MW.
- production scale of wafer, photovoltaic cells and modules keep the No.1 ranking in the world. among the TOP10, there are 6 from China

**Table of Solar PV manufacture distribution in the world (2000-2010)**

Regions	2005	2010
China	200	13018.4
EU	470	3545
Japan	833	2299.5
Taiwan		3448.5
USA	154	1253
Other region	102	3648.3
Total	1759	27213



**Figure of TOP 10 solar PV manufacture in the world**

The market share of Chinese manufacture is also increased from 27.2% in 2007 to 47.8% in 2010.

# Sectors review-- Renewable Energy

## ***Solar thermal utilization***

- 2010, the number of China solar water heater production and operational capacity continuously keeps No.1 in the world.
- The annual production of solar water heater reaches 49 million sqm, with the growth rate 16.7%;
- operational capacity reached 168 million sqm, with an increase of 15.9%.
- Up to 2010, in vacuum tube water heater industry chain, the total output of borosilicate glass was 890,000 tons, and full glass vacuum line is more than 2,000 pieces.

Figure 9. Solar Heating Added Capacity, Top 12 Countries, 2009

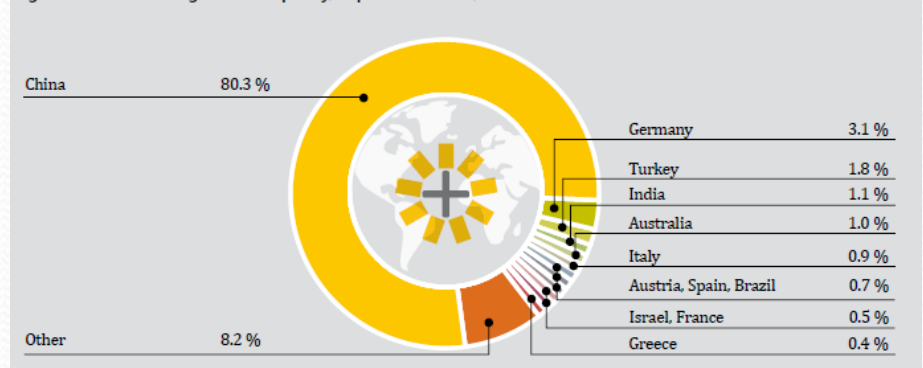
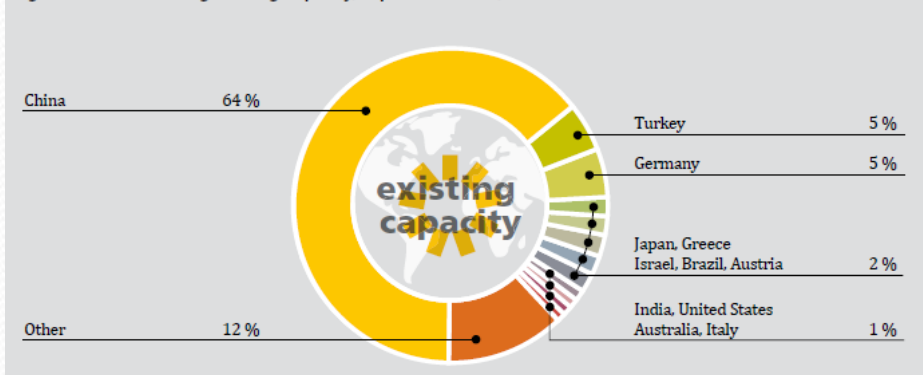


Figure 10. Solar Heating Existing Capacity, Top 12 Countries, 2009





# Sectors review-- Renewable Energy

## ***Biomass***

- Biomass power: By the end of 2010, total installed capacity for all kinds of biomass generations is about 670 MW, exceeded the designated aim of 550 MW
- Biogas Project. By the end of 2010, China totally has built 4000 large-scale biogas projects, annual production volume from household biogas digesters and large biogas projects is about 16 billion m<sup>3</sup>.
- Bio-liquid Fuel. In 2010, four aging grain ethanol fuel projects and Guangxi COFCO cassava ethanol project generated 1.84 million tons of ethanol fuel. Annual vehicle ethanol gasoline consumption was about 18.4 million tons

In the biomass industry, construction cost of domestic biomass power plant is about 10,000 Yuan per kW, more than twice of unit cost of conventional thermal power plant. Now have been reduced to 7,000 Yuan or less.



# Sectors review-- Renewable Energy

## *Small hydropower*

- China is now a world leader in small hydro systems, which have been fully commercialized. Investment is growing every year, and more than 20 GW is under construction annually.
- By the end of 2010, total installed capacity small hydropower is around 55 GW. Power generation from small hydro reached 160 TWh, accounting for about 25% of total hydropower generation.

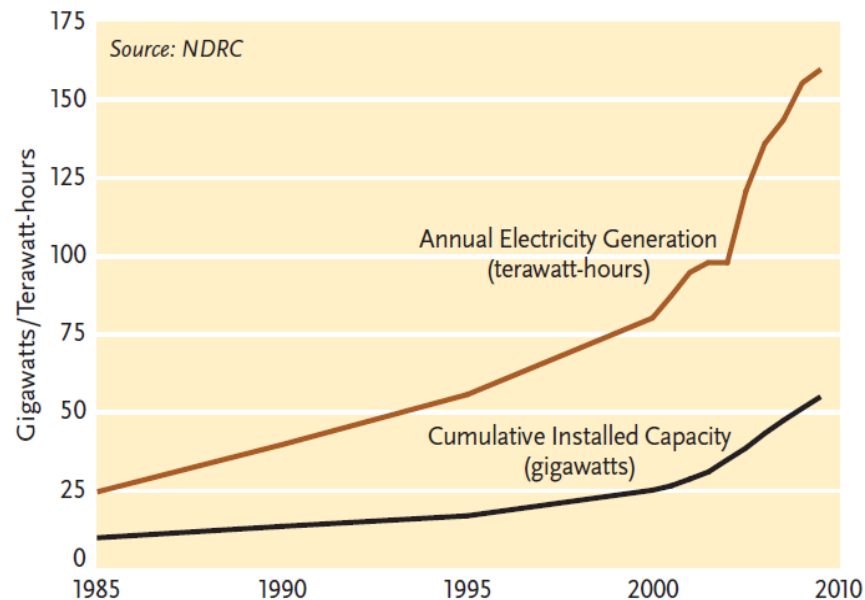


Figure of China's small hydropower installed capacity and power generation, 1985-2009  
ERI/CREIA

# Sectors review-- Renewable Energy

## *Others*

### ***Geothermal Energy***

- By the end of 2009, the country's total geothermal installed capacity reached 9 GW, with most of this located in Tibet.
- ranks 2nd in installations, and 1st in annual geothermal energy production (21 TWh).
- experiencing 10% annual growth in geothermal applications in space heating, hot water, and farming. Geothermal energy currently provides space heating over some 30 million m<sup>2</sup> and supplies 600,000 families with hot water.

### ***Ocean Energy***

- China and its nearby islands are rich in ocean energy resources
- Development of ocean energy is in the pilot and demonstration stages in the country.
- It is estimated that some 190 tidal power plant sites could be developed to achieve more than 500 kW installed capacities.
- The country's total recoverable ocean energy resources could reach 1,000 GW. But due to technical barriers, these resources have not been actively tapped.



# International sharing

# - Policies mechanism sharing

## Policy Analysis

Main policy : learn from Germany mainly, plus some From USA , Japan and UK for formulation of the Chinese Renewable Energy Law  
Learn from EU for formulation of Medium and Long-Term Development Plan for Renewable Energy

- National targets. From EU
- Mandatory grid access. From EU
- Feed-in-tariffs/ Power pricing. From Germany
- Special subsidies: Japan
- Cost sharing: learn from Germany and plus local situation
- financial support for R&D on key renewable energy technologies: learn from USA and Others



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# Technologies Sharing

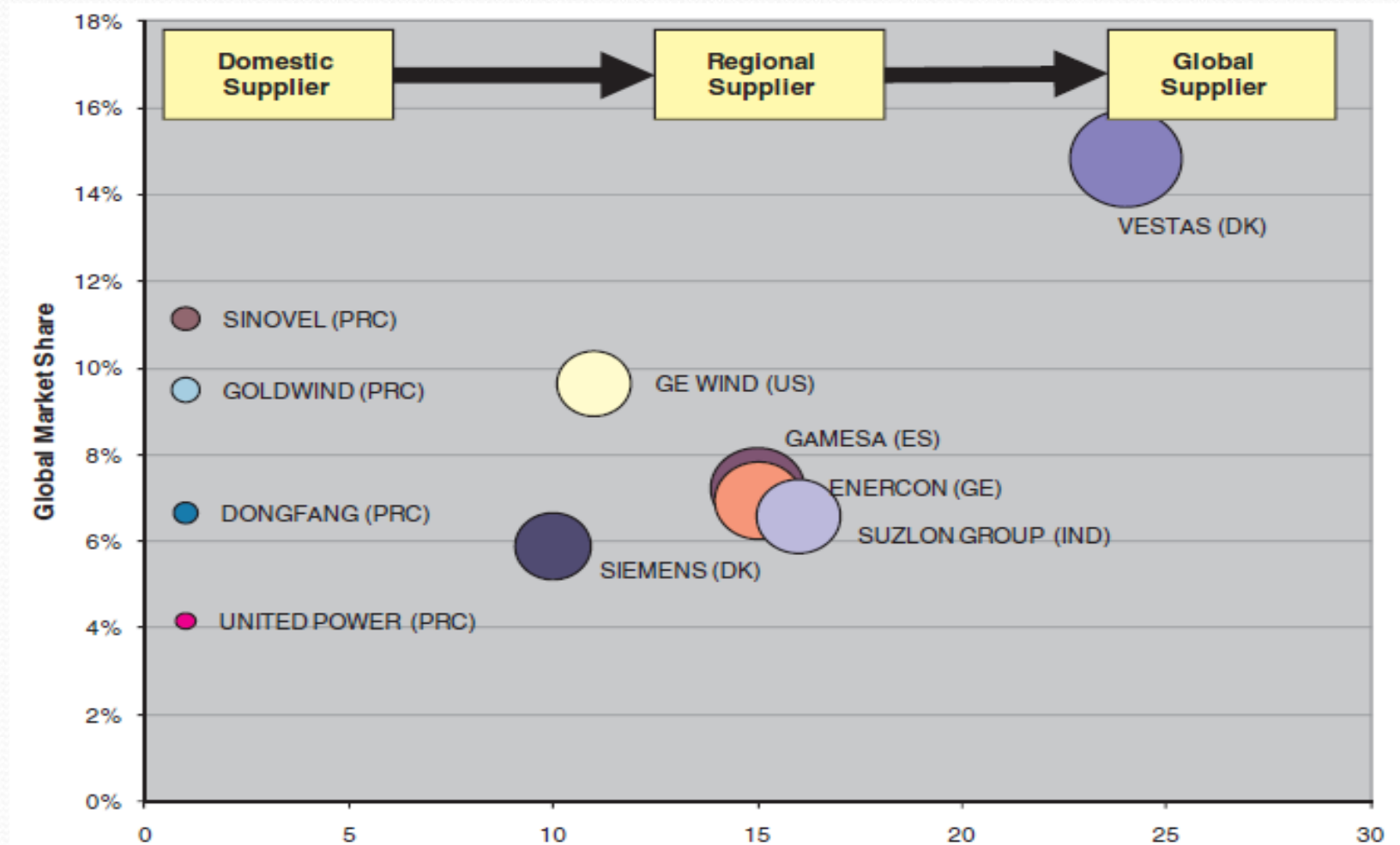
- Wind technologies mainly from Denmark and Germany
- Solar PV mainly from USA, Japan and Swiss
- Biomass from Denmark, USA and Sweden
- Hydro-power mainly from Canada and Norway as well as China
- Solar thermal from hot water, mainly from China and Australia



# Market sharing

- Wind started from Denmark, Germany and Spain, expanding to USA and China
- Solar PV, started from Japan and expanding to Germany and EU countries and now comes to China and USA
- Solar hot water system, started from USA and other and now booming in China
- Biomass liquid fuels started from USA and Brazil, expanding to ????
- Small hydro???

# Industries sharing-wind





# Industrial sharing—Solar PV

- International market
  - 50% from PV Module manufacturing from China
  - 70% of the equipment for PV from USA, Japan and Swiss
  - 70% of the silicon materials from USA, Japan and EU, China and Korean take only about 30% or less
- Chinese market
  - More than half of silicon materials from international market
  - 3 billion USA equipment for PV from USA, Japan and Swiss and Germany



# Conclusion

# Renewable market is still very small

Figure 1. Renewable Energy Share of Global Final Energy Consumption, 2009

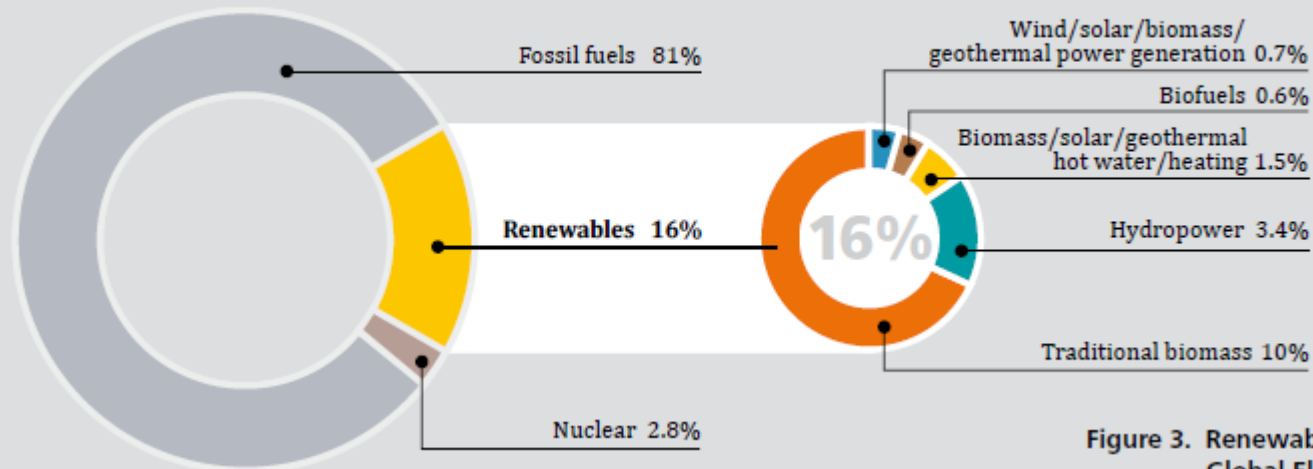
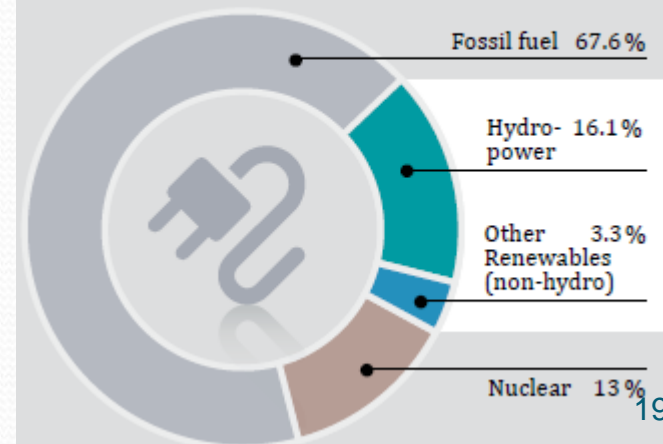


Figure 3. Renewable Energy Share of Global Electricity Production, 2010



# International cooperation makes cost down

- PV
  - Price from 4-5\$ per Wp from 2000 and down to about 1.5\$ per Wp by now
  - Power generation can reach about 0.15 US\$ cents per kWh
- Wind
  - Turbines price from 1000 Euro per KW from 2000 down to about 700 Euro by now
  - Power price down to about 5-10 US\$ cents per KWh



# Renewable energy development is beyond the border

- We need sharing
  - Policies framework
  - Technologies R & D
  - Set up the industries chains for cost reduction
  - Free trading for Market expansion
- We need learn each-other
  - Polices
  - Technologies
  - industry

# THANKS !



## Contact

Li Junfeng or Ms Li Nan

Email: [lijf@eri.org.cn](mailto:lijf@eri.org.cn)

Tel: +861068003689

Chinese Renewable Energy Industries Association (CREIA)

Energy Research Institute (ERI) of National Development & Reform Commission