

Renewables for Manufacturing Industry in China

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May 11-12, 2015 Paris

Current Climate Targets

- Commitment to Copenhagen (2006-2020): 40-45% of reduction of energy intensity of GDP.
- 12th FYP: Share of non-fossil fuels in primary energy consumption to 15% by 2020.
- China and the US Joint Announcement on Climate Change: to cap carbon dioxide emissions by 2030, sooner if possible, and to increase the share of non-fossil fuels in primary energy consumption to 20% by 2030.

Policies with the Targets

- Priority on energy efficiency improvement focusing on industrial sectors, especially energy-intensive sectors;
- Low carbon/renewable resource development focusing on renewables for power generation;

EE Important But Not Enough

-- Case of Aluminum Industry

From 1980 to 2010

- Energy intensity of primary aluminum declined 22%, alumina 60% and carbon intensity of aluminum production declined 40%;
- But carbon emission of aluminum industry increased 19 times;
- Because primary aluminum output increased 41 times, alumina 33 times.

China produces most of energy-intensive products in the world

	2013 output (Mton)	Share of world total(%)
Crude steel	779	48.5
Pig iron	709	60.8
Cement	2420	58.6
Electrolyzed aluminum	22.1	43
Chemical fertilize	70.4	35
Population	1357.4 million	19.05
GDP	9240.3 billion USD	12.2

Source: China Statistical Yearbook 2014, WB Database

How Many Are Enough?

	Output Peak (Mton)/Year			2014 output (Mton)
Crude steel	390/2040	610/2020	888/2020	823
Cement	--	1600/2020-2030	2790/2020	2480
Electrolyzed aluminum	--	16/2020-2030	--	24.36
Chemical fertilize	--	61/2020-2040	--	68.9
Year of estimated	1993	2009-2011	2014	2015

Source: ISBN 978-7-03-024569-4, ISBN 978-7-03-029943-7, www.nrdc.cn/coalcap, Statistical Communiqué of the PRC on the 2014 National Economic and Social Development

Prospective of future

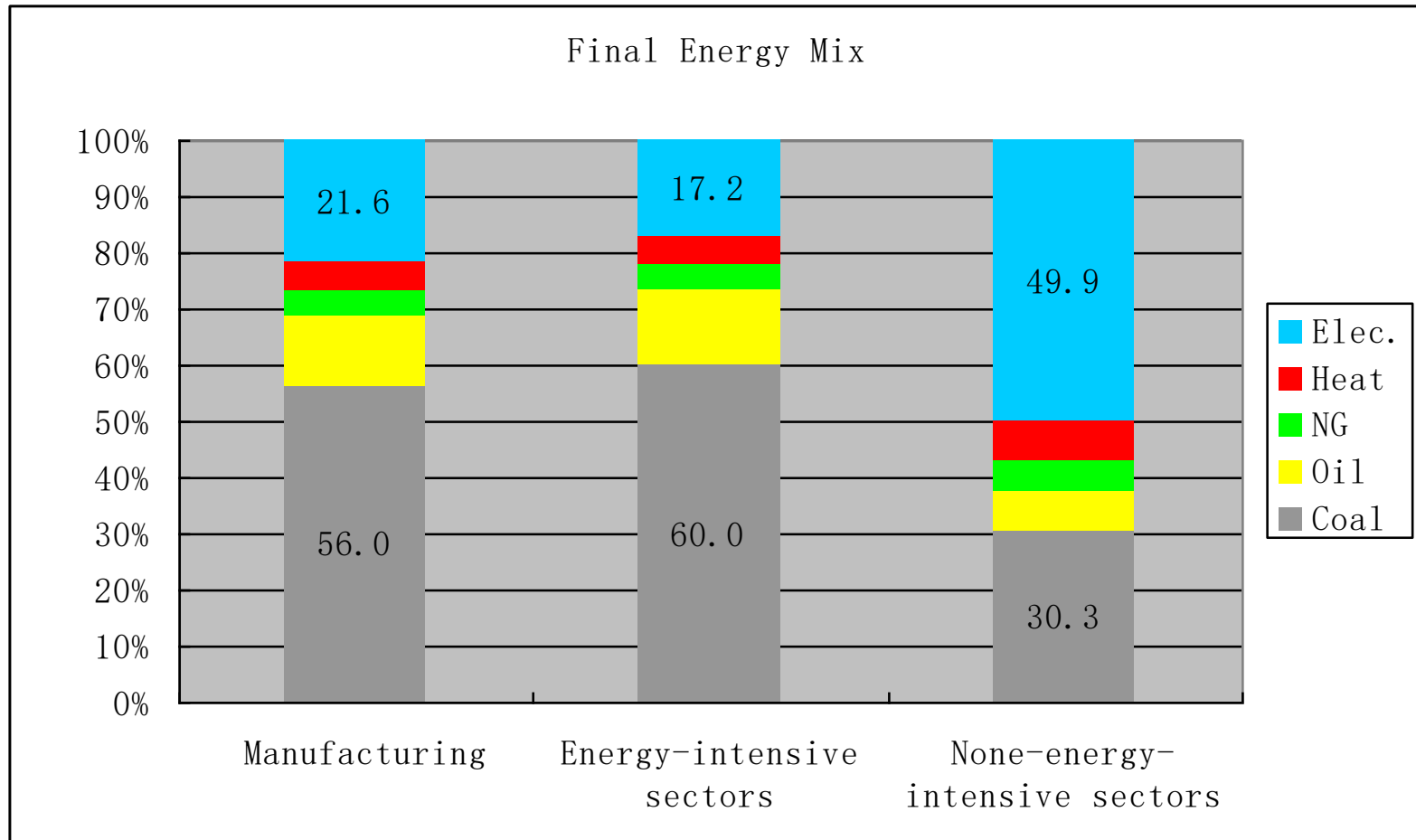
1. Most energy-intensive products will reach their output peak in the next two decades
2. Renewables will meet more energy demands.

Could manufacturing industry use more renewables in the future?

Structural Change Needed

- Manufacturing industry generated 30% of GDP and consumed 62% of total primary energy in 2012.
- Energy-intensive sectors generated 36.9% of value-added tax and consumed 85.7% of final energy and 68.7% of electricity in total manufacturing industry.

Final Energy Mix of Manufacturing



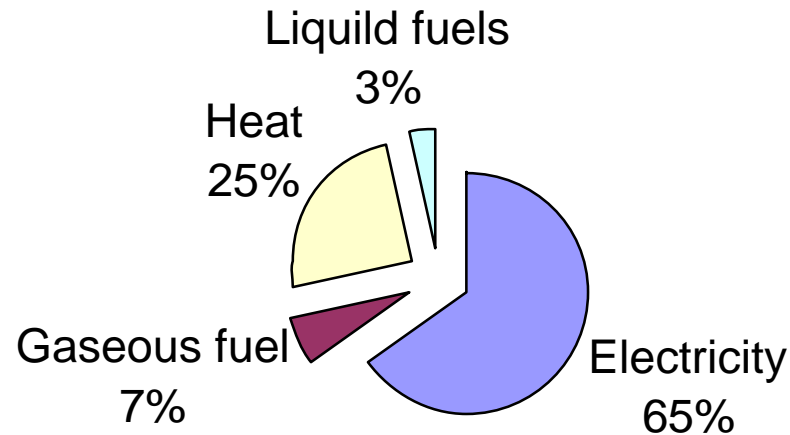
Source: China Energy Statistical Yearbook 2013, data of 2012

Manufacturing Industry Structural Change Policies - Implications for Final Energy

- To encourage development of hi-tech sectors (Medical and Pharmaceutical Products, Aviation and Aircrafts Manufacturing, Electronic and Communication Equipment, Electronic Computers and Office Equipments, Medical Treatment Instruments and Meters);
- To limit energy-intensive sectors' development;
- The share of coal in final energy mix will decrease;
- The share of electricity in final energy mix will increase – natural trend of electrification;

Renewables for power generation dominated their utilization

**Renewables utilization: 192.1 million tce in 2013,
5.32% of total primary energy consumption**



A Long-term Scenario

ERI “China 2050 High Renewable Energy Penetration Scenario and Roadmap Study” presents a promising scenario in 2050

1. Renewables generates 85%+ electricity needed;
2. Electricity meets 62% of final energy use.
 - Industry: Electrification
 - Building: Renewable+NG+Elec. for space heating; Elec. for 80% of cooking use
 - EVs and hydrogen fuel cell vehicles >86%

Source: ERI news conference, April 16, 2015 Beijing

62% reasonable?

- 2012 fuel shares in final consumption
 - OECD: elec. 22.3%
 - World: elec. 18.1%
 - China: elec. 22.5%
 - Manufacturing: 21.6% (none-energy-intensive 49.9%);
 - Wholesale, retail trade and hotel, restaurants: 39%
 - Commercial buildings: 35.4%
 - Urban residents: 25.7%
 - Rural residents: 30.3%
 - China: coal 24%, gasoline 4.7%, heat 4.5%
- In 2014, State Grid conducted 13,000 projects of electrification which reduced burning coal 23.4 million tons at final consumption by 50.3TWh electricity, 0.9% of total electricity generated.
- In 2015, State Grid planned to use 75TWh electricity to replace other fuels.

More Renewables for Manufacturing Industry in the Future

- More research needed.
- Focus on end-use rather than final energy consumption.
- Sector by sector.