Moving Towards to Low Carbon Future: Energy Transition in China

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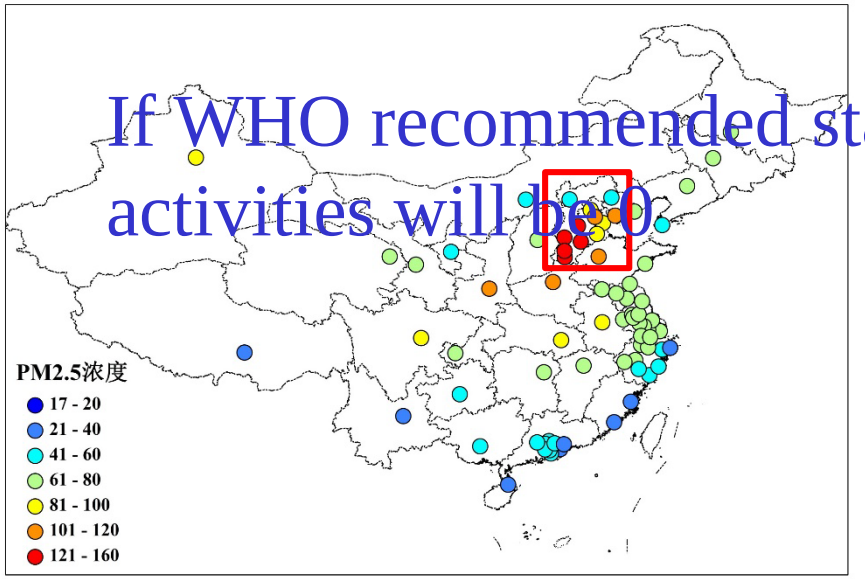
Energy Policy Overview: National Strategy

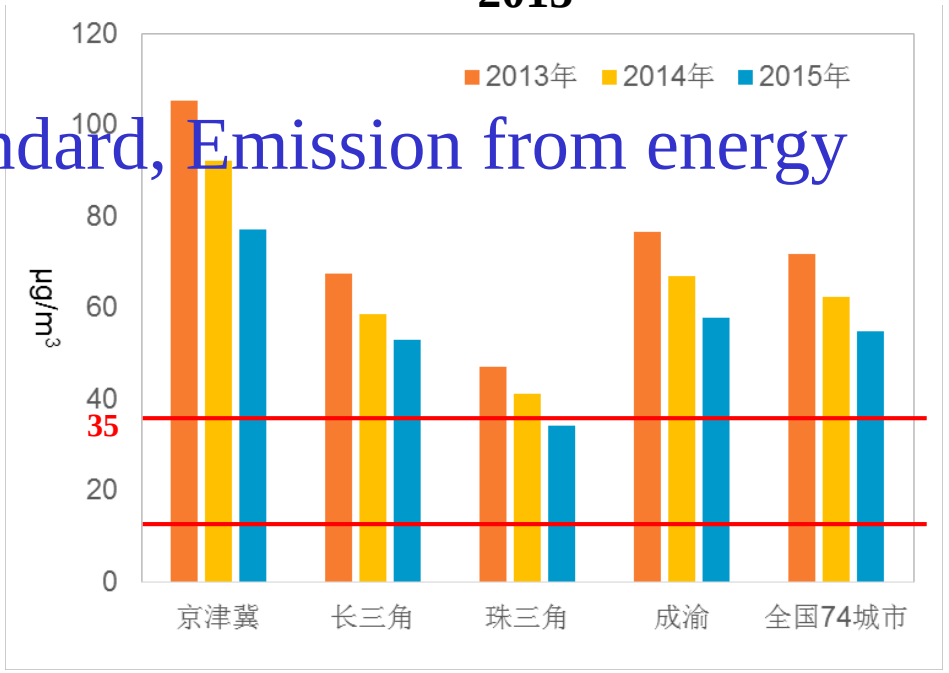
- Energy Revolution
- Renewable energy development policy package
- Energy Reforming
- Clean Air Action Plan

$PM_{2.5}$ Concentration is much higher than standard

PM2.5 concentration of 74 cities in 2013



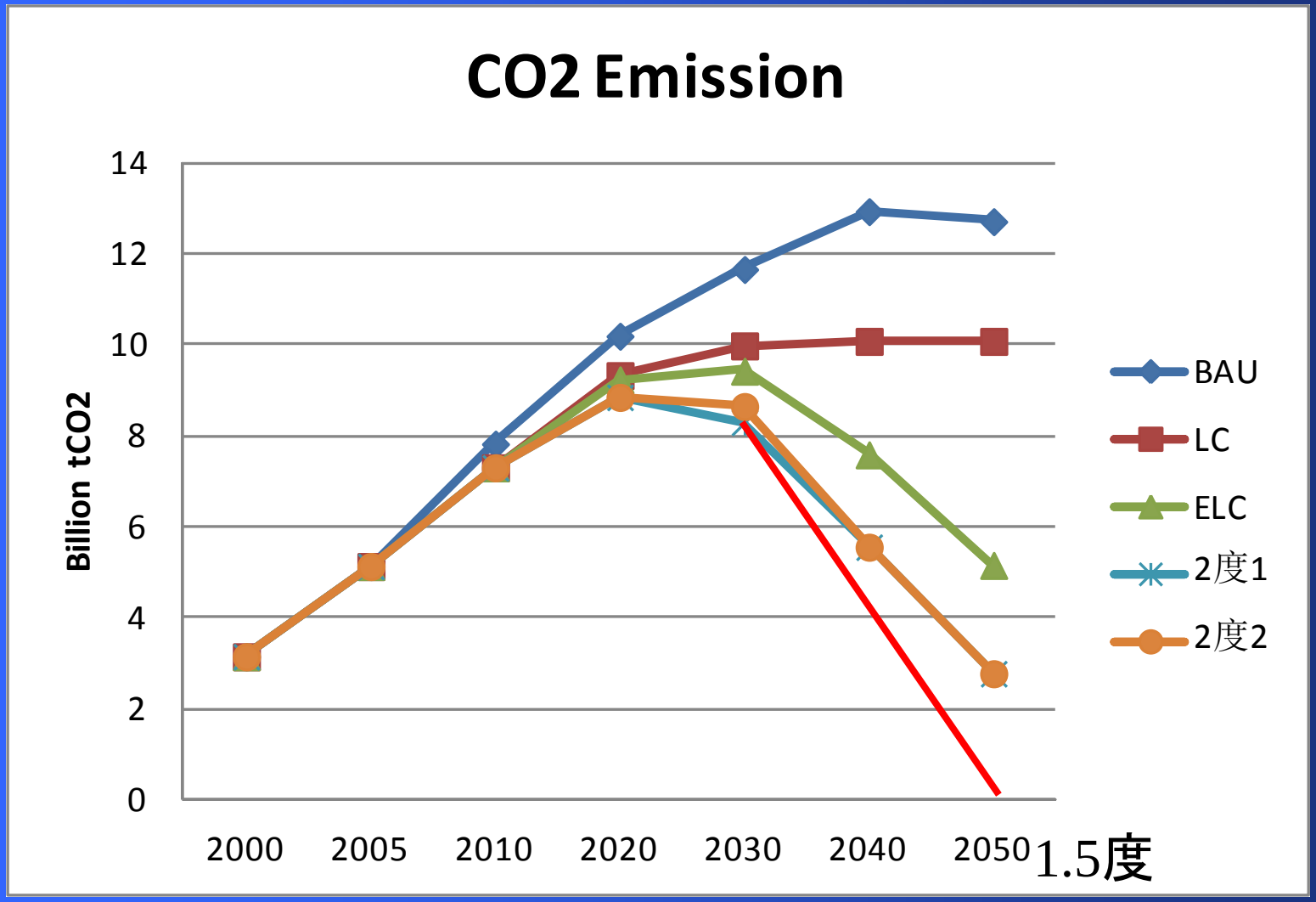
PM2.5 annual concentration from 2013-2015



If WHO recommended standard, Emission from energy activities will be 0

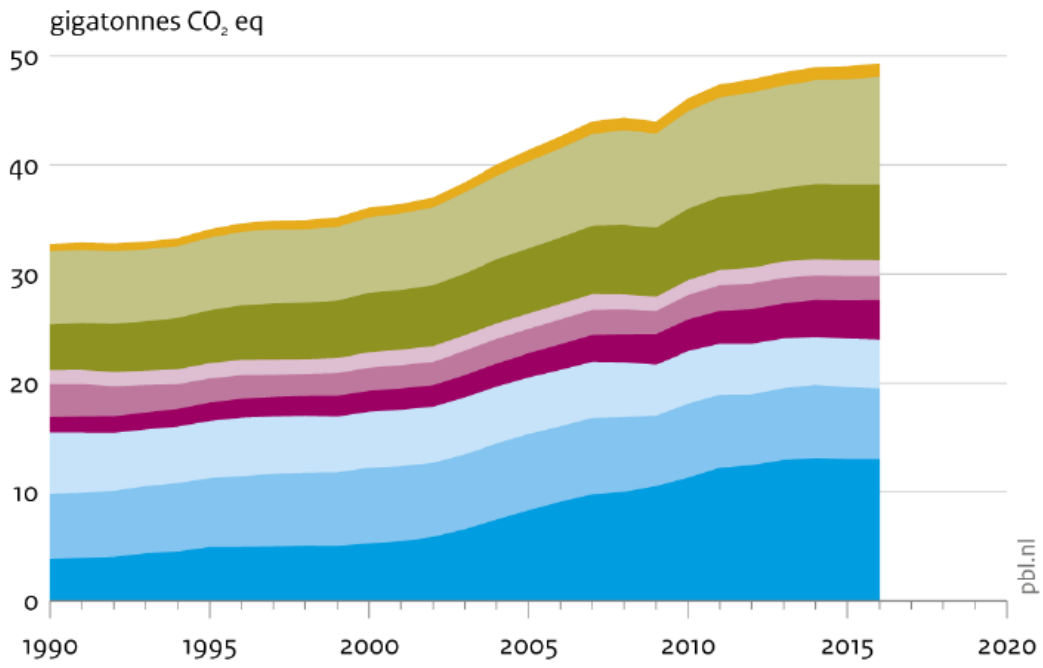
- 2013年京津冀地区所有城市$PM_{2.5}$年均浓度均超标，区域内$PM_{2.5}$年平均浓度达106μg/m³，虽2014、2015年空气质量有所改善，但仍大幅超过国家空气质量二级标准。

SUSTAINABLE DEVELOPMENT GOALS

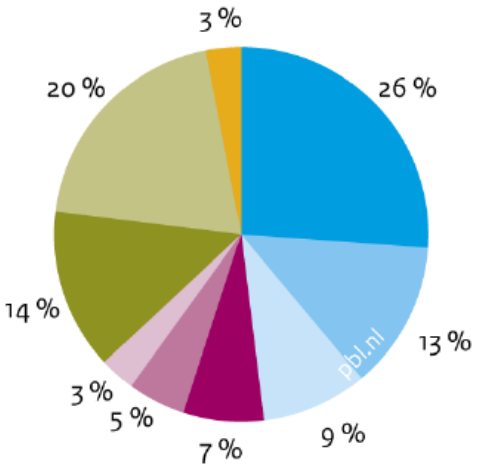

CO2 Emission
Billion tCO2
14
12
10
8
6
4
2
0
2000
2005
2010
2020
2030
2040
2050
BAU
LC
ELC
2度1
2度2
1.5度

Global greenhouse gas emissions, per country and region

Trend



Shares in 2016

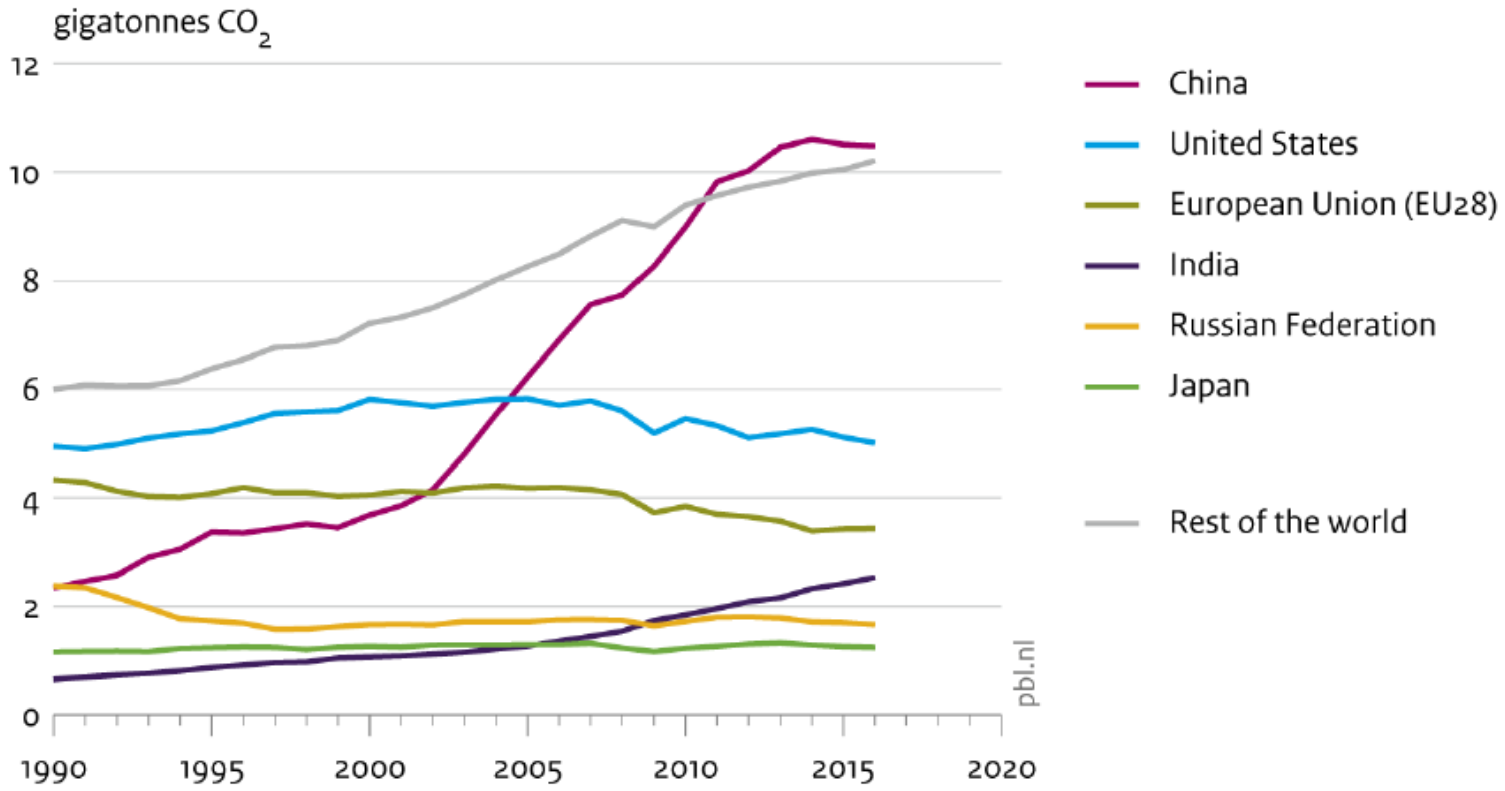


International transport
Other countries
Other G20 countries
Japan
Russian Federation
India
European Union (EU28)
United States
China

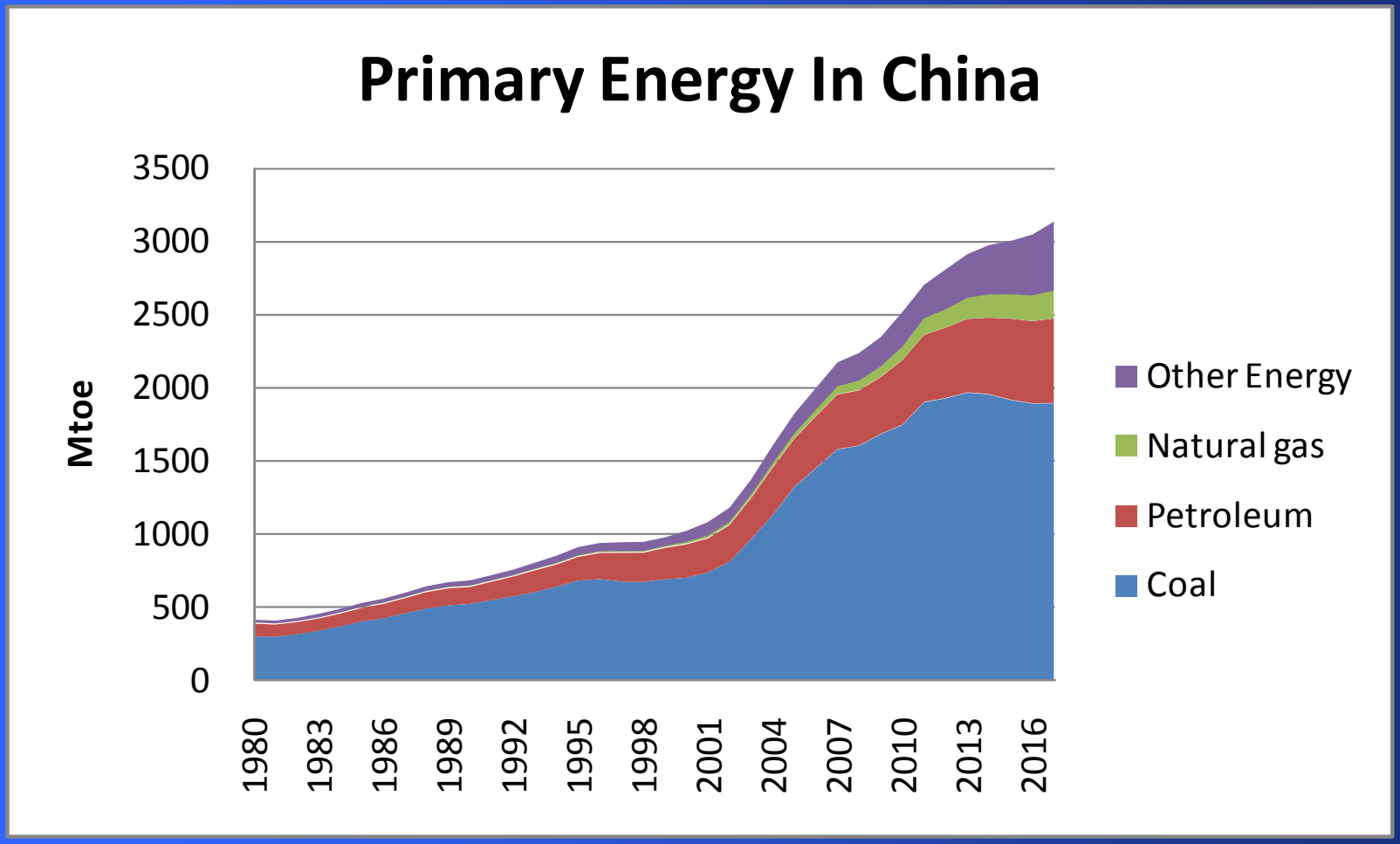
Emissions do not include those from land use, land-use change and forestry and forest and peat fires (LULUCF)

Bron: EDGAR v4.3.2 (EC-JRC/PBL 2017)

CO_2 emissions from fossil-fuel use and cement production, per country and region



Source: EDGAR v4.3.2 CO2 FT2016 (EC-JRC/PBL 2017)


Primary Energy In China
Mtoe
3500
3000
2500
2000
1500
1000
500
0
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007
2010
2013
2016
Other Energy
Natural gas
Petroleum
Coal

四、影响电动汽车发展的主要制约因素分析

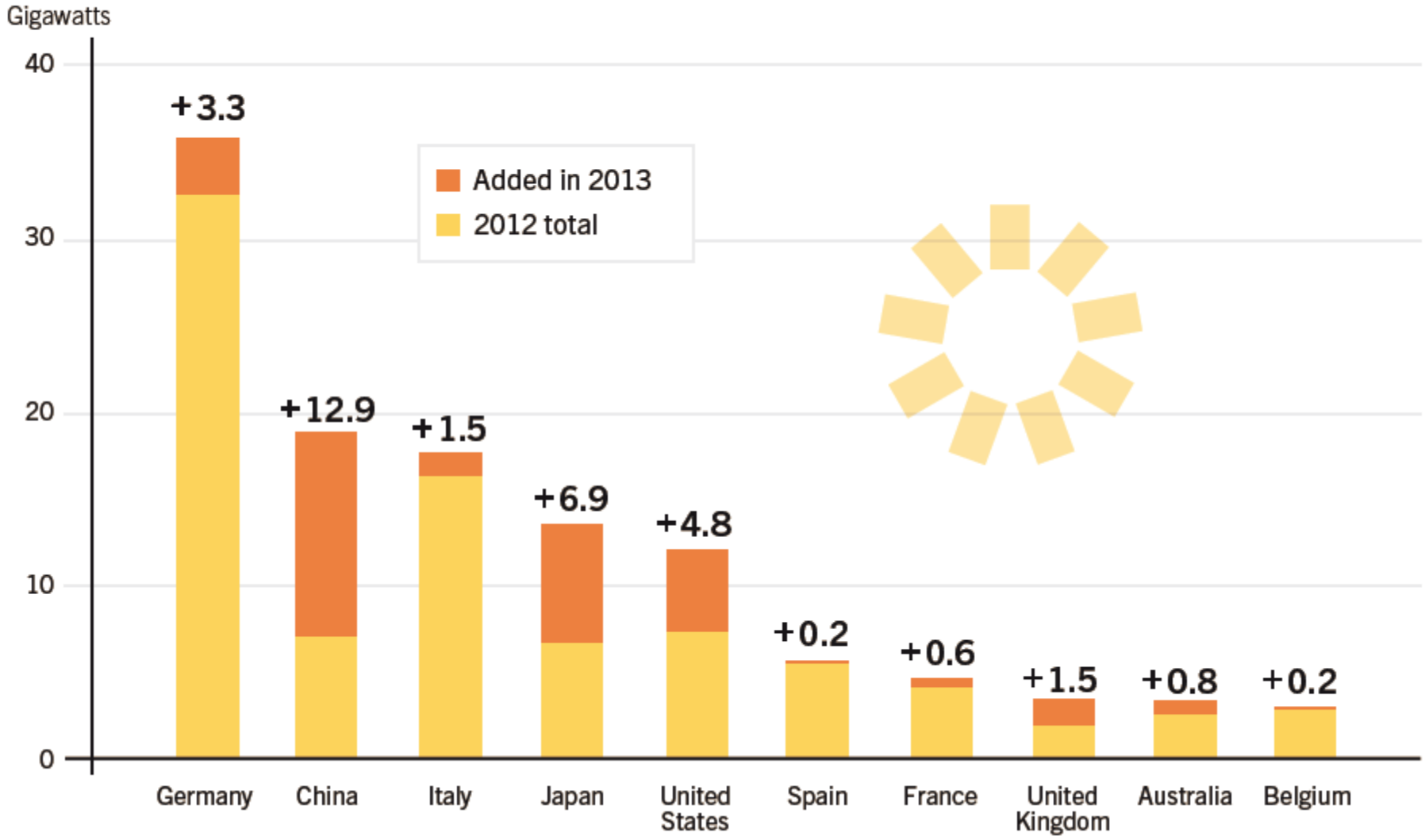
4. Analysis Major Constraints Factors

- 3.3 电动汽车实现经济性的趋势分析 Trend Analysis on EVs

电动汽车与先进汽油和柴油车成本变化趋势分析					
	2006-2010	2011-2015	2016-2020	2021-2025	2026-2030
电动汽车Evs					
电池充满电时总容量kWh	16	24	48	80	112
电力销售价格（元/kWh）	0.48	0.60	0.75	0.94	1.18
单位里程耗电量（kWh/km）	0.18	0.13	0.08	0.08	0.07
单位里程耗电费用（yuan/km）	0.09	0.08	0.06	0.08	0.08
电动汽车燃料成本（yuan/car）	43200	39067	30104	37694	41299
单位电池容量成本(USD/kWh)	750	375	130	75	30
Evs车电池组成本(yuan/car)	80400	60300	41808	40200	22512
电池组寿命（年）	3.6	5	11	22	22
电池组更换次数（set/year)	4.1	2.8	1.4	0.7	0.7
EVs全寿期电池成本（yuan/car）	413256	226728	99503	67938	38045
EVs全寿期电耗和电池总成本（yuan/car）	456456	265795	129607	105632	79345
每年费用（yuan/car）	30430	17720	8640	7042	5290
先进汽油汽车ICE					
汽油销售价格（yuan/liter)	6.6	8.5	10.2	11.0	11.8
柴油销售价格（yuan/liter)	6.4	8.3	9.9	10.6	11.4
单位里程耗汽油（L/km）	0.050	0.039	0.031	0.024	0.020
单位里程耗柴油（L/km）	0.047	0.038	0.030	0.024	0.020
全寿期行驶里程（km)	500000	500000	500000	500000	500000
先进汽油车燃料成本（yuan/car）	165000	167550	158356	133574	117738
先进柴油车燃料成本（yuan/car）	150400	155333	149317	128100	114170
每年费用	11000	11170	10557	8905	7849
比较（Evs车费用－ICE车费用）	291456	98245	-28749	-27941	-38394

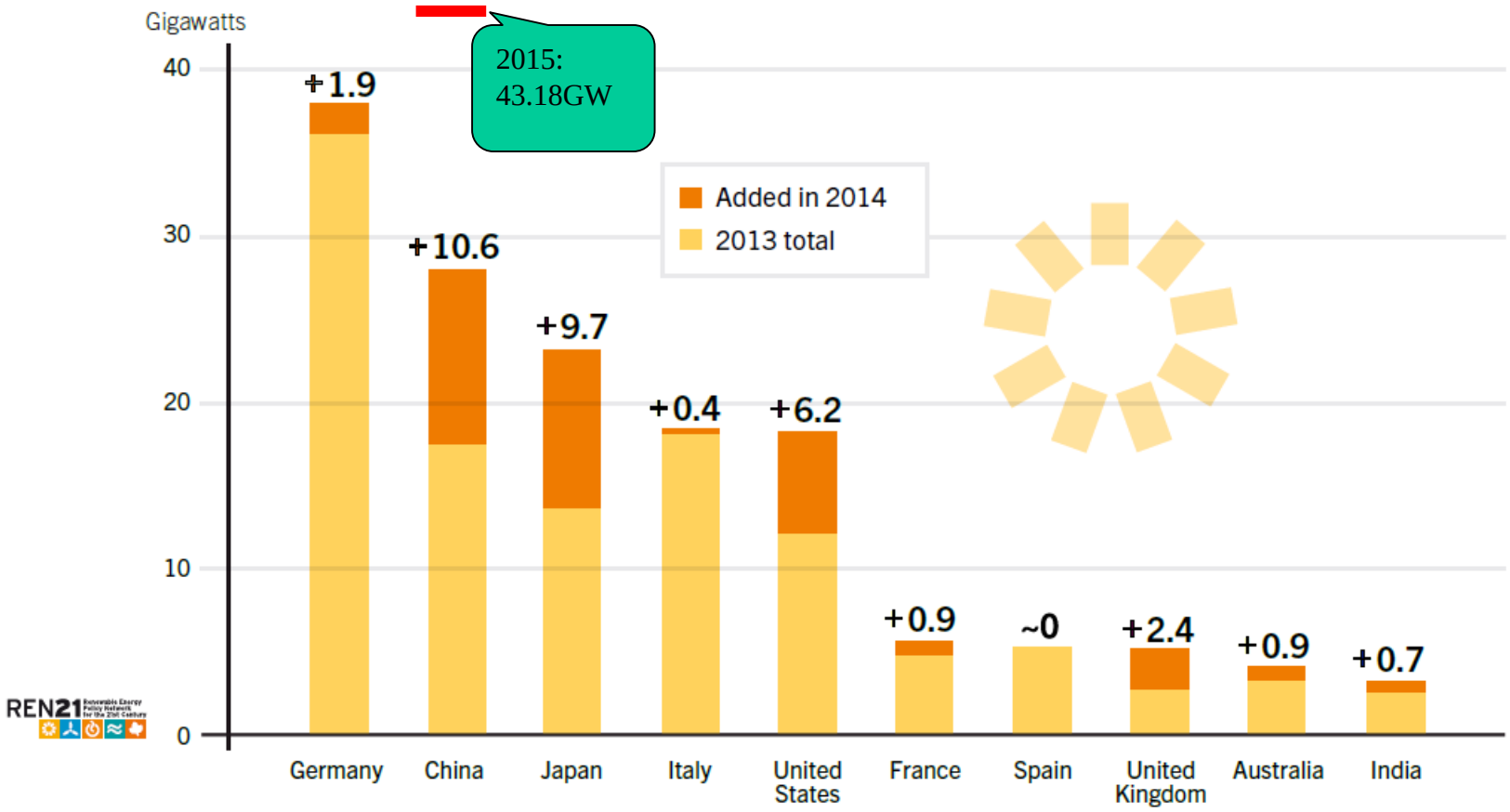
By 2016, There are 260million electric bike in China

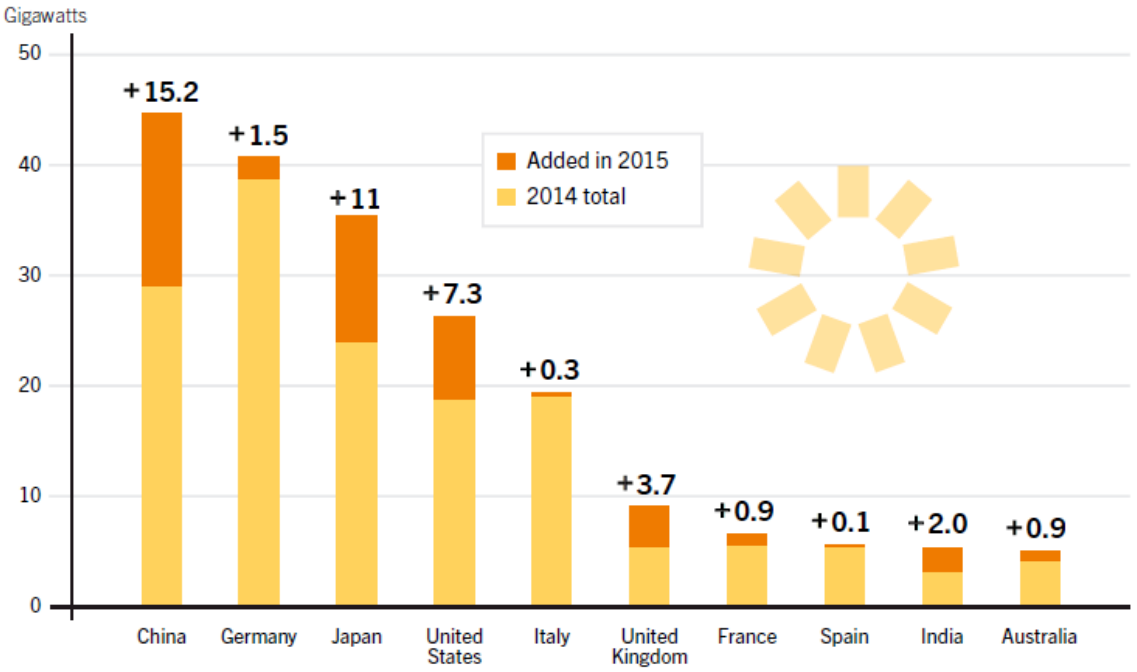
Figure 13. Solar PV Capacity and Additions, Top 10 Countries, 2013



40 GW
added in 2014

Solar PV Capacity and Additions, Top 10 Countries, 2014



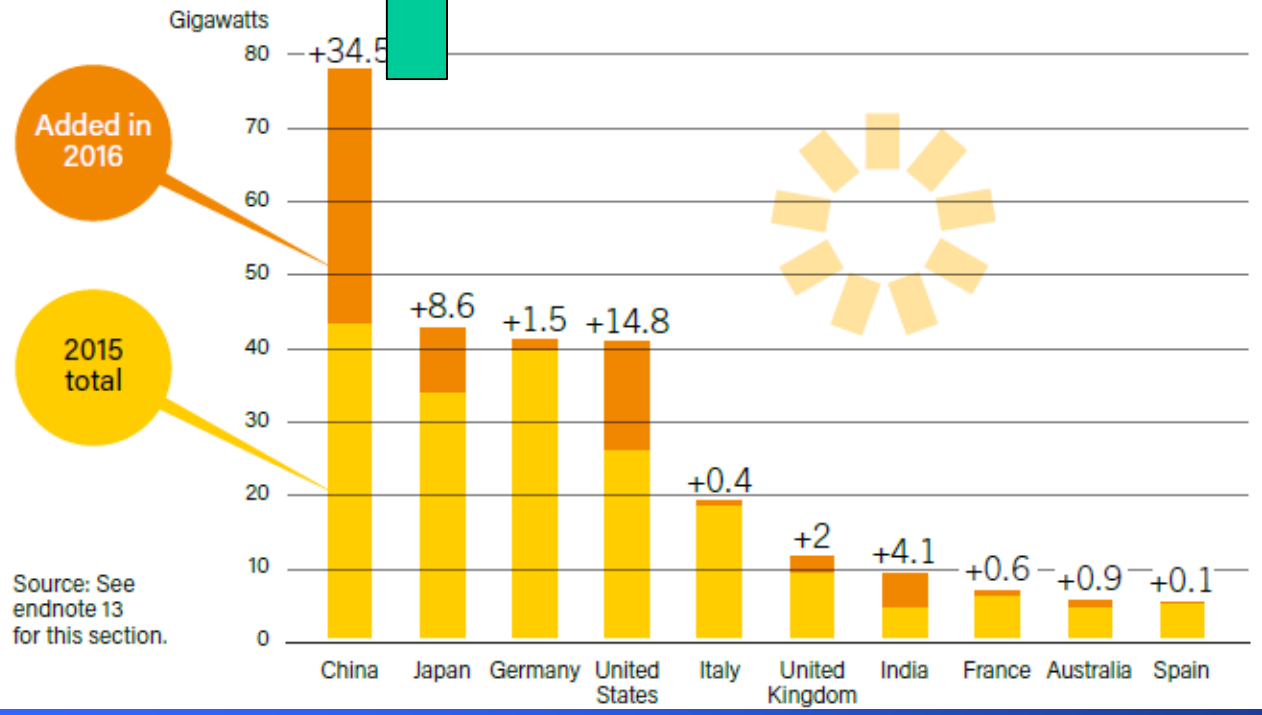


50 GW
ADDED IN 2015

+53GW in 2017

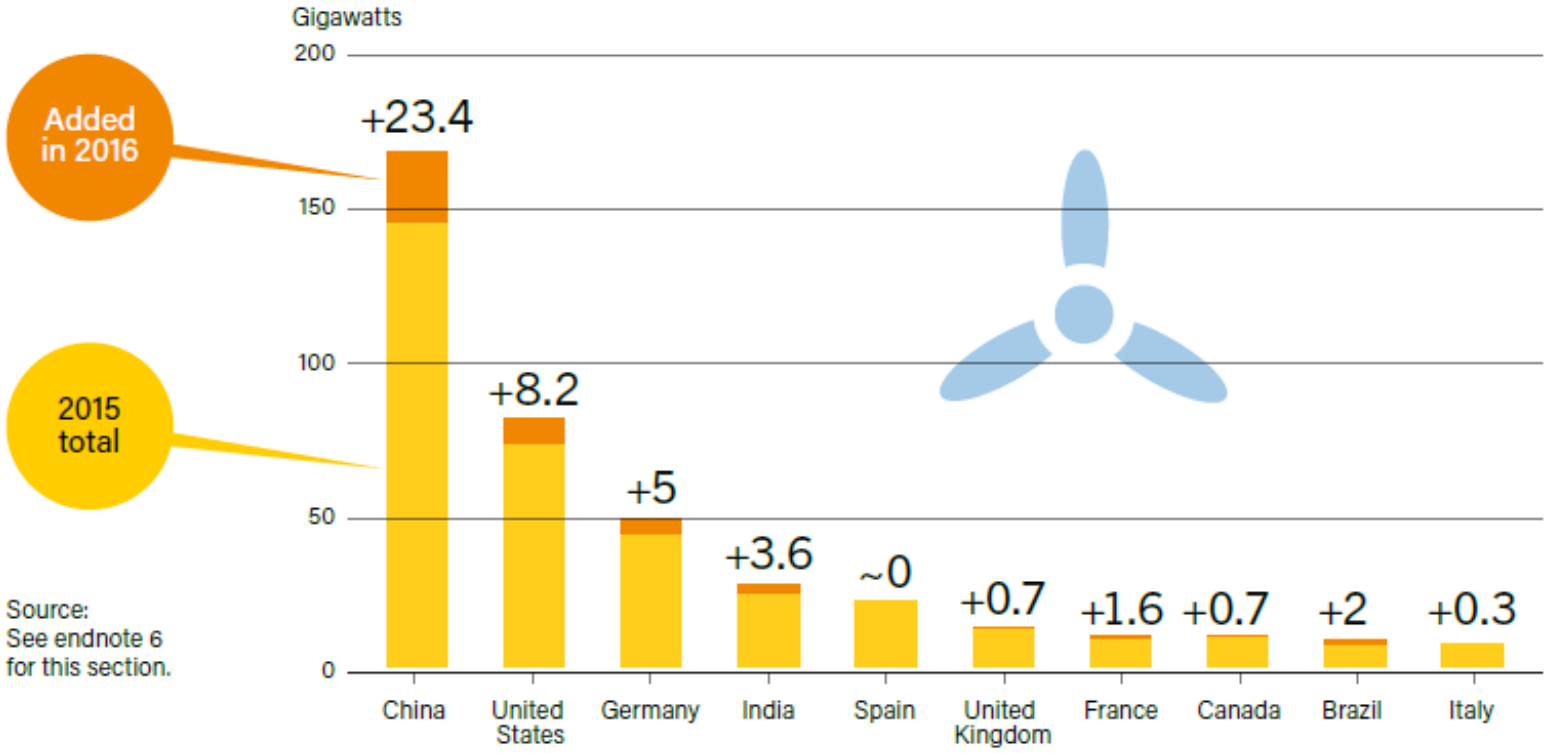
+24.5GW from Jan. to June 2017

Figure 17. Solar PV Capacit[illegible]d Additions, Top 10 Countries, 2016



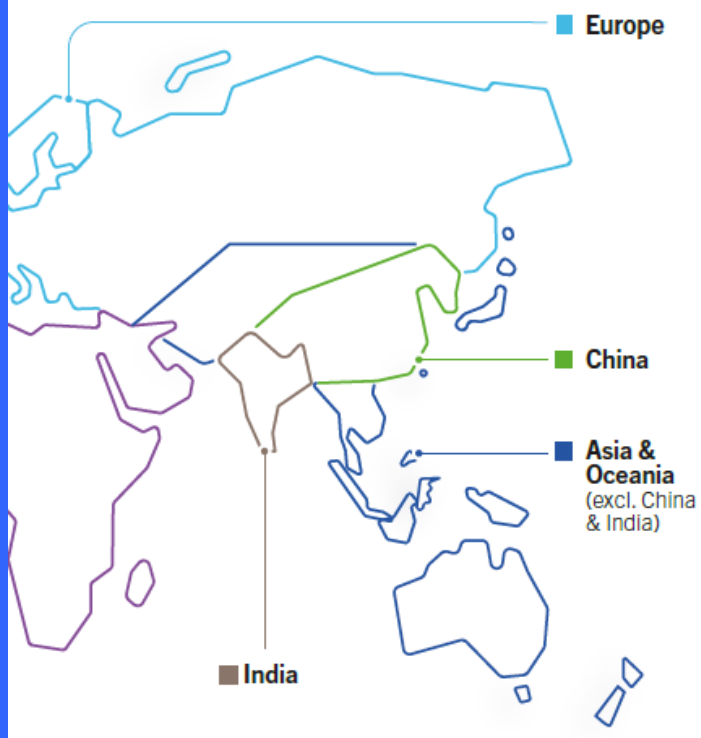
CHINA ACCOUNTED FOR **46%** OF NEW CAPACITY.

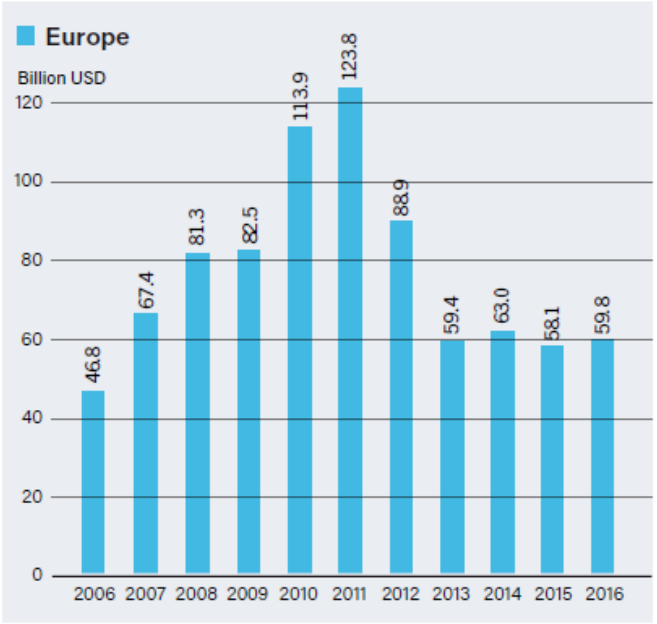
Figure 27. Wind Power Capacity and Additions, Top 10 Countries, 2016

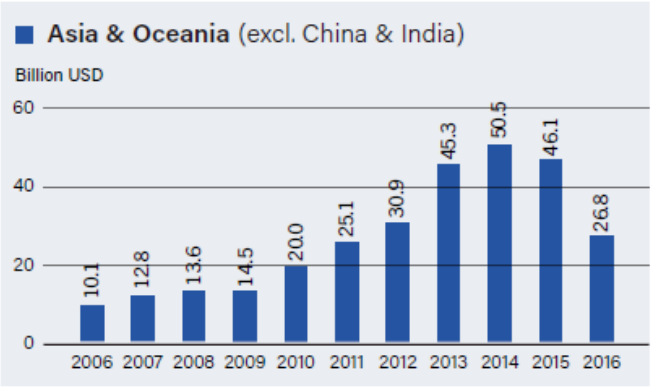


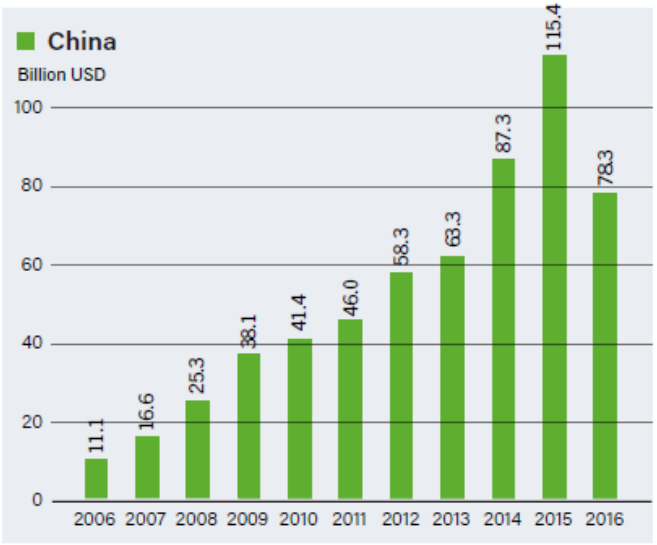
Source:
See endnote 6
for this section.

Note: Germany's additions are net of decommissioning and repowering. "~0" denotes capacity additions of less than 50 MW.


Europe
China
Asia & Oceania (excl. China & India)
India


Europe
Billion USD
120
100
80
60
40
20
0
46.8
67.4
81.3
82.5
113.9
123.8
88.9
59.4
63.0
58.1
59.8
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016


Asia & Oceania (excl. China & India)
Billion USD
60
40
20
0
10.1
12.8
13.6
14.5
20.0
25.1
30.9
45.3
50.5
46.1
26.8
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016


China
Billion USD
100
80
60
40
20
0
11.1
16.6
25.3
38.1
41.4
46.0
58.3
63.3
87.3
115.4
78.3
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016


龙源振华

NASA images show stunning progress of China’s vast 850 MW Longyangxia Solar Park

2013 2017

INDC+/NDC for China

- Peak CO2 emission in 2030, **try to peak earlier**

  peak 2020-2022

- 60% to 65% carbon intensity reduction by 2030 with comparison with 2005

  70%-75% carbon intensity

- 20% non-fossil energy in TPE

  25%, based on NEA's picture

China’s National ETS

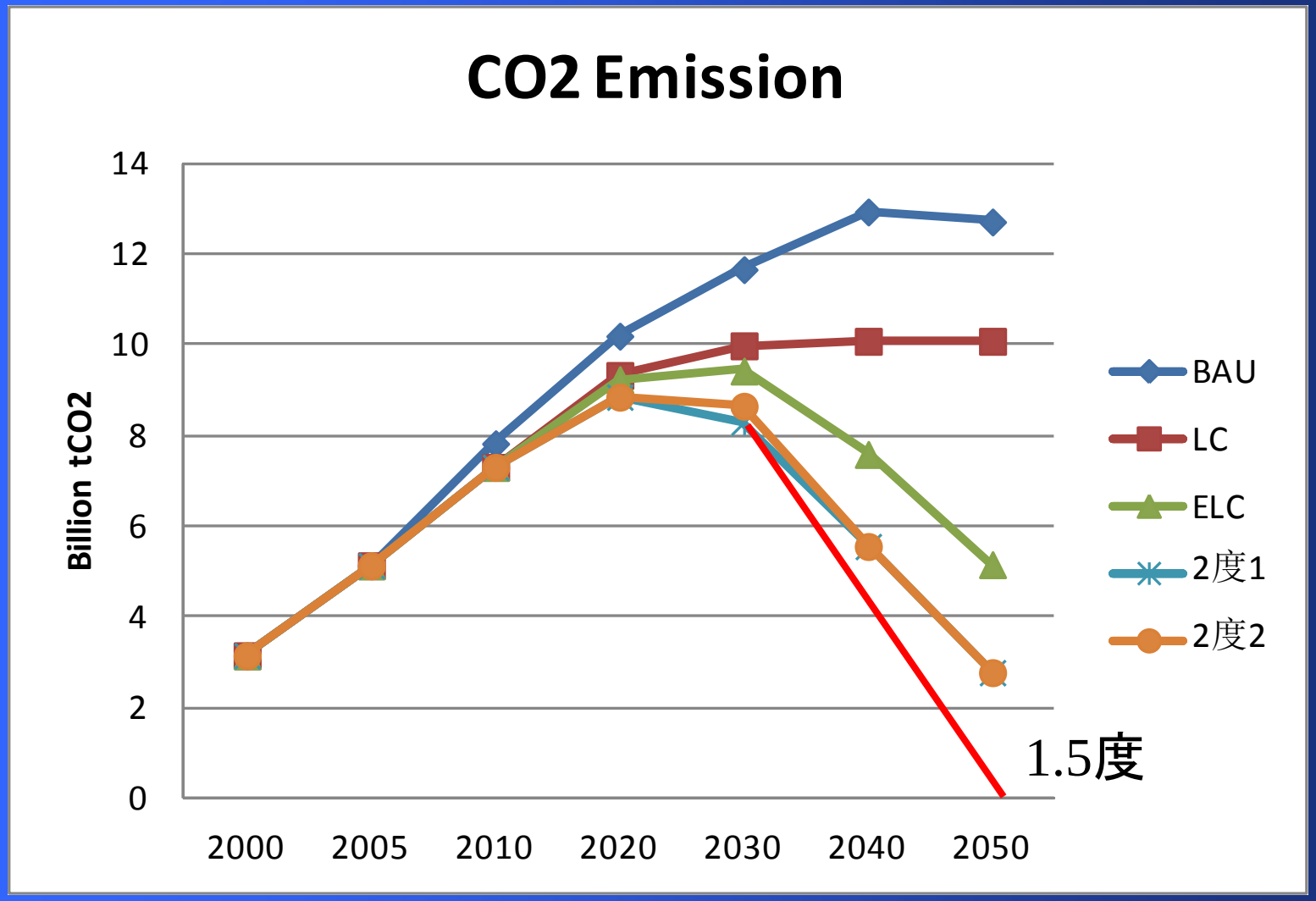
- Launched in Dec. 19, 2017
- Cover Power generation sector
- Use bench-mark method for allowance allocation
- The market will then enter a trial period in 2019
- Free allowance

China's National ETS: what is the future

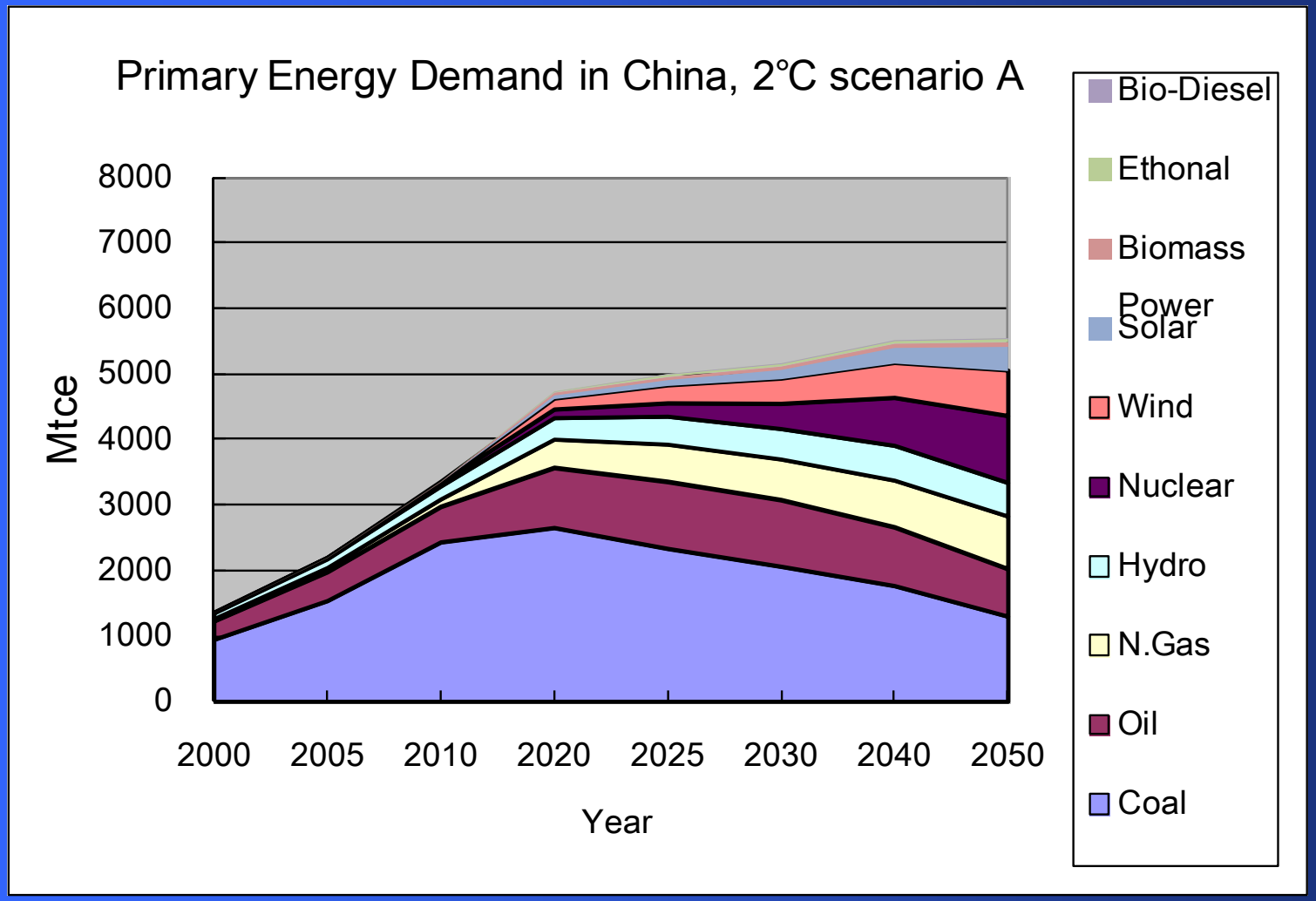
- No message when it will be no free allowance
- The National Development and Reform Commission (NDRC) enlisted 10 sectors to start providing data on their historical greenhouse gas emissions
- Expect to cover more sectors in future
- Carbon pricing could play key role in future's deep cut of CO2 emission in China

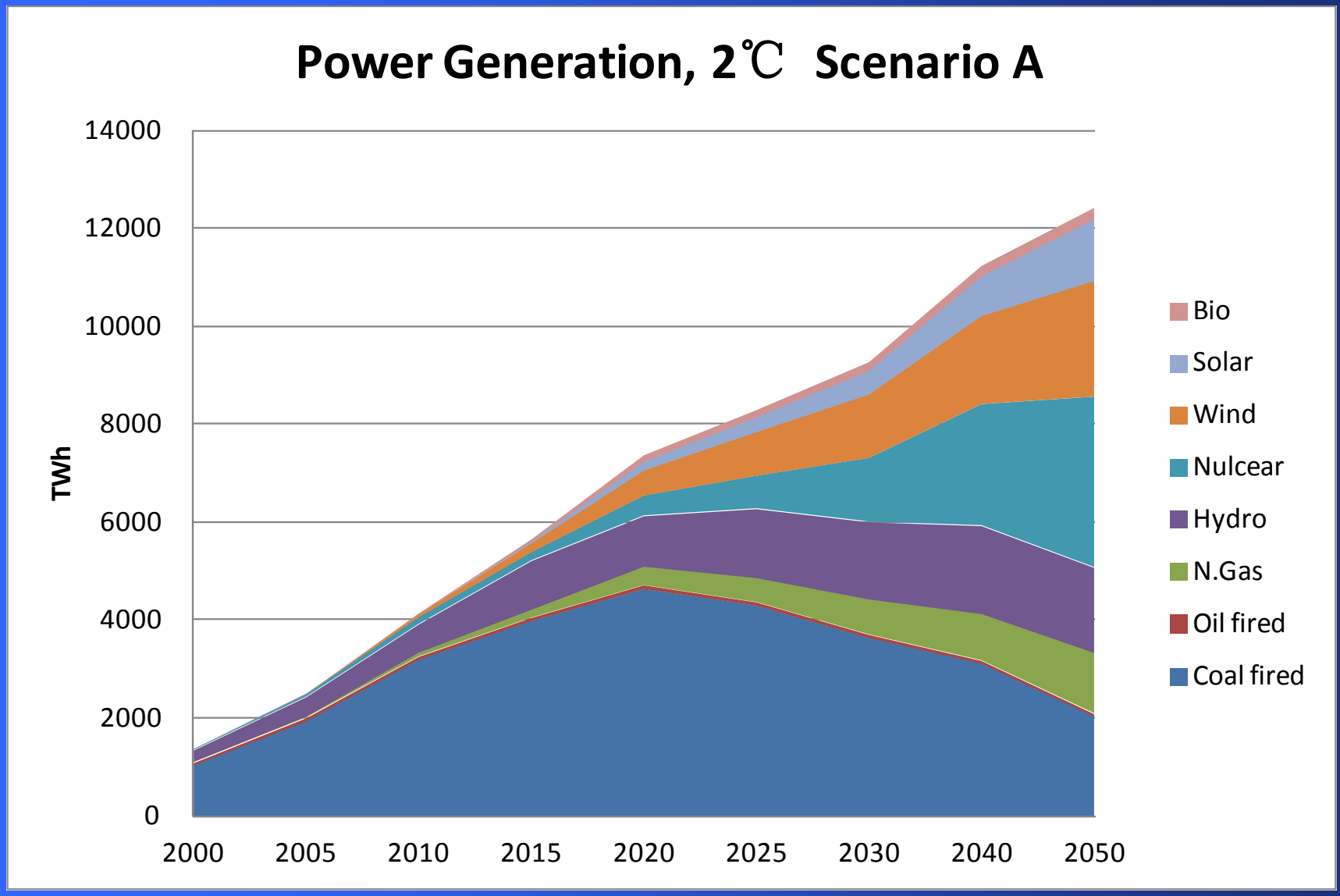
The expected big changes in energy system in China

- Coal consumption start to decrease, coal industry should be ready for it, and make own long-term strategy: local manufacture, export/import, security, clean coal use.
- Much more natural gas demand, need to work out for the supply
- Much faster progress on renewable energy, both centralized and distributed
- Grid should be reconstructed to support the system
- Energy price increase, to cover energy environment externality.
- Large scale of nuclear in near future
- Much lower growth rate for energy demand in China


CO2 Emission
Billion tCO2
14
12
10
8
6
4
2
0
2000
2005
2010
2020
2030
2040
2050
BAU
LC
ELC
2度1
2度2
1.5度

We Need Rapid Transition : Put that into 13th Five Year Plan
Primary Energy Demand




Power Generation, 2℃ Scenario A
TWh
14000
12000
10000
8000
6000
4000
2000
0
2000
2005
2010
2015
2020
2025
2030
2040
2050
Bio
Solar
Wind
Nulcear
Hydro
N.Gas
Oil fired
Coal fired

A 2 degree Asia: A good way to understand the global target

Scenario Analysis:

Japan
Korea
China
India
Thailand
Malaysia
Indonesia
Nepal
Vietnam
Cambodia
Laos
Philippine