



The X Factor: China's Energy Profile

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ROADMAP

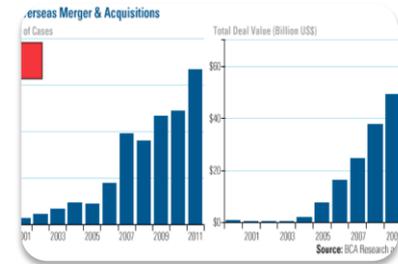


The Past
World Energy
Order



The Present
China's Energy
System

China X Factor



The Future
Key Questions:
Economic +
Political

China as X Factor



- **Driving 3 out of 4 “Main Shifts” in Energy Sector...**
 - Solar/Wind Global Growth
 - Electrification of Transportation
 - Infrastructure Buildout of Developing World
 - *[US Oil & Gas Revolution → Link to LNG Demand Growth in China]*

- **...But Politics Opaque + Role of Party Increasing in Market...**
 - Internal Industrial Policy and External Trade Policy

- **...May be one of few Bright Spots in US-China Relations**

Past: The “China Share”

China's Commercial Energy Consumption as % of World Consumption

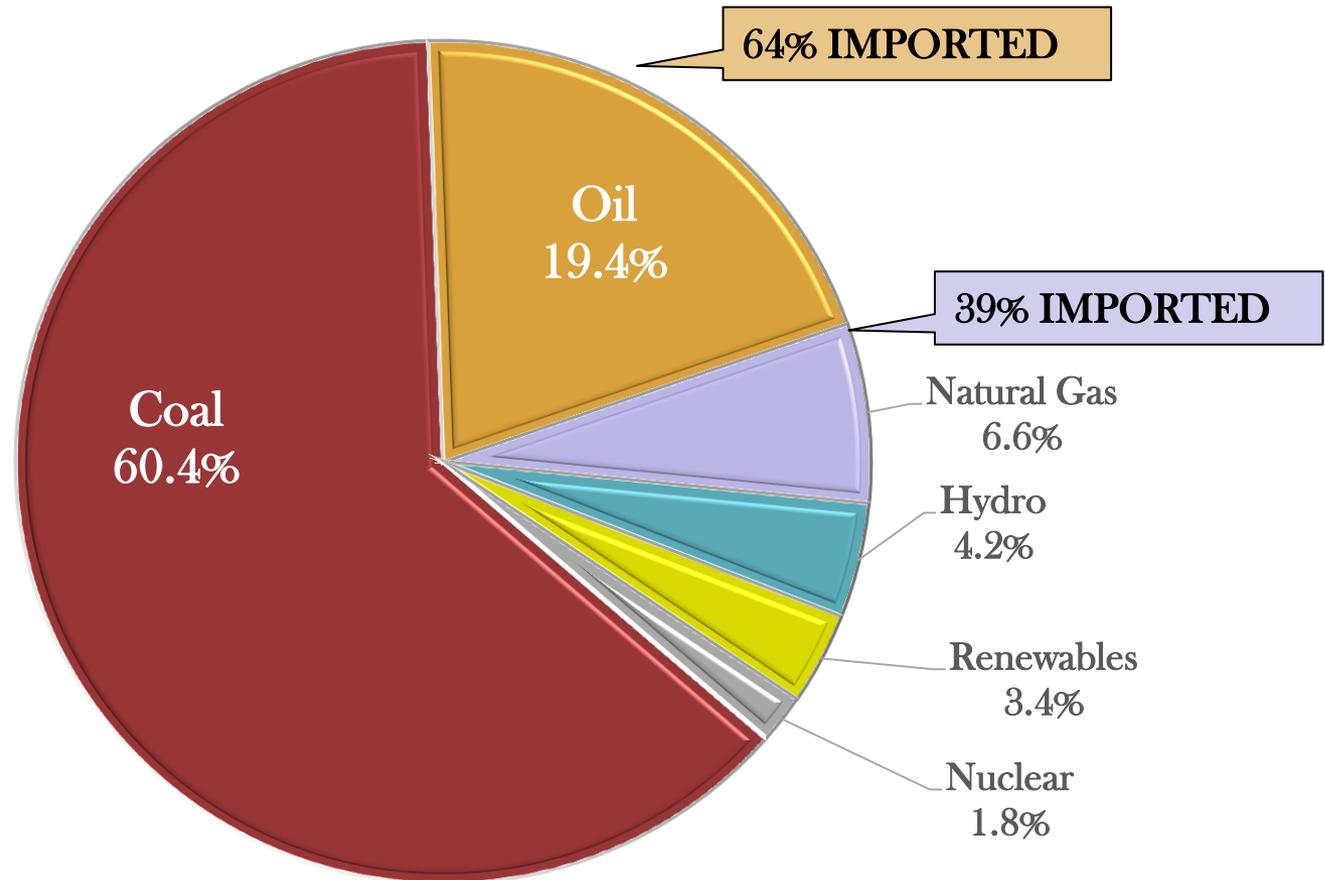


		1973	1983	1993	2016	2006-2016
Oil	China	2%	3%	4%	13%	50%
	US	30%	26%	25%	20%	
Gas	China	0.6%	0.8%	0.8%	6%	22%
	US	53%	33%	29%	22%	
Coal	China	14%	18%	28%	51%	97%
	US	21%	21%	23%	19%	

Source: Calculated from BP Statistical Review of World Energy 2017.

Oil: mt; Gas; mtoe; Coal: mtoe; PE: mtoe

Present: Primary Energy Demand Met by Fossil



Total Primary Energy Consumption - 2017

China's Global Weight Today

2018



19% of Population
17% of Economy (at market rates)
23% of Energy Cons.
31% CO₂ Emissions
14% Crude Oil Cons.
51% Coal Cons.
22% Renewables Cons.
~100% Nuclear Growth

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Green Pivot?

In 2017, China:

- confirmed the establishment of the world's largest carbon market
- merged two state-owned power enterprises to create the world's largest power producer by installed capacity
- accounted for 40% of global clean energy investment (more than double that of the U.S.)
- became the world's #1 exporter of environmental goods and services, overtaking the U.S. and Germany.

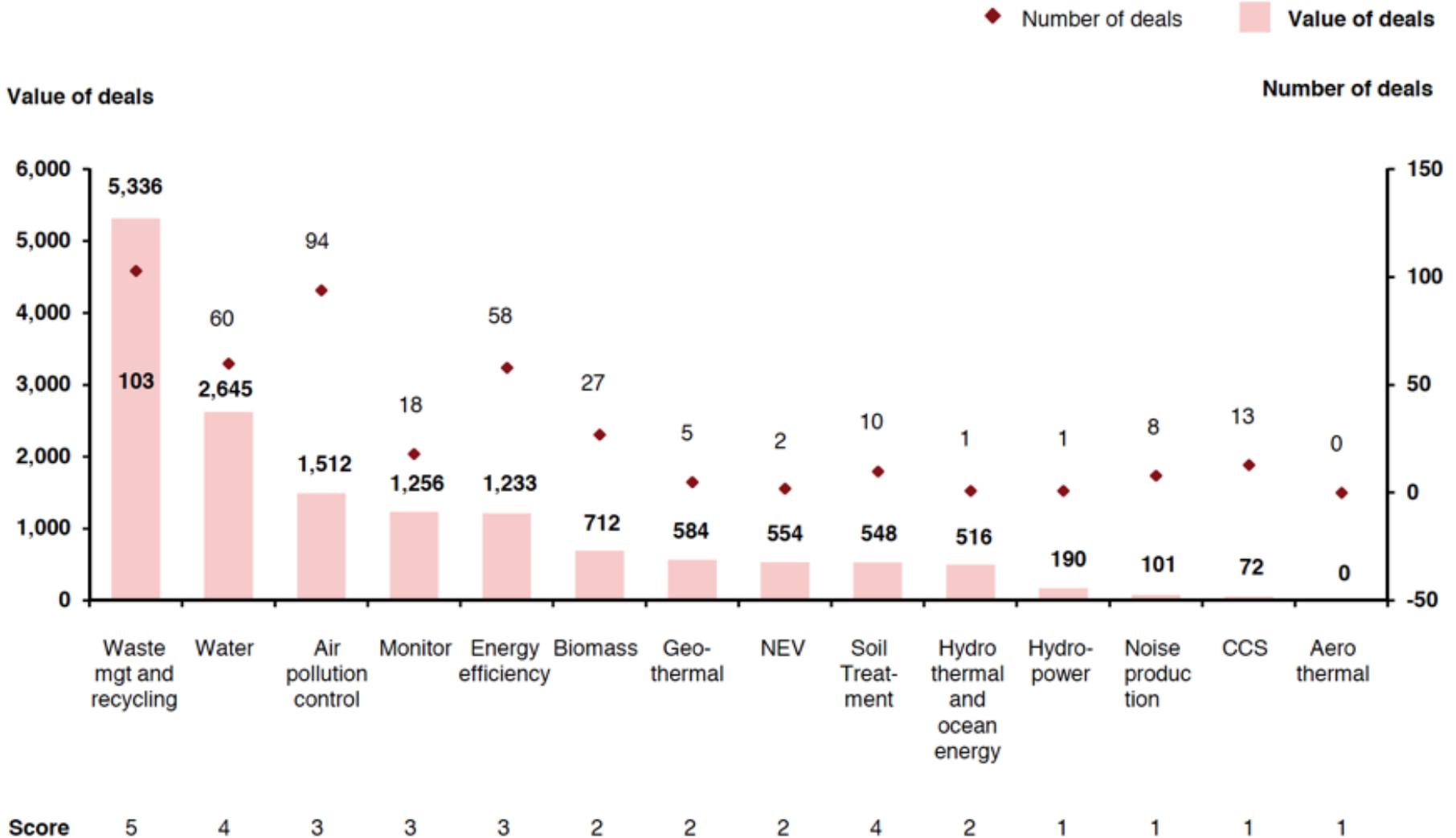
Cleantech Companies Operating in China

2005: 2,762 → 2015: 50,734

Ministry of Commerce “Encouraged Import Catalog” 2017

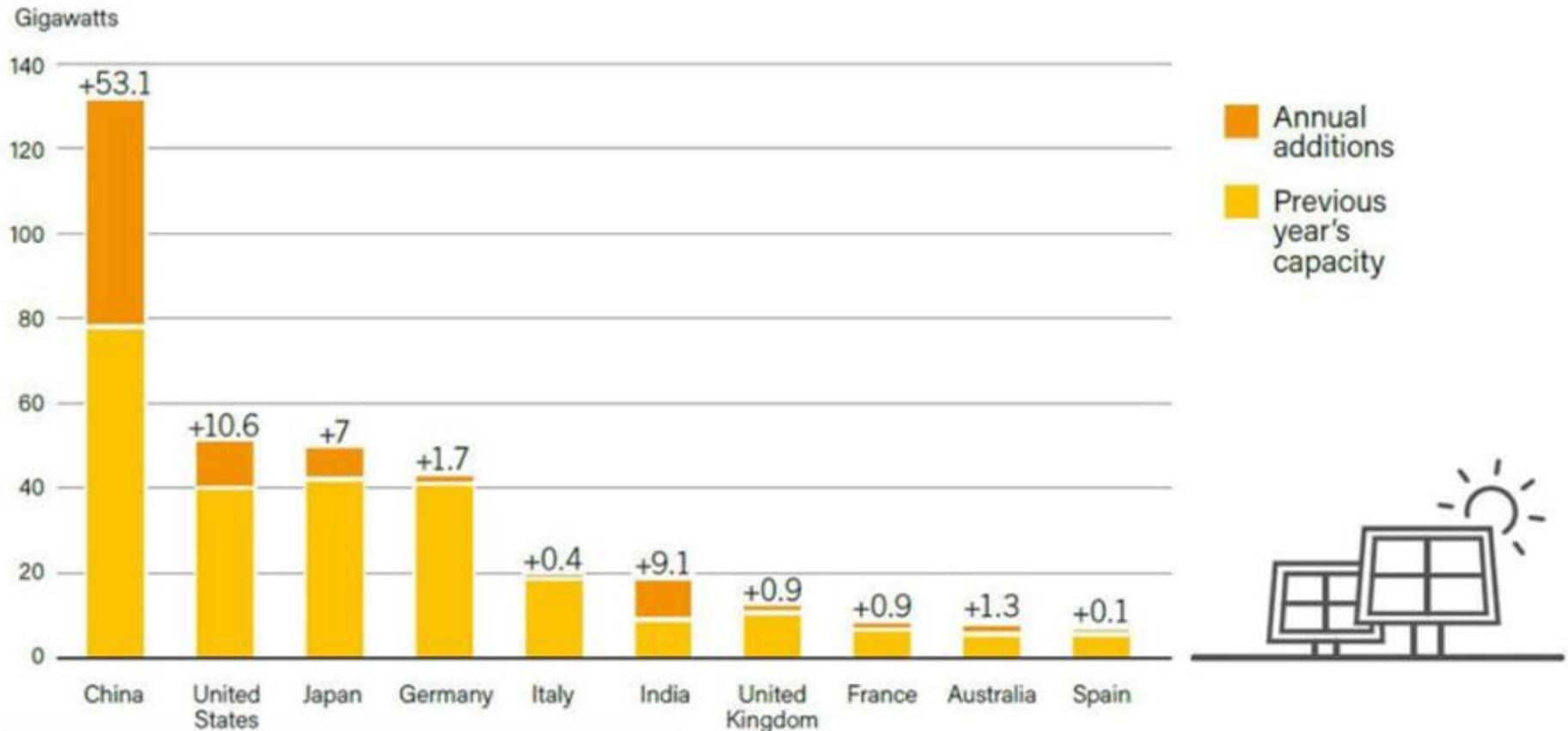
Category	Subsector	Rational	Score
1. Hungry for technology solution	Soil treatment	<ul style="list-style-type: none"> Soil pollution from industry, agriculture, and waste in China is extremely severe Soil treatment is preliminary, hence technology and experience are in high demand 	5
	Hydrothermal and ocean energy	<ul style="list-style-type: none"> Technology mainly in R&D stage, onshore renewable energy sources dominate. Emerging technologies can be introduced. 	4
2. Advanced technology needed	Aero thermal	<ul style="list-style-type: none"> Technology gap exists, but only low potential of large scale application in the next five years due to high cost and little demand. 	3
	CCS and carbon services		
	Waste management	<ul style="list-style-type: none"> Government is promoting the development of these technologies, but not as advanced compared to developed countries. 	3
	Biomass		
	Electric vehicles		
Geothermal			
3. High performance/ low cost /differentiated technology needed	Water treatment	<ul style="list-style-type: none"> Technology in these areas has already matured during recent years. Differentiated and customised high performance or low cost technologies are needed. 	2
	Air pollution control		
	Energy efficiency and conservation	<ul style="list-style-type: none"> Technology in these areas has matured during recent years. Not very much demand in these areas. 	1
	Hydro power		
	Noise reduction		

2016 Investment from Financial Investors in China (Million RMB)



Source: PWC, May 2017

2017 Additional Solar



REN21 2018 Global Status Report

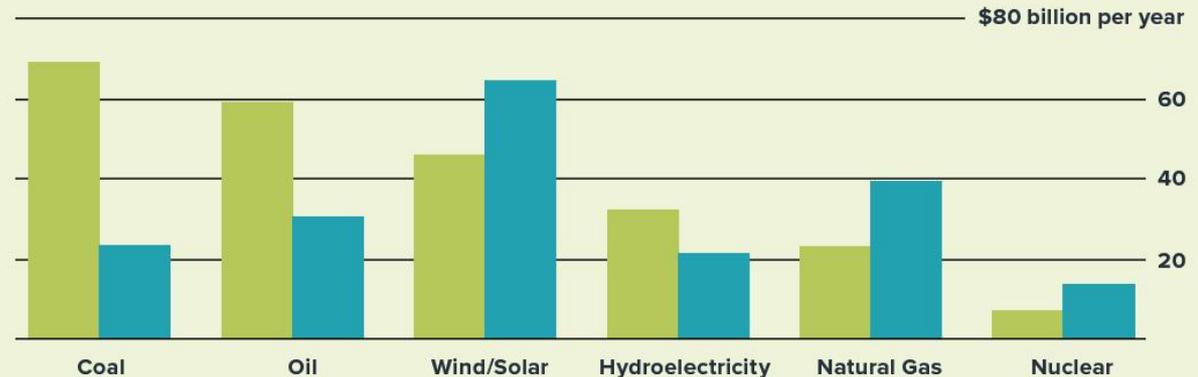
Future Investment: Wind/Solar/Gas

CHINESE ENERGY INVESTMENTS: PAST VS. FUTURE

- 2010 - 2016
- 2017 - 2040

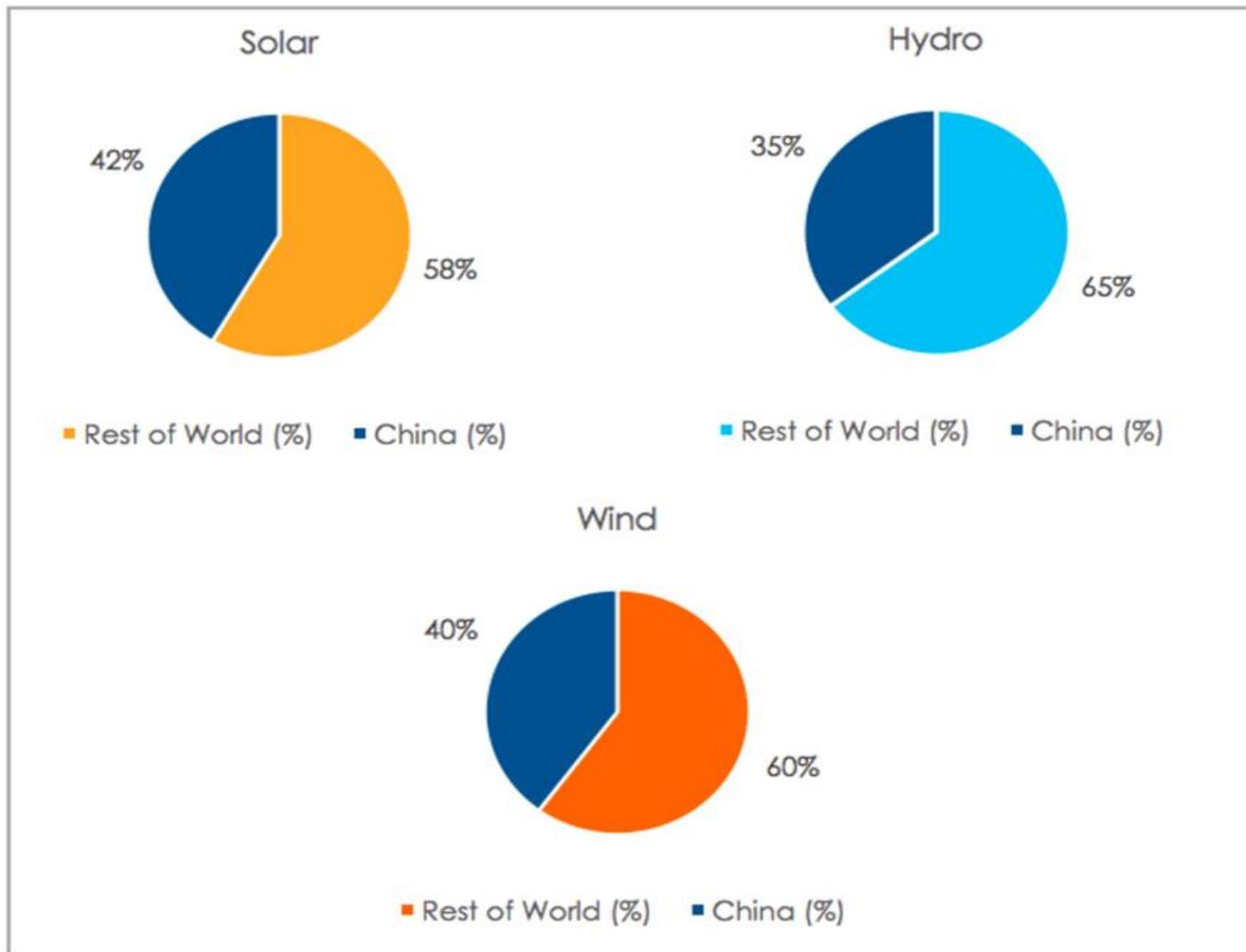
Follow the Money

The type of energy China invests in over the next few decades is critical



Note: Projections as per the IEA's central "New Policies Scenario". Figures are 2016 dollars. Data: International Energy Agency; graphic by Bloomberg Gafly. Source: <https://www.bloomberg.com/news/articles/2017-11-14/china-energy-gorilla-will-eat-less-do-more>

China's Share of Renewable Energy Capacity Growth 2017-2022



Source: IEA Renewables 2017: Analysis and Forecasts to 2022

China as X Factor



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China as #1?



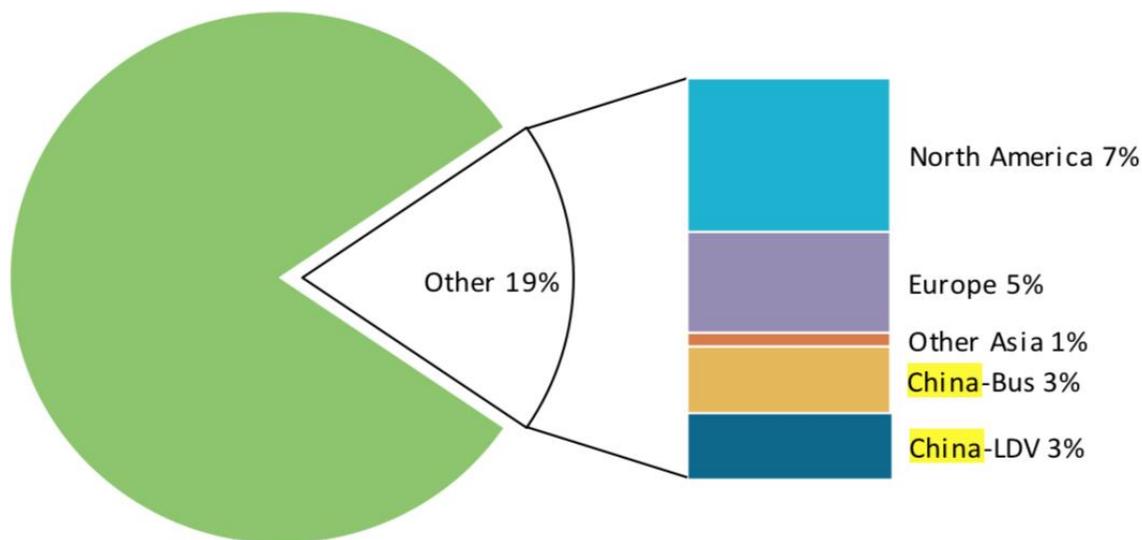
- Globally, 385,000 fully electric buses → 99% in China
- In 2016, 507,000 EVs and PHEVs were sold in China, a 53% increase YoY. (222,200 EVs and PHEVs were sold in Europe, a 14% increase; and 157,130 units were sold in the United States, a 36% increase from the prior year.)
- In 2017, global new electric car sales = +1 million units. >50% were sold in China. In 2017, China = 40% of the global electric car stock.

CO₂ Emissions Avoided due to EVs, 2016



Global: 29.4 MtCO₂

China- 2 Wheeler 81%



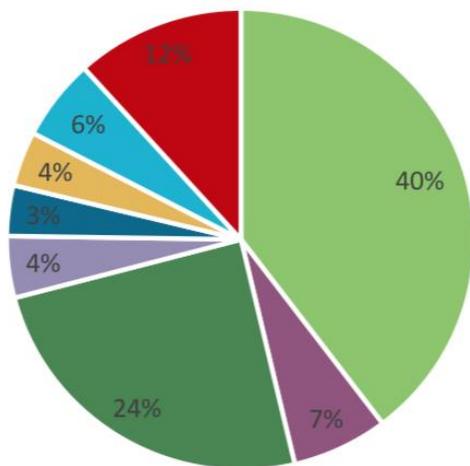
Notes: LDV refers to light-duty vehicle. Unless stated otherwise, emissions savings refer to the entire EV fleet. Mileage and fuel economy assumptions here are the same as in Figure 4.1. CO₂ intensities are elaborated from *World Energy Outlook 2017* (IEA, 2017b).

Source: IEA analysis based on country submissions; IEA (2017b).

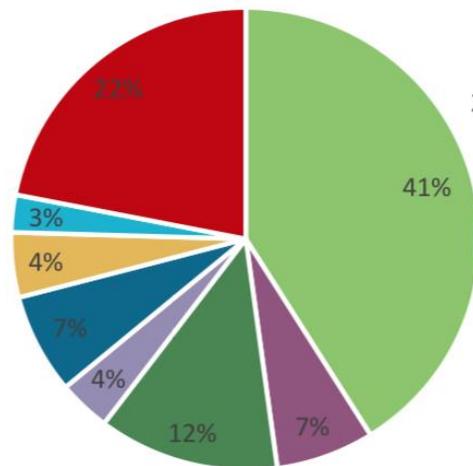
Electric Car Stock and Public Chargers, 2017



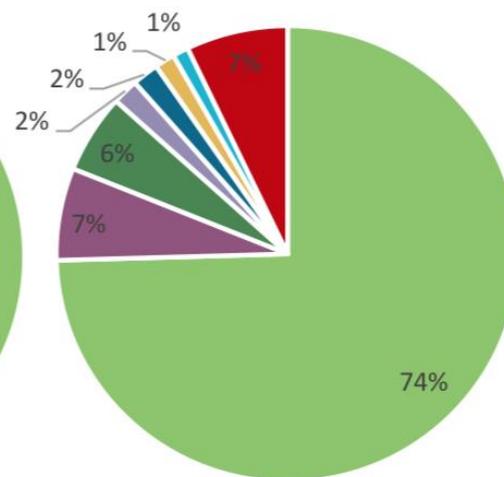
Electriccar stock
3.1 million



Publicly accessible slow chargers
318 000 outlets



Publicly accessible fast chargers
112 000 outlets



- China
- Japan
- United States
- United Kingdom
- Germany
- France
- Norway
- Others

Sources: IEA analysis based on EVI country submissions, complemented by EAFO (2018b).

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Green at Home, Black Abroad?



BRI Goals:

- **Absorbing industrial overcapacity** through the increased export of manufactured and industrial goods and services to less-developed but trade-relevant countries
- **Transferring labor-intensive industries** to other countries as part of the process of rebalancing the economy
- **Creating critical trade and security infrastructure** in key ports and choke points
- **Bolstering Chinese foreign policy goals** where appropriate
- **Further develop 18 provinces in China** by connecting them to Central and South Asian markets.
- **Internationalizing use of the RMB**
- **Strengthening the use of Chinese engineering standards**

Green at Home, Black Abroad?



- **Paradox:** major focus of the BRI is developing infrastructure for fossil fuel resources.
- China is the world's largest exporter of coal-fired power plant finance and technology. 130+ new coal-fired power projects in the Belt and Road markets. Building of coal-to-chemical plants abroad.
- 2000-2016:
 - 2/3 of power sector lending = coal projects.
 - China led the construction of 240 coal-fired power projects in 25 of the 65 Belt and Road countries, with a total installed capacity of 251 GW.
- **Pakistan:** China is financing and building large solar farm (100MW), and pursuing a \$1.2 billion investment for coal mining in the Thar Desert and the construction of 21 coal-fired power plants. Water contamination in Ghana, suspended Myitsone Chinese dam project on Myanmar's Irrawaddy River. New oil and gas pipelines cross Myanmar and coal-fired power plants are being built across Southeast Asia.

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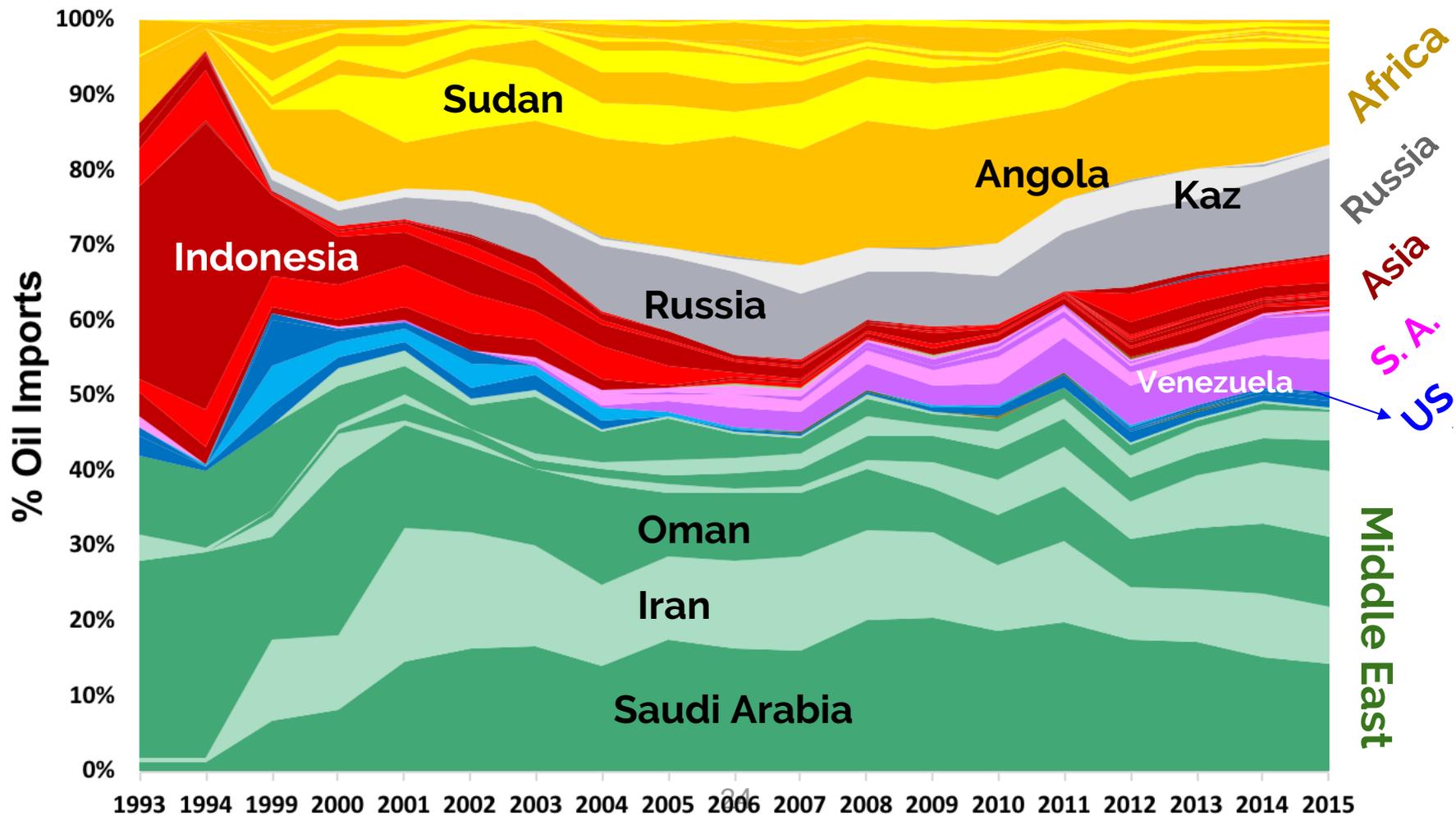
- **... but Political Opacity +  Role of Party in Market **
 - #1 Energy Market & #2 Economy

Focus on Supply Side Security (2017)

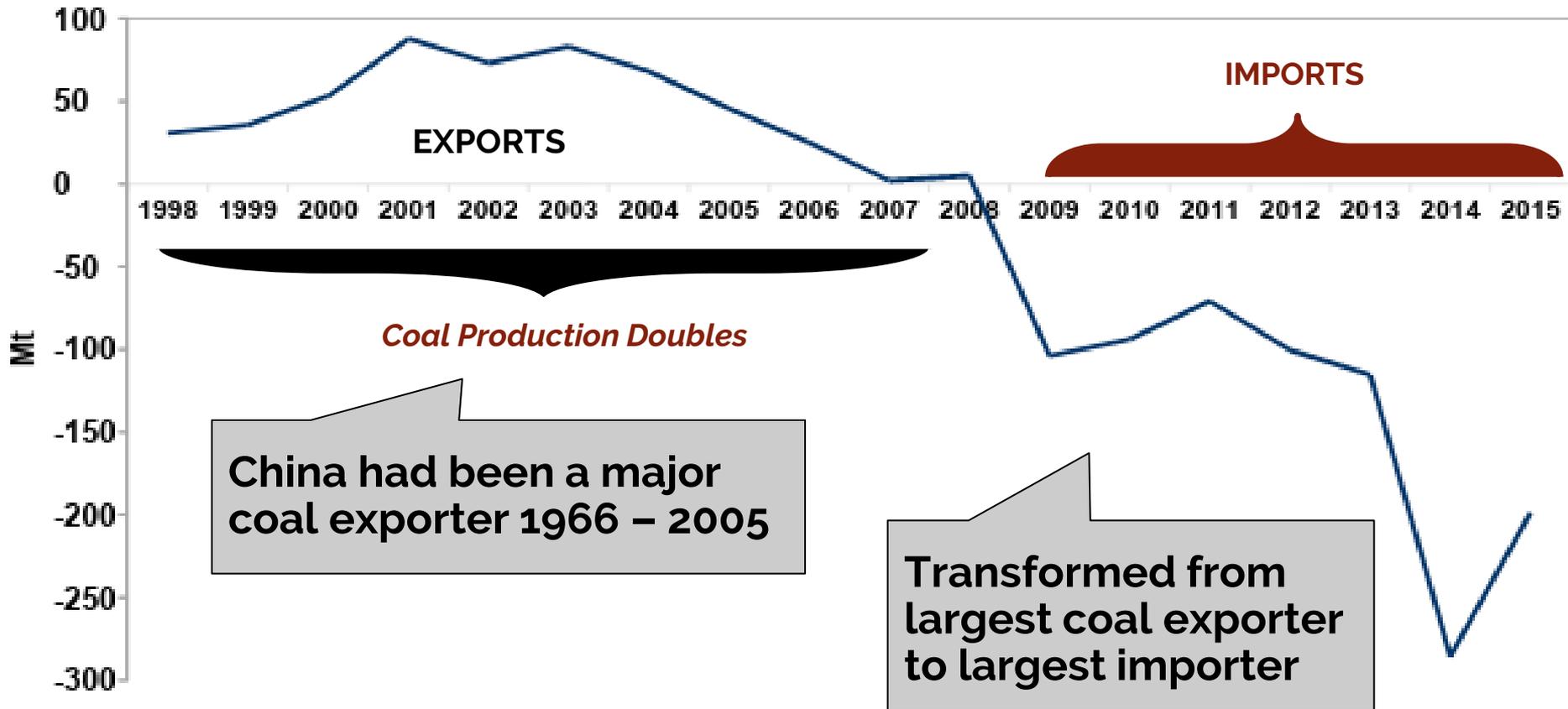
	U.S.	China
Coal Proved Reserves (% of World)	24.2%	13.4%
Coal R/P	357 Years	39 Years
Oil Proved Reserves (% of World)	2.9%	1.5%
Oil R/P	10.5 Years	18.3 Years
Gas Proved Reserves (% of World)	4.5%	2.8%
Gas R/P	11.9 Years	36.7 Years

Diversification of Crude Imports

- Asian Suppliers became African/Russian Suppliers
- Middle East Exposure Stable – Viewed as security success



Energy Trade Policy Shifts Can Pivot - Coal Case



★ 2009 Thermal Coal Imports = 10% of Global Trade

★ 2009 Met Coal Imports = 14% of Global Trade

...Gas Case



“

“Only five months ago the Chinese government took a decision to limit the use of coal and move to LNG. As a result of that, Chinese LNG import increased more than 50% and LNG prices doubled from \$6 to \$12 dollars in the Asia Pacific region.”

-- Fatih Birol, Exec Director of IEA

Energy Industrial Policy Can Also Change Rapidly → ...and *Against* Major Interest Groups

Coal/Power Industry

August 2017

- **Shenhua Group merged into China Guodian to create world's largest power generator by installed capacity - 225 GW - China Energy Investment Corp (CEIC).**
- **World's Largest Wind Developer**
- **326,000 employees (4x US coal industry)**
- **Shenhua was 90% coal power, Guodian is ~24% renewables**
- **More to come? Huaneng discussing with SPIC**

Partial Logic:

- **Shifting Incentives of Shenhua (Coal Major)**

Energy Industrial Policy Can Also Change Rapidly

→ ...and *Against* Major Interest Groups

Solar Industry

June 1, 2018 - NDRC, MoF, NEA:

- New Project Allocation Quota halted**
- Tariffs lowered by 0.05 RMB/kWh (6.7 - 9% depending on the region)**

Partial Logic:

- Subsidy Costs Mounting**
- Curtailment Rates**
- Potentially Countering US Trade Tariff Effects**

→ *Current Discussions Related to Wind....*

Future Implications - Economic



1. Will China become a Market Maker while Strengthening Role of Party?

– New Benchmarks

- > New investment index products and benchmarks: S&P New China Sectors Index highlights Chinese companies in emerging sectors such as clean energy and healthcare
- > RMB-denominated oil futures trading on Shanghai International Energy Exchange
- > Whither the Brent crude in London or West Texas Intermediate in NYC?

– Role of International Capital

- > Will foreigners buy in? They really haven't yet in China's stock and bond markets, which are large and have longer history
- > Risk: Occasional market interventions + capital controls. Shock devaluation in 2015, etc.

Future Implications - Political



2. Will Energy be one of the few bright spots in US-China Relations?

- Trade

- > US LNG Exports NOT included in tariff list
- > US shale gas and shale oil exports improve US trade deficits
- > US leading areas of complementary technology: Soil Remediation, Mercury Removal, Industrial Wastewater Treatment

- Investment:

- > US VC strong upstream in energy technologies, yet US energy demand stagnating

Climate:

- > While US acts at state-level, China provided opportunity at central govt level to contribute to the global commons