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WARWICK BUSINESS SCHOOL
THE UNIVERSITY OF WARWICK

For the Game Changers

Professor David Elmes

IGov: Innovation and governance of
the power sector to enable a high
penetration of electric vehicles

Chatham House, 12th June 2018

EVs as part of China's Digital Economy

Aims for this presentation

- View the market for high EV penetration by looking beyond its power sector implications
- Consider electrification as only one of the forces transforming automotive in particular and transport in general
- Take a specific look at electrification of transport in China
 - Summarise the pollution drivers we probably all know well...
 - ... discuss transport's role in China's Digital Economy which may be less familiar
 - discuss how China's power sector may view their role and how that might be very different to Western companies



Global EV Outlook 2018

Towards cross-modal electrification



- Sales of new electric cars worldwide surpassed 1 million units in 2017 – a record volume. This represents a growth in new electric car sales of 54% compared with 2016 and increases electric car stock to 3 million units.
- More than half of global sales of electric cars were in China where electric cars had a market share of 2.2%.
- Electrification of other transport modes is also developing quickly. Sales of electric buses were about 100,000 and sales of two-wheelers are estimated at 30 million; for both, the vast majority was in China.
- Nearly a third of global electric vehicle sales are in just 14 electric vehicle capitals & three are in China (ICCT, 2017).

JLR STRATEGIC PRIORITIES -- ACES



AUTONOMOUS

- JLR vehicles currently include level 2 features
- Investing in driver assistance technology to support increasing degrees of automation



CONNECTED

- Investment in technology & infrastructure to support higher levels of connectivity
- Cloudcar - \$15m equity investment



ELECTRIC

- I-PACE Battery Electric Vehicle on sale 2018
- Plug-in hybrids starting in 2018



SHARED

- InMotion Ventures invests in the future of transport and mobility
- Lyft investment - \$25m with opportunities to collaborate

China's targets and objectives for EV deployment from the IEA's GEVO 2018

China



- 5 million EVs by 2020, including 4.6 million PLDVs, 0.2 million buses and 0.2 million trucks.
- New energy vehicle (NEV)² mandate: 12% NEV credit sales of passenger cars by 2020.³
- NEV sales share: 7-10% by 2020, 15-20% by 2025 and 40-50% by 2030.

State Council (2012), EVI (2016b) MIIT (2017)

Marklines (2017b)

- NEV sales in China are primarily of domestic vehicles
 - Of the 605 500 NEVs delivered in 2017, 24 800 were imports.
 - Leading Chinese OEMs: BAIC, Zhidou, BYD, Chery, JAC, Geely, SAIC, Zoyte,



SAIC brings NEVs to energy-saving exhibition

October 18, 2017

SAIC Motor Corporation Limited brought **seven** vehicle models to the 5th China International Energy-saving and New Energy Vehicles Exhibition & Energy-saving and New Energy Vehicles Achievement Exhibition held in Beijing on Oct 18.

The exhibited vehicle models were the pure electric internet SUV Roewe ERX5, the plug-in hybrid internet sedan Roewe ei6, the plug-in hybrid internet administrative Roewe e950, the fuel cell light bus Maxus FCV80, the electric light bus EV80, the internet sedan Roewe i6, and the internet SUV MG ZS.



The NEV targets are speeding up industry consolidation

Bloomberg



Hyperdrive

Shakeup Looms for China's Electric-Vehicle Makers

Bloomberg News

March 19, 2018, 9:00 PM GMT

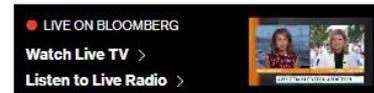
- ▶ Deal spree tops \$29 billion as China pushes for more NEVs
- ▶ Future mergers expected to include biggest state-owned makers

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China's breakneck push to lead the world in electric-vehicle adoption may cause collateral damage among the legion of domestic carmakers deemed superfluous to that mission.

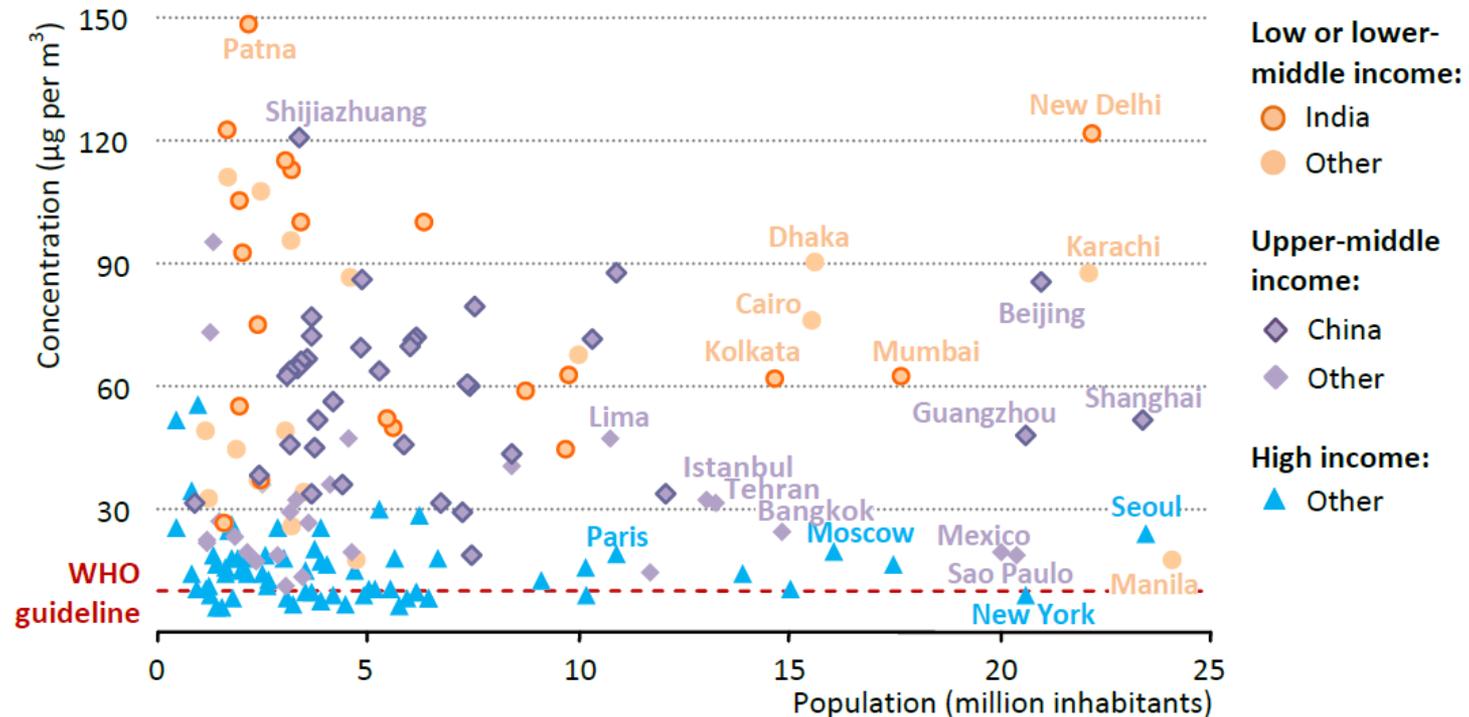


TesoroPúblico
To Spain, the future

Where is this and why am I showing you this picture?



Average annual outdoor PM2.5 concentrations in selected urban areas



Source: OECD/IEA (2016) Energy & Air Pollution WEO Special Report



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PREMIER LI KEQIANG AND INTERNET PLUS

Internet Plus became one of the top ten phrases in China in 2015, according to a leading Chinese language magazine. This is mostly due to Premier Li Keqiang, who first proposed developing the "Internet Plus" action plan in a government work report. Over the year, the plan played an important role in encouraging the development of e-commerce, industrial networks, and Internet banking.



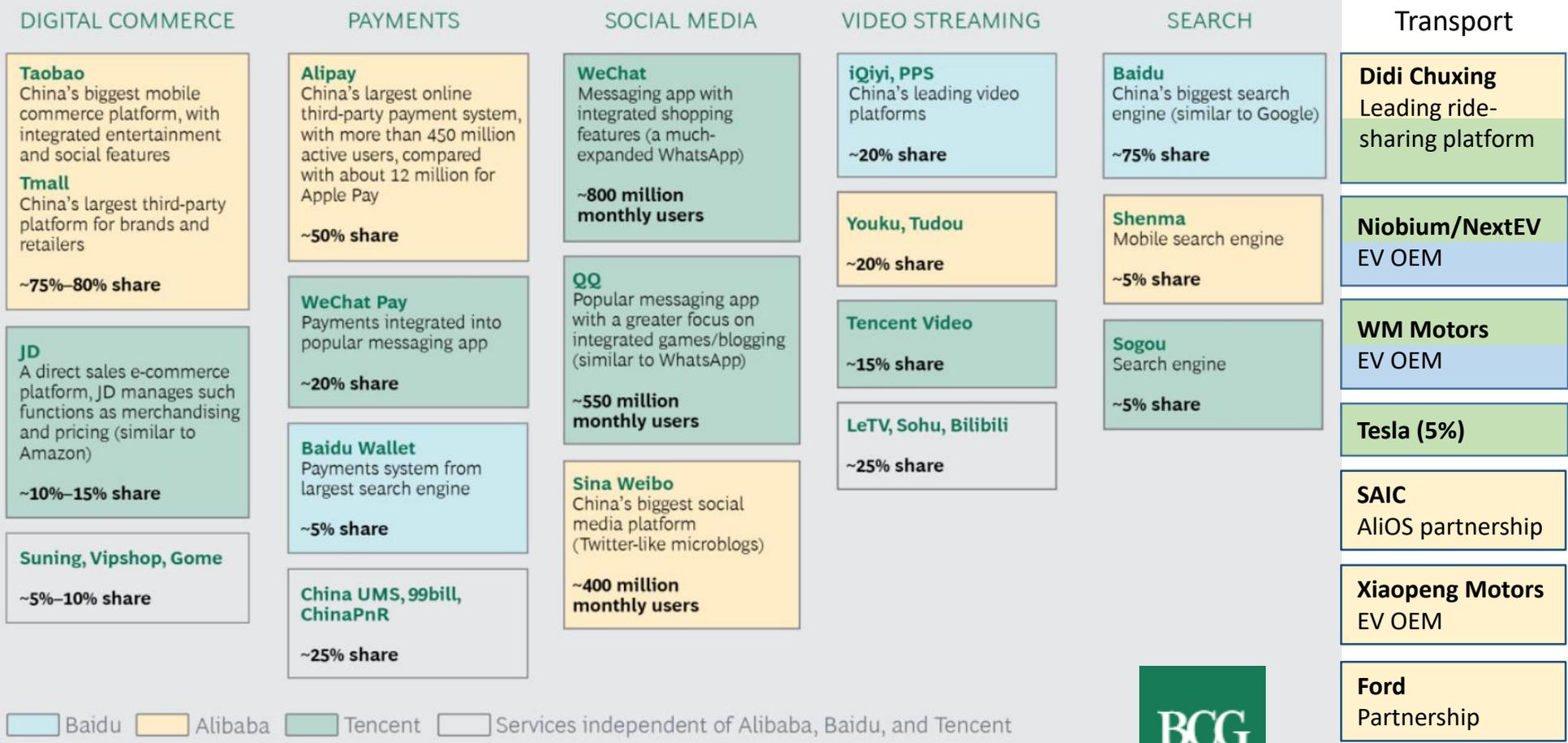
Premier Li Keqiang and Internet Plus

From Internet Plus to China's Digital Economy – an example from Alibaba



<https://www.youtube.com/watch?v=fap3NA7mfGg>

EXHIBIT 3 | China's Digital Ecosystem Is Highly Integrated



Baidu
 Alibaba
 Tencent
 Services independent of Alibaba, Baidu, and Tencent

Source: BCG analysis.
Note: Other social media and search sites were omitted because of their relatively small market share.

So how are China's power sector responding to the electrification of transport?

- From the 13th Five Year Plan (2016-2020)...

Ch 30: Build a Modern Energy System; Section 3 Smart Energy Systems...

We will accelerate smart development across the entire energy sector and all areas of its operation in order to make energy development more sustainable and adaptable. We will adapt to the development of distributed energy and the diversified demands of users, improve demand-side management of electric power, speed up the development of smart power grids, and make power grids and the power generation and demand sides more mutually responsive. We will promote significant integration of new technologies between the energy sector and other sectors such as information technology; coordinate the development of energy infrastructure and communications, transportation, and other infrastructure; and build an energy internet that enables the coordinated development, integration, and complementarity of power generation, transmission, loading, and storage.

Other factors guiding China's power sector response to the electrification of transport

- State Council No.9 Document, March 2015
 - Power Market Reform: “a major transition from a state managed system to a market price based one”
- 13th FYP Ch13: Improve the Modern Market System
 - Reform of Pricing Mechanisms
- 13th FYP Ch23: Strategic Emerging industries
 - Energy storage and distributed energy
 - New-energy vehicles
- 13th FYP Ch26: Develop Modern Internet Industries
 - Integration of the Internet into Multiple Fields
- 13th FYP Ch29: Develop Better Modern Comprehensive Transportation Systems
 - Low-Carbon, Smart, and Safe Transportation Services
- 13th FYP Ch43: Promote Economical and Intensive Resource Use
 - Energy Conservation
- 13th FYP Ch44: Step Up Comprehensive Environmental Governance
 - Pollution Prevention and Control Action Plan
 - Emissions Standards Compliance and Aggregate Emissions Reduction

Reforming the Chinese Electricity Supply Sector: Lessons from International Experience

EPRG Working Paper 1704

Cambridge Working Paper in Economics 1713

Michael G. Pollitt, Chung-Han Yang, Hao Chen

June 2018: ISSUE 114

Electricity Transformation



“Successful power market reform” – well this is what the West says!

Based on Joskow (2008) adapted by Pollitt and Anaya (2016)

Market structure	Market design	Economic regulation	Climate	Transition mechanisms
<ul style="list-style-type: none">• Unbundling• Sufficient number of competitors• ISOs• Privatisation of monopolies	<ul style="list-style-type: none">• Spot and ancillary services markets• DSR• Regulated system access	<ul style="list-style-type: none">• Charging arrangements• Competitive wholesale procurement• Independent agencies	<ul style="list-style-type: none">• Competitive procurement• Cost-reflective access• Pricing externalities	

But what does power market reform “with Chinese characteristics” look like?

Is China's power sector debating the electrification of transport or just getting on with it?

- Facing the prospect of “Market Reform”
 - But still able to marshal and coordinate the resources of a vertically integrated monopoly
- Clear government direction on...
 - Energy storage and distributed energy as a Strategic Emerging Industry
 - New-energy vehicles as a Strategic Emerging Industry
 - Energy Conservation
 - Pollution Prevention
 - Emissions Standards
 - Energy's role in Internet+
 -



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State Grid Completed Company Restructure on Time
Finishing the Transition from an Industrial Enterprise Owned by the Whole People to an
Enterprise Wholly Owned by the State

Released on:2017-12-07 72 hits

Points for discussion

- Predicting the ACES future for automotive is virtually impossible at the moment
 - Ownership vs shared/services has a significant impact on charging needs and locations
- Electrification of transport in China is a Government objective
 - Reduce pollution, reduce urban congestion, reduce hydrocarbon imports...
 - Create a world class, next generation auto industry
 - A chance for their vertically integrated monopolies in power to show their worth?
- Electrified transport is becoming a core part of China's Digital Economy
 - Which is led by the Tech giants, also with government support