GOVERNMENT OF INDIA
MINISTRY OF HOUSING AND URBAN AFFAIRS

Implementation Challenges of E-buses - Shenzhen Case

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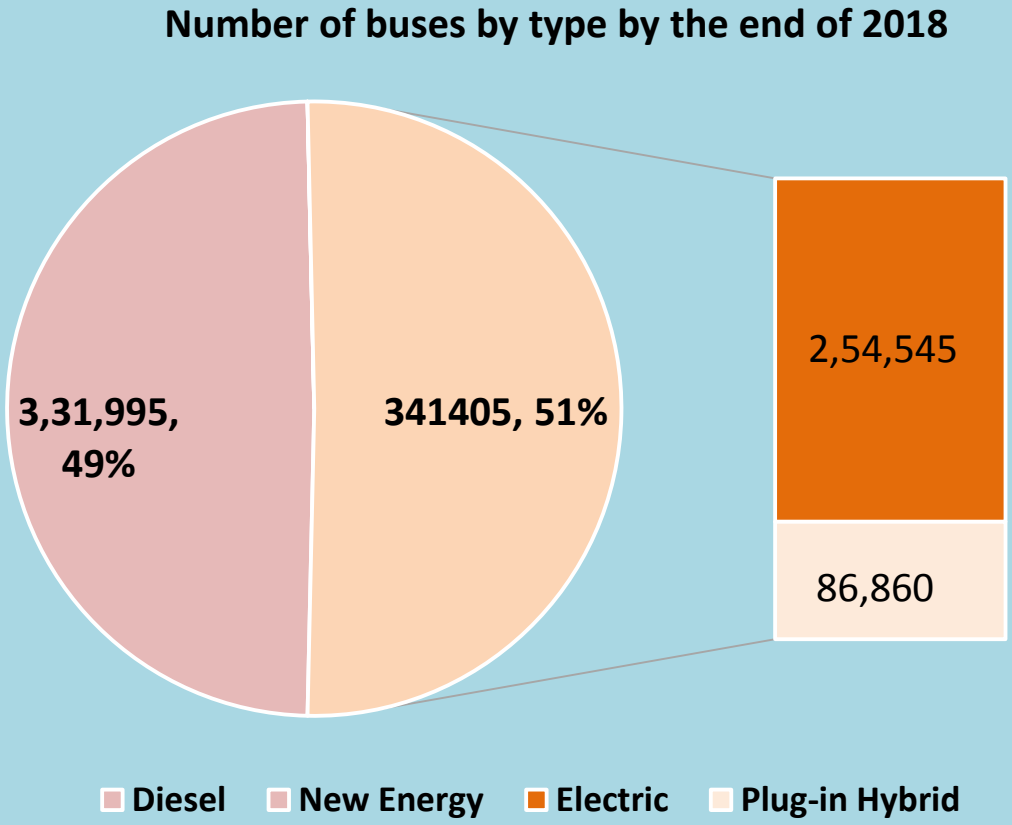
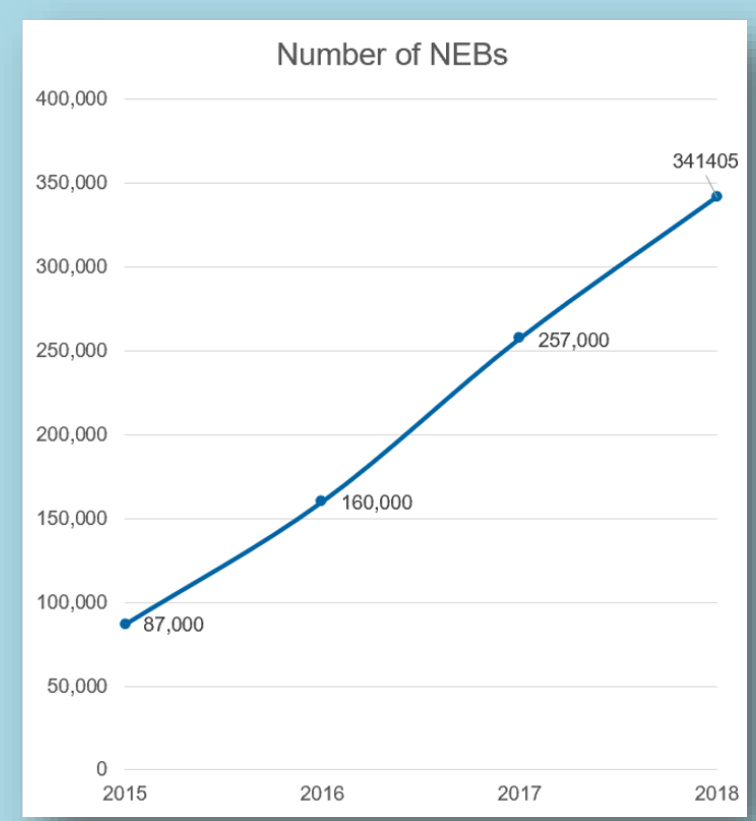
Data on E-bus deployment in China

- More than 250,000 Electric Buses in China by the end of 2018





Shenzhen Bus Group and its electrification

- Shenzhen achieved 100% e-bus fleet by the end of 2017, with total 16759 e-buses;
- Shenzhen Bus Group: about 1/3: about 5900 e-buses by the end of 2017;
- Pilot: 2011:125 e-buses procured;
  2013: 180 e-buses procured;
- Roll-out: 2015-2017: about 5530 e-buses procured;
- Brands: BYD(79%); NJL(17%); WZL(4%)
- WB and SBG are working together for a case study on SBG's e-bus experience

Challenge 1: new technology and its maturity

- Pilot and trial: understanding the key issues and challenges through piloting;
- Communication with the industry and follow with the latest e-bus technology;
- Closely follow the government policy signals;
- Chose good products

Slow-charging; large capacity and long run

Fast charging; small capacity and charge at terminals

- **Almost can fully replace the diesel fleet**
- **Easier fleet arrangement;**
- **Less charging dependency at the beginning;**
- **More purchase subsidies;**

BYD: K8
Length: 10.5m
Distance: 250km
Weight: 12.2ton

Challenge 2: high price of e-bus

- Take advantage of subsidies from national level and local level;
  - BYD; 10.5m; 250km; 1,580,000RMB in 2016
  - After purchase subsidies: 580,000RMB; comparable to diesel bus (400,000-500,000RMB)
  - Operation subsidies – 80,000RMB per year
- 'Purchase + financing lease + buy-back' deal
  - Require the bidders (manufacturers) to look for better mortgage deal;
  - Require the bidders to buy-back the diesel buses;
- Savings on fuel costs and maintenance costs
  - Fuel cost: 40L diesel/100km: 204RMB

    100kwh/100km: 100RMB

    One year savings per ebus on fuel cost: 98,000RMB
  - 8-year Warranty on key parts – especially on battery, electric engine and control: less maintenance costs

Challenge 2: high price of e-bus (cont.)

TCO Comparison (8 years)

(k RMB)	Diesel	EB - 2016	EB -2019	EB - after 2020
Bus Price	508	1,580	1,000	850
Purchase Subsidy	0	-1,000	-180	0
Energy	937	480	480	480
Maintenance	391	304	304	304
Opeartion Subsidy	-30	-640	-640	0
TCO present value	**1,806**	**724**	**964**	**1,634**

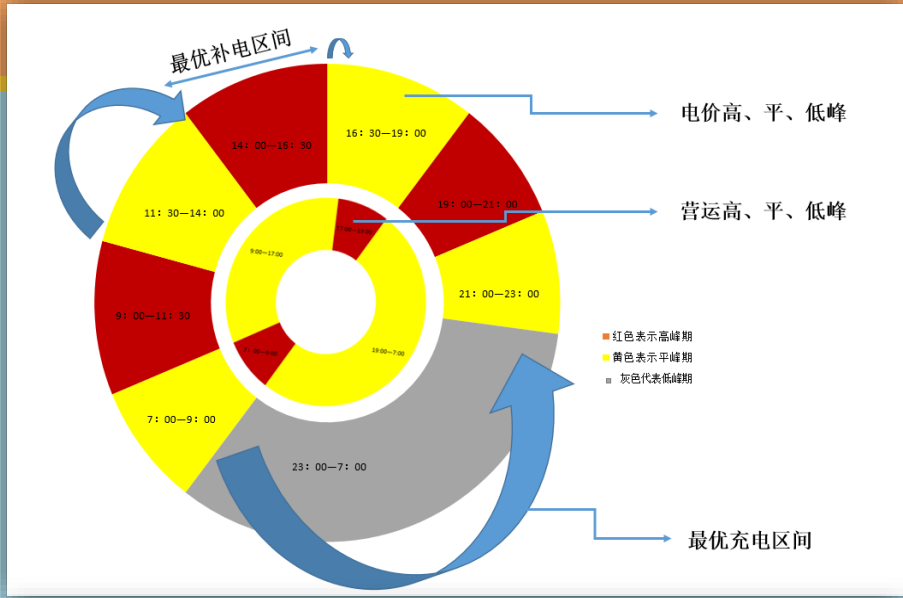
Challenge 3: Charging facility

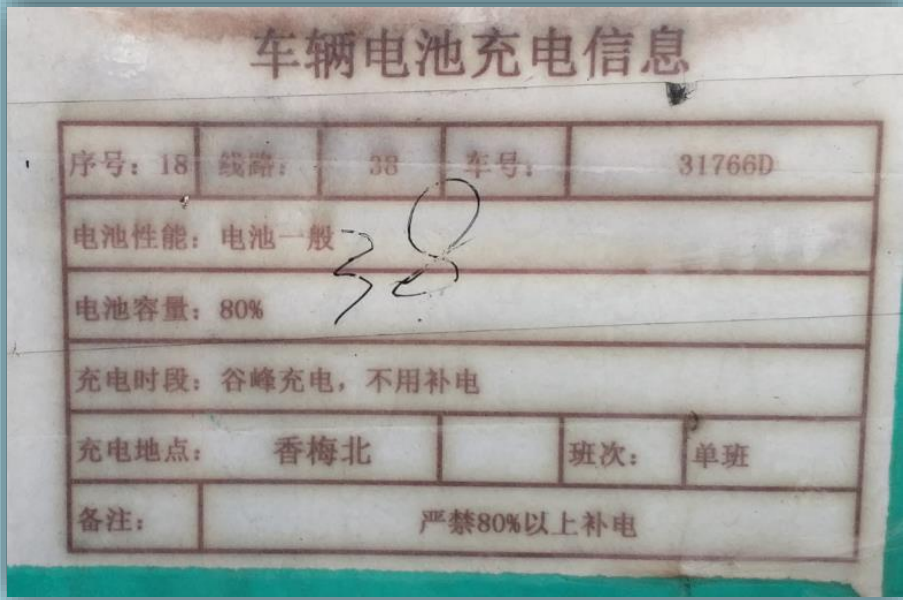
- Collaborate with charging service provider
  - SBG no need to invest on charging infrastructure;
  - Charging service provider could liaise with the Grid and government regarding any grid capacity issue;
  - SBG (bus operator) pays charging service fee;
  - One key challenge is the land: Some charging service provider has the resources of land

Install at the key terminals with several bus lines → **Give priority to terminals with longer-distance bus lines** → **Land from Charging service provider: optimize bus lines**

Challenge 4: Operation

- Preparation before operation:
  - Training for drivers
  - Training for maintenance staff: a) trained by manufacturers; b) trained by bus company;
- Optimization of bus lines considering the characteristics of e-bus
- Charging arrangement:
  - All e-buses receiving full-charging at night (23:00 – 7:00)
  - In most cases, the e-buses of morning shift and afternoon shift can run for the whole shift;
  - One-day shift e-buses would need a quick charge during the day time;
  - Clear guidance to drivers regarding when&where to charge for each bus;





Environment Benefits

- Initial findings from the GHG emission from diesel and electricity

Type of Bus	Fuel consumption/100km	CO_2 (kg/100km) In Shenzhen	CO_2 (kg/100km) In Beijing
Diesel Bus	40 L	105.40	105.40
Electric Bus	100 kWh	58.74	72.63

- The team is working on emissions for the whole cycle of e-bus
  - Battery production carbon emission is a major part;

Key factor: strong support from government

- How the central/local governments look at the public transport?
  - Semi-Public Service;
  - Effective/efficient way to mitigate congestion, pollution and GHG;
  - Image of a nice city;
- Other measures/policies from local government:
  - Travel Demand Management (TDM)
  - Plate rotation
  - Car purchase quota
  - Low-emission zone

Thank you!