China and US are world’s two largest EV markets
Our study: *EV Charging in China and the United States*
Anders Hove and David Sandalow, Columbia CGEP (Feb 2019)

More than 50 interviews

- United States: 27
- China: 25

Chinese and English literature
EV charging in China

At least 800,000 charging posts at year-end 2018

- 330,000 public chargers and 480,000 home chargers, per EVCIPA
- Actual figures may be higher
- Growing highway network
- “Fly-line” charging in some cities
EV charging in the United States

At least 500,000 charging posts at year-end 2018

- Most home chargers
- 67,500 non-residential chargers at over 24,000 stations, per US DOE
- Growing highway network

Source: Department of Energy 2019
Little overlap between charging networks providers in China and the US
Some Chinese charging providers have offices in the US.
Some overlap among other stakeholders

Top 5 EV Manufacturers in China
- BYD
- BAIC GROUP
- ZD
- BAIC MOTOR
- CHERY

Top 5 EV Manufacturers in US
- Tesla
- Nissan
- GM
- Ford
- Toyota

Utilities

Sources:  
http://evadoption.com/ev-sales/  
https://asia.nikkei.com/Features/FT-Confidential-Research/Foreign-electric-cars-favored-in-China-but-shakeout-looms
EV charging policy in China

*Chinese central government promotes EV charging as a matter of national policy*

- sets targets
- provides funding (via state-owned grid companies)
- mandates charging standards

*Many provincial and local governments also support EV charging*

- license plates
- financial incentives
- requirements with respect to new building construction
EV charging policy in the United States

**US federal government plays a minor role**

- 30% tax credit up to $1000 expired end of 2017
- Designation EV charging corridors on interstates (mostly signage; $4.5 billion loan guarantee authority never used)
- DOE voluntary workplace/municipal charging program

**State/local policies much more significant**

- Rebates, tax credits, tax exemptions, grants and loans

Source: Department of Energy 2019
EV charging technologies in China and US

*Broadly similar (overwhelmingly cords and plugs)*

-- China – one fast charging standard (China GB/T)
-- US – three fast charging standards (CHADeMO, CCS, Tesla)

-- Chargers cost less in China
In both countries, EV charging is a new, dynamic industry
In both countries, EV charging is a new, dynamic industry different than filling car with gasoline or diesel.

<table>
<thead>
<tr>
<th>Location</th>
<th>Duration</th>
<th>Cost</th>
<th>Role of utilities</th>
<th>Government</th>
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<tbody>
<tr>
<td>Most charging at home</td>
<td>Takes longer than filling a car with gasoline or diesel</td>
<td>Cheaper than filling a car with gasoline or diesel</td>
<td>More central</td>
<td>-- Decades of prior support for oil industry</td>
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<td></td>
<td>-- Recent support for EV charging</td>
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</table>
Numerous business models, with wide range of players

Independent Charging Networks
Utility Companies
Auto Manufacturers
Shopping malls and businesses

Fueling Stations
Sharing Economy
Mobile Charging Units
Commercial Parking Lots
Municipal Charging
Independent charging networks

China and the United States both have major independent charging networks

China:
- Largest two networks are Tgood and StarCharge, both with over 50,000 charging posts
- Interviews suggest concerns about profitability given regulated charging prices

United States:
- The largest networks are ChargePoint, EVgo, Blink and Greenlots

In both countries, independent charging networks operate chargers at public and private parking lots, malls, hotels and apartment complexes, as well as curbside on public streets.
Utility charging networks

Utilities are active in both China and the United States

China:
- State Grid and China Southern Grid both have chargers in major cities and along highway corridors
- Investments in grid upgrades and chargers made under social responsibility budget

United States:
- Utility investments in charging vary widely by state
- Motivations include boosting electricity sales and increasing returns on regulated assets
Auto manufacturer networks

Auto manufacturer charging networks relatively important in the United States

China:
- BYD and Tesla are the only large auto manufacturer networks in China, and rank far below State Grid and independent networks

United States:
- Tesla is a leading national fast charging network along highway corridors
- Nissan has partnered with independent networks Greenlots and EVgo.
- Electrify America, an outgrowth of the diesel-gate scandal, is at the early stages of building a nationwide charging network
China and US can learn from each other

US could learn from:

1. China’s long-range planning for EV infrastructure
2. China’s investment collecting and analyzing charging data

China could learn from:

1. US market-driven approaches to EV charging locations
2. US experience with demand response

Both countries could learn from the other with respect to EV business models
Average EV range less in China

- Sales-weighted average range:
  - EVs sold in China in 2018 – approximately 124 miles/200 km
  - EVs sold in US in 2018 – approximately 228 miles/400 km
- Difference due to dominance of Tesla and Bolt sales in US
- Implies a greater need for charging infrastructure in China

Source: InsideEVs and author calculations, 2019, adjusts NEDC range to United States EPA range in km