

# Electric Vehicle and Energy Storage Implications on Power System Flexibility in China

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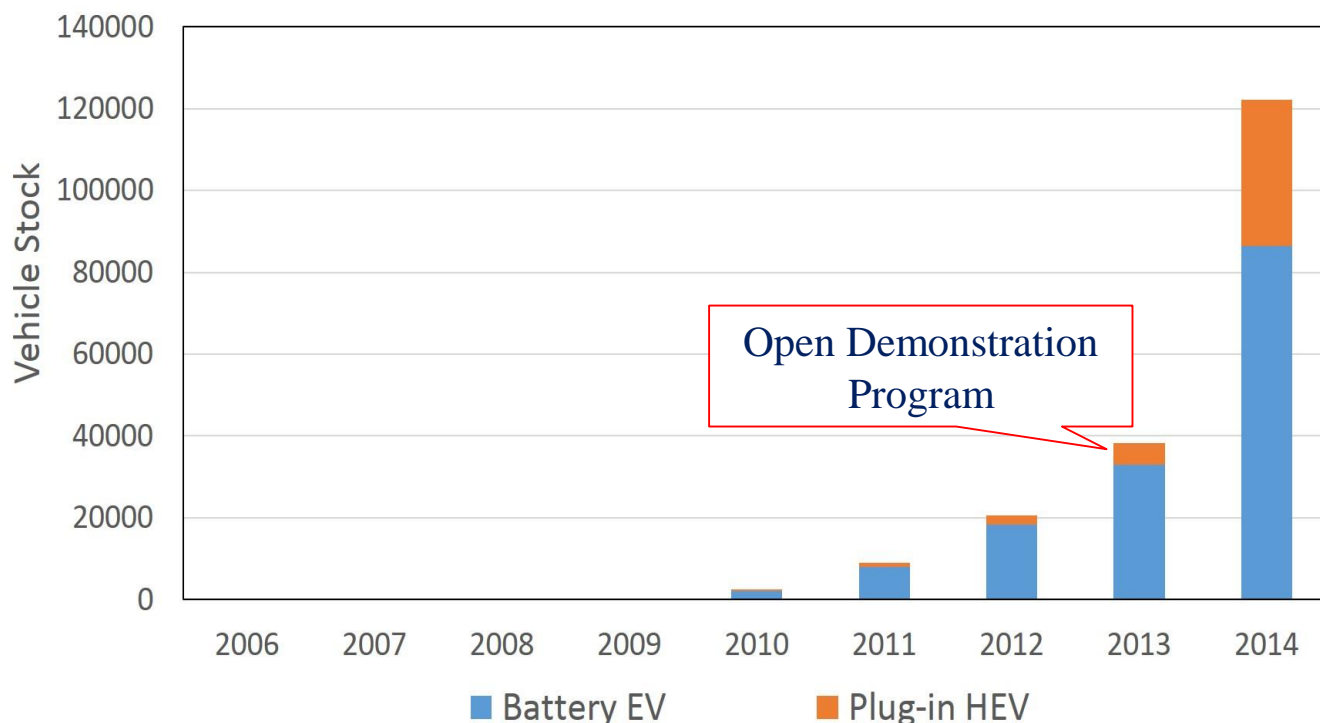
National Renewable Energy Center / Energy Research Institute  
National Development and Reform Commission



国家发展和改革委员会能源研究所

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# Electric Vehicle Growth in China 2009-2014



## Targets

- Total stock: 500,000 by 2015, 5 million by 2020.
- Passenger car fuel efficiency: 6.9 L/100Km, 5 L/100km.

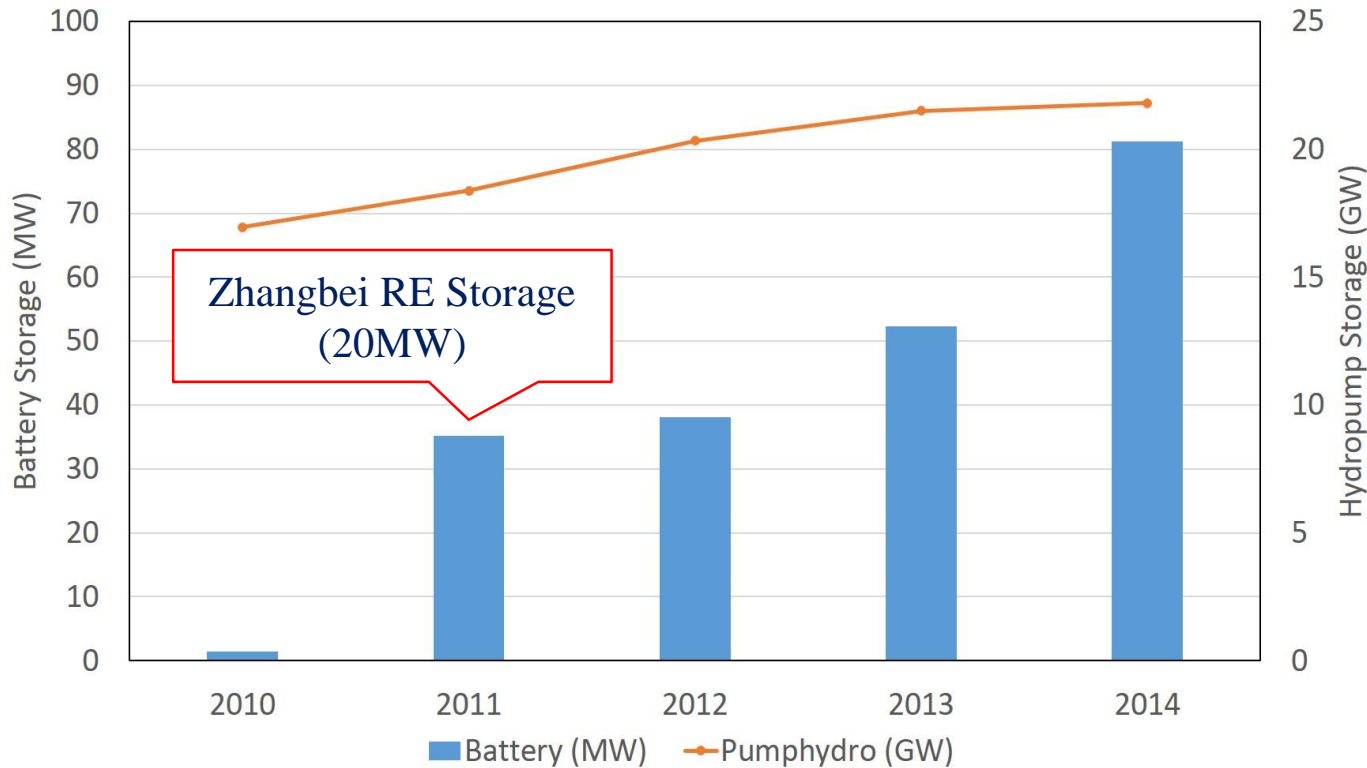
## Demonstrations

- 88 cities with 330,000 EVs.

## Subsidies:

- Passenger car: EV-USD 5650 to 9680; PHEV - USD 5650
- Bus: EV-USD 48390 to 80650; PHEV-USD 40320
- FCV passenger car: USD 32260 to 80650
- 2016-2020 draft subsidy plan - under publicity for comments

# Energy Storage Growth in China 2010-2014



## Targets:

- Hydropump 2020: 70 GW
- NEA investigating Energy Storage 13<sup>th</sup> Five Year Plan (2016-2020)

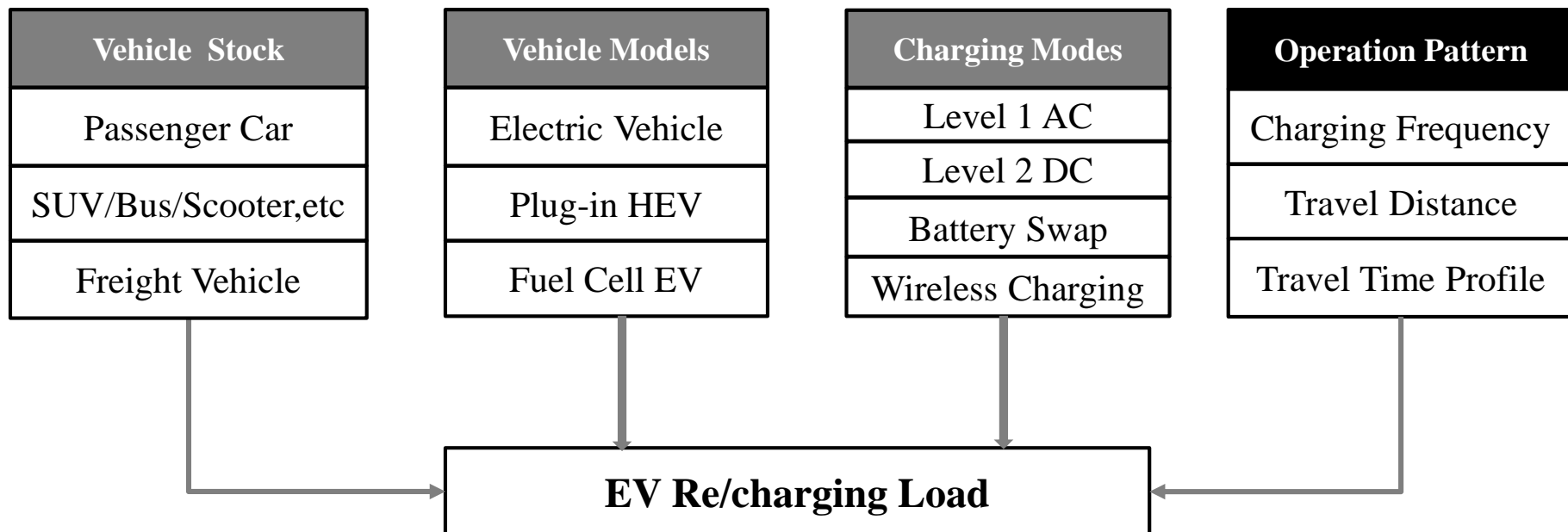
## Policies:

- Renewable energy polices
- Industry guideline catalogue

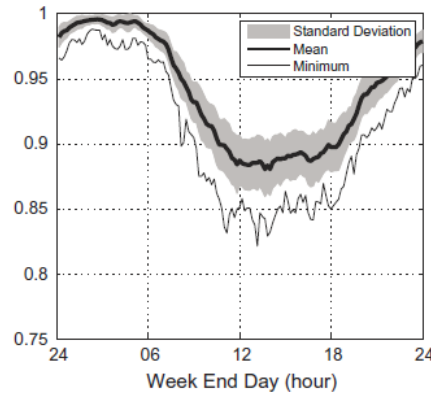
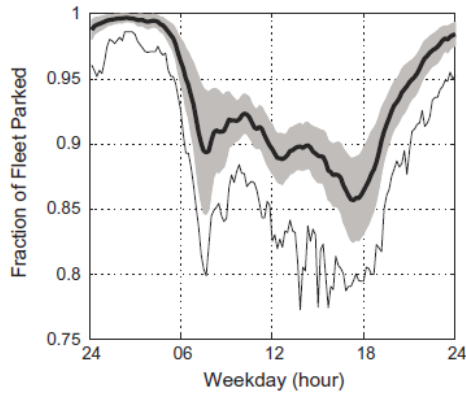
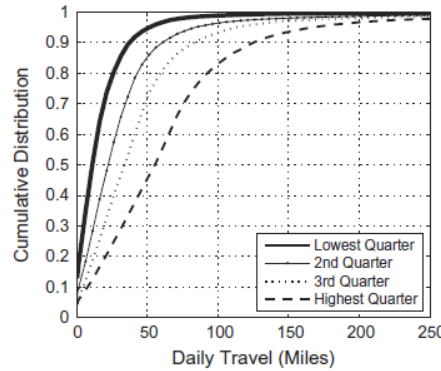
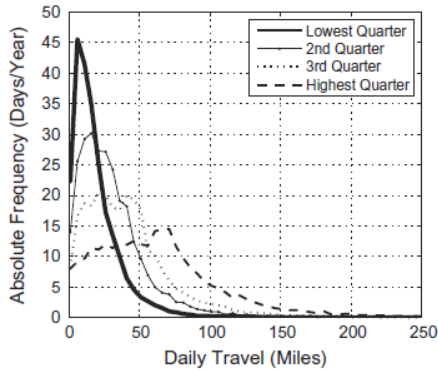
## Market:

- Hydropump power on-grid rates (two components)
- Peak-trough retail rates
- Ancillary services
- Demand response demonstrations

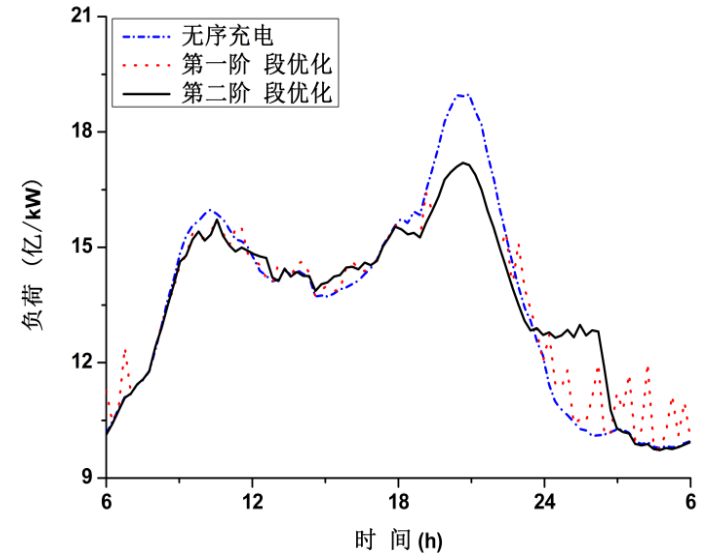
# EV re/charging



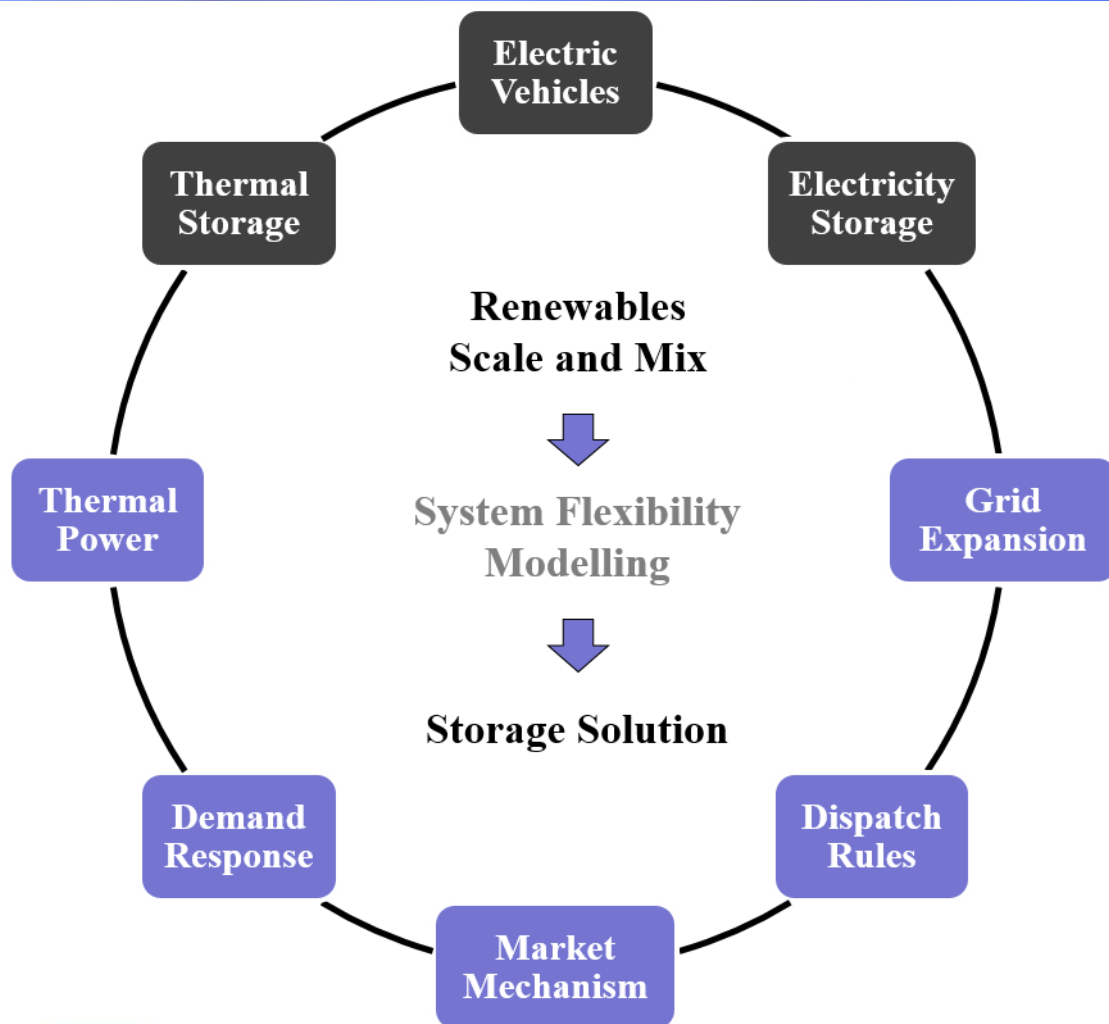
# Operation Pattern



## EV re/charging Load



# Flexibility Sources



## CNREC System Flexibility Study

### Optimization

1. Resources
2. Technical potential
3. Costs

### Discussions

1. Trade-offs
2. Complementarity
3. Flexibility solution

# Flexibility Roadmap



- Resource fully developed by 2030



- EV battery cost reduction: USD 250/kWh in 2020
- EV battery specific energy: 0.3 kWh/KG in 2020



- Before 2020: Mini-grids, PV storage, off-grid applications  
Renewable energy grid integration demonstration
- After 2020: Home-based storage  
Demand response

Load Shifting

Frequency Regulation