

# Battery Maker. Market entry for battery storage in China

Final report  
GPS UCSD  
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- This project was carried out for Battery Maker and aimed at analyzing market entry opportunities for battery storage in China. The project was a part of the capstone graduate course, “Real World Projects in Energy and the Environment”, undertaken by a team of graduate students from the UC San Diego School of Global Policy and Strategy. The contributors to the project are Nikolay Zudin, Cory Rogers, Shaoqian Zhang, Qiuyi Wang and Paul Hernandez-Minjarez.
- The team would like to thank David Victor, Jim Lambright, Eric Redman and Alicia Krueger for the invaluable guidance they provided, which helped to maximize the value of the analysis in the limited time available. The team would also like to express its gratitude to Michael Davidson, who provided unique insights on China’s electricity market and energy policy outlook. Finally, the team would like to thank our point-of-contact from Battery Maker, Andrew Klinkman, who provided useful feedback that helped to focus this analysis on the areas Battery Maker was most interested in.

- Project objective was to identify market entry opportunities for energy storage in China
  - The client was interested in (1) China's energy market overview; (2) segmentation and sizing of the target market segment;
  - After several meetings it was decided to keep the energy market overview and segmentation of the target market segment but give up market sizing and instead focus on defining target province for entry and on gathering provincial-level data.
- Given project objectives the analysis was split into 3 sections – (1) China's energy market overview (2) Energy storage market analysis; (3) Provincial analysis
  - China's energy market overview consisted of 3 arcs – (a) distilling energy fundamentals; (b) defining electricity market structure; (c) examining energy policy landscape
  - Energy storage market analysis consisted of 3 arcs – (a) applying energy fundamentals to energy storage, (b) examining energy storage market landscape; (c) defining the target market segment and use case
  - Provincial analysis consisted of 3 arcs – (a) running a trial spatial analysis; (2) designing the screening index of provinces; (3) identifying the target province
  - Project has 2 deliverables - (a) slide deck (b) excel file (provincial data, Province Screening Tool)

- Our findings suggest that power sector policy, though volatile, nonetheless tracks in a favorable direction for battery storage in China.
  - Energy priorities and electricity market reforms converge in the desire for ‘power system flexibility’, creating a favorable long-term outlook for FTM ancillary services and BTM arbitrage. However, policy volatility and the lack of policy coordination across provinces create a hierarchy of market entry opportunities.
- If Battery Maker decides to enter the battery storage market in China, it should focus on **C&I arbitrage** and consider **Guangdong, Jiangsu and/or Zhejiang provinces**.

- **Energy sector overview**
  - Energy storage market analysis
  - Provincial analysis

## KEY MESSAGES

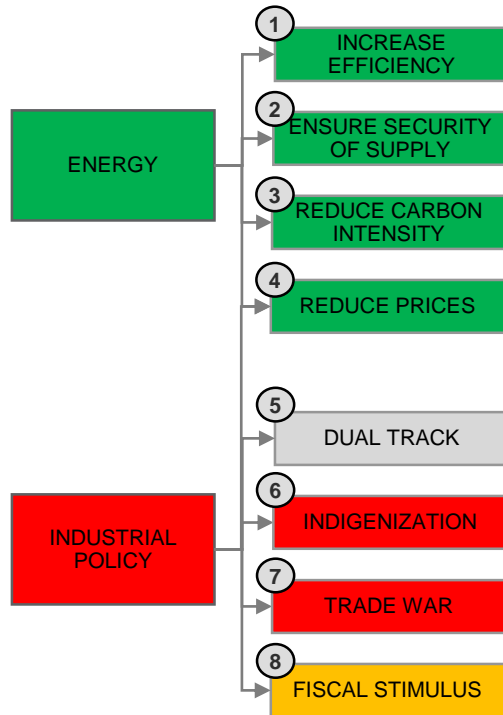
1. Favorable energy-policy priorities are constrained by protectionist industrial policies
2. Power relations between NDRC and grid companies create huge policy volatility
3. “Provincial pilots create a “loophole” opportunity for battery storage in a volatile policy environment



Entry potential is mixed – (1) favorable fundamentals tempered by negative investment environment; (2) rigid market structure with authority collision; (3) divergent policy incentives with “loopholes” in provinces

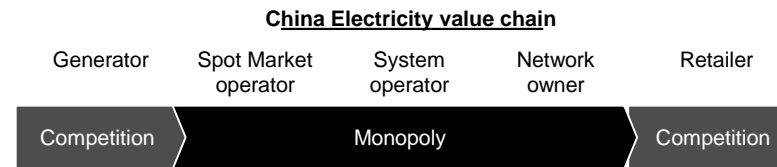
## Energy-related fundamentals

Favorable energy policy is constrained by protectionist industrial policy -> initial conditions for battery storage positive

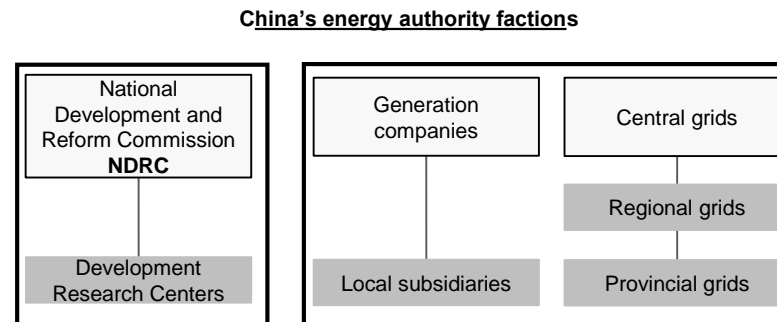


## Electricity market structure

China's unique “generation-grid” electricity value chain creates upward pressure on pricing and problems with reliability + powerful “grid” interests opposed to market reforms

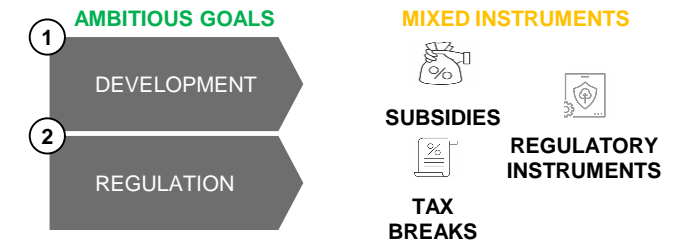


Internal conflict between NDRC and SASAC factions + unique relations between provinces and the center imply large uncertainty around electricity price regulation



## Energy policy landscape

Policy goals suggest support the development of the energy storage but changing policies create uncertainties about its profitability



“Provincial pilots” imply “loophole” opportunities for energy storage in a rigid policy environment

