The State of the Global Race for Batteries: United States

David M. Hart
Senior Fellow, ITIF

November 7, 2018

Join the Conversation: #ITIFEnergy

@ProfDavidHart
Contents

1 U.S. Battery Demand for Grid Storage and Electric Vehicles

2 U.S. Li-ion Battery Production Capacity

3 U.S. Battery Policy and Strategy
U.S. Energy-Related CO₂ Emissions by Sector

Figure 4: Energy-related CO₂ emissions by sector

Source: EIA and Rhodium US Climate Service
U.S. Grid-Connected Storage Installations through 2016

Source: EIA, May 2018
U.S. Grid-Connected Storage Deployment Forecast through 2023

Source: GTM Research/Energy Storage Assn., Sept 2018
U.S. Plug-In Car Sales

Source: Inside EVs, October 2018
Projected All-Electric Vehicle Sales in North America, 2015-2030

Source: Bank of America, Merrill Lynch, 2017
Contents

1 U.S. Battery Demand for Grid Storage and Electric Vehicles
2 U.S. Li-ion Battery Production Capacity
3 U.S. Battery Policy and Strategy
U.S. Li-ion Battery Production Capacity in Context

Source: International Energy Agency, Nov. 2018
EV and Battery Pack Trade: Cumulative, 2010-2017

Electric vehicles: US a slight net importer

Battery packs: US a heavy net importer

Source: International Council for Clean Transportation, May 2018
N. American Li-ion Battery Production Capacity Projection

Source: Benchmark Mineral Intelligence, July 2018
U.S. Li-ion Battery Production Capacity Projection

A Global Battery Arms Race | Planned Lithium ion megafactory capacity by 2028

Capacity 2017: 145 GWh
Capacity 2028: 45 Megafactories @ 1048.5 GWh

Source: Benchmark Mineral Intelligence, Sept 2018
Tesla’s Giga-Factory: Ahead of Schedule

Source: Clean Technica, Oct 2018
Tesla Sales Take Off

Source: EV Volumes, current
Beyond Tesla: Not Much, Yet

Above: LG Chem, Holland, MI
Upper right: Nissan AESC, Smyrna, TN
Lower right: Magnis Resources, Endicott, NY (planned location)

Sources: Holland Sentinel, Magnis Resources, Greentech Media
Contents

1 U.S. Battery Demand for Grid Storage and Electric Vehicles
2 U.S. Li-ion Battery Production Capacity
3 U.S. Battery Policy and Strategy
Obama Surge…

- **ARRA**: $1.5 billion in cost-shared grants across battery supply chain
  - Approx. $1 billion to Li-ion battery factories (including Holland, MI)

- **LPO**: $8.5 billion in loan guarantees to EV manufacturers
  - Including Tesla, Nissan, and Ford

- **Significant increases in battery R&D**
  - Including EERE VTO & OE ES, ARPA-E, and JCESR
…Reverts to Business as Usual

- States go “buffalo hunting”
  - Michigan
  - New York
  - Nevada
  - Etc.

Source: Reno Gazette Journal, Sept 2014
Factors Determining Battery Production Location

- Supply chain (costs, reliability, etc.)
- Production know-how
- OEM vertical integration
- Shipping costs
- Policy, domestic and international (subsidies, incentives, tariffs, etc.)

![Global Flows of Lithium-Ion Cells in 2014](source: NREL CEMAC. 2017)
Federal Policy Priorities

- EV and grid storage market development
- R&D investment (including manufacturing)
- Lab-to-market technology transfer
- International technology transfer
- Scale-up capital for new entrants
- Fair trade
- State incentive “race to the bottom”

EXHIBIT 3 | Factory-of-the-Future Concepts Are Essential to Reducing Costs

Battery Cost Reduction Opportunities
Source: BCG, Sept. 2018

Source: BCG analysis.
Thank You!

David M. Hart, Senior Fellow | dhart@itif.org | @ProfDavidHart