

NECCES Sierra Club: Battery-NY and NENY – January 2023

Innovation, Manufacturing, Workforce Development: Why Batteries? Why New York? Why Now?



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Nobel Committee: “They have laid the **foundation** of a wireless, **fossil fuel-free society**, and are of the greatest benefit to humankind.”  
**Now, we need action!**

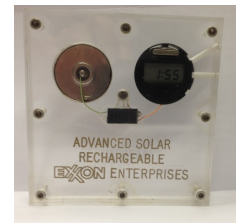
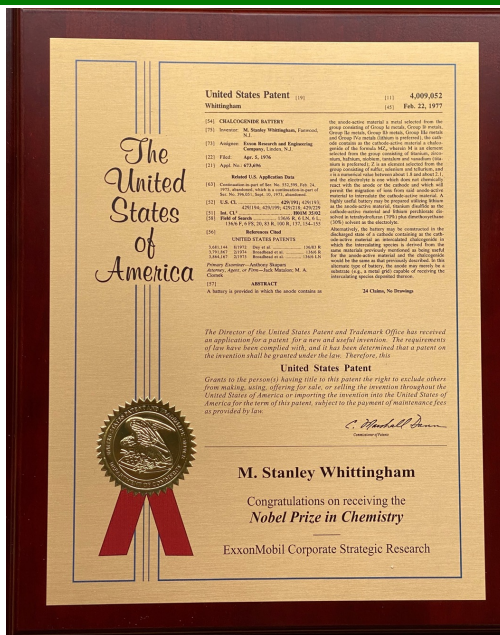
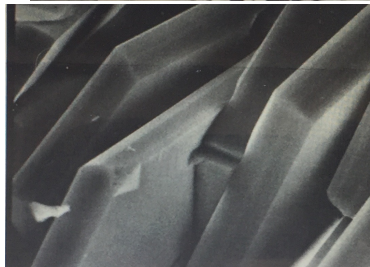
Climate Change leads to Global Messing-up/Humanity Disruption



# Climate Change leads to Global Messing-up/Humanity Disruption

- **Humanity has undergone two disruptions in the last 30 years**
  - Communications revolution, enabled by the lithium battery
  - Covid, showed challenges of global supply chains, but fast vaccines
- **Now Humanity will have to adapt to climate change, but we can control**
- **Humanity will have to do with much less fossil fuels**
  - Cleaner cheaper renewable **electrical energy** will be the future (electric century)
    - No coal power plants in New York today
      - AES Lithium Battery storage closed coal power plant in Westover
    - Solar and wind will dominate (+ hydro), but they are intermittent
      - So storage of the energy is critical
      - **Lithium batteries are the dominant form of portable storage**

# Many thanks are due to Esso for initiating Li rechargeable 50 Years 1972-2022



46 years old - still working



EV Show Chicago, 1977

## Where we are now in transportation



Bermuda 2019



Peterbilt Electric trucks 2019



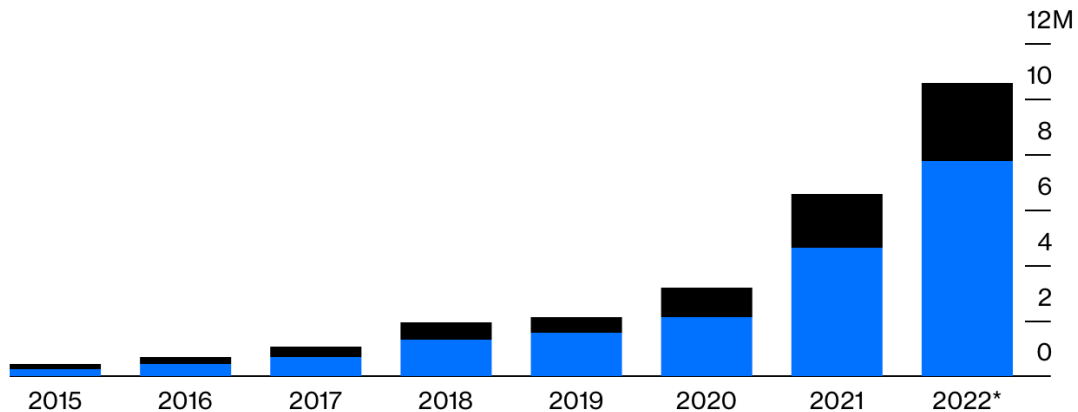
London buses 2022



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## Electric vehicle sales growing exponentially

■ Battery electric ■ Plug-in hybrid



Source: BloombergNEF

Note: Sales of passenger electric vehicles by drivetrain. Data for 2022 are forecasts.

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## The Astronauts on the Space Station – Li-ion Batteries-2019



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## Why Batteries dominate new Electric Energy Storage

- **Pumped Hydro** (potential to electrical energy)
  - ✓ By far the largest by storage, gigawatt-hours
  - ✓ Highly efficient, 73%
  - ✓ Limited new sites
- **Batteries** (chemical to electrical energy)
  - ✓ By far the most flexible and common
    - ✓ Portable and stationary
    - ✓ Milli Watts to Mega watts
    - ✓ Very fast switch on and off



**Blenheim-Gilboa**  
 > 1GW  
 < 2 min s/u  
 (From NYPA)

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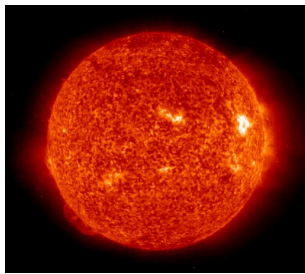
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## Where we are now in grid energy storage

- **Renewable lower cost than new coal**
  - Minimal cost during operation
    - No fuel cost during operation
- **But, intermittent so need storage**
  - Batteries are the most flexible solution



West Virginia Wind Farm



1.6 GWh at Moss Landing, California 2021



8 MW Binghamton, NY, 2011

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## The Future for Cleaner/Safer Energy

- ✓ **Lithium battery systems will dominate for next 5-10 years**
- ✓ **Need new manufacturing technologies**
  - ✓ Leapfrog the Asians
  - ✓ Clean mining with clean energy
- ✓ **Need clean recycling technologies**
  - ✓ Sustainable society with clean chemistry
- ✓ **Need regional supply chains as proposed in Europe**
  - ✓ **Build capability in Endicott**
    - ✓ **Made in America** batteries
    - ✓ **Ecosystem** for clean energy

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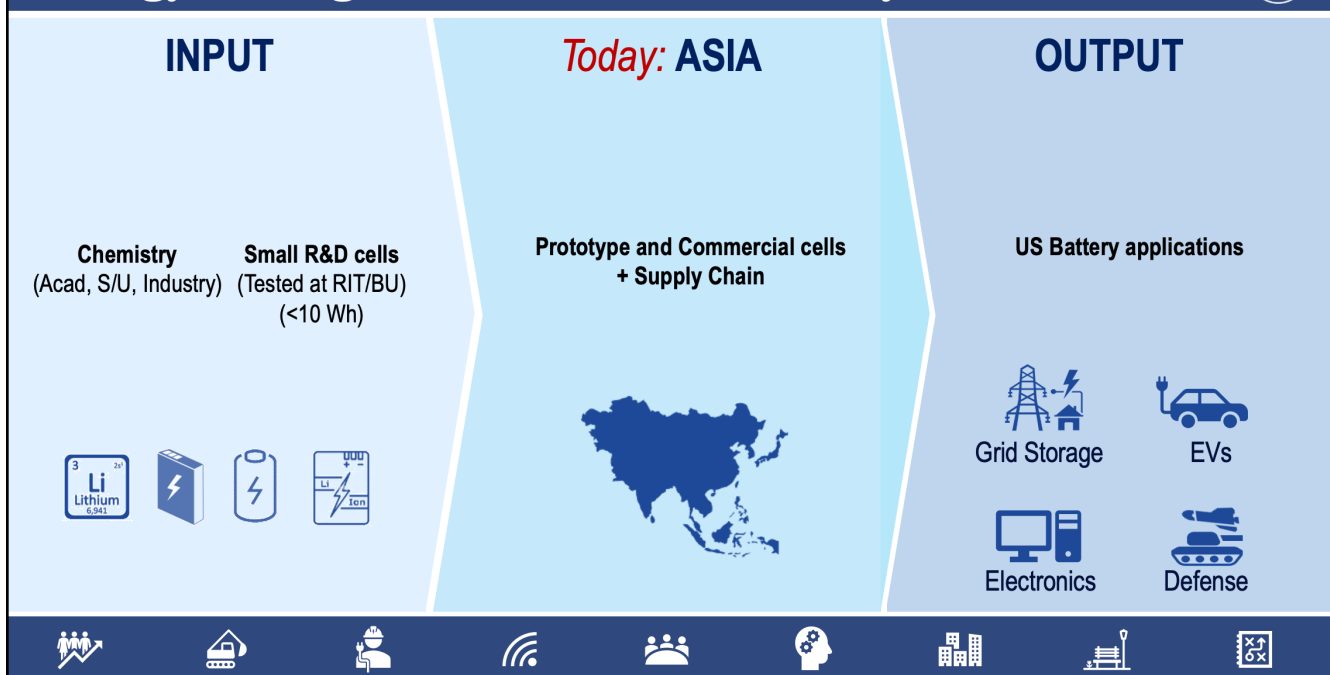
## Present Battery Global Supply Chain is Untenable

- **The supply chain is too constrained today**
  - Security **and** sustainability
- **Critical elements** need to be eliminated by science advances or be locally sourced
  - For example cobalt must go
    - Idaho mine open, but processing in Brazil/Finland
  - Graphite and metals ideally need sourcing locally
- **North America is a hot-bed for battery activities**
  - Universities are leading the world in chemistry IP
  - Start-ups are pushing the frontiers, but exponential hype
  - BUT major gap in prototyping batteries and in battery equipment
  - BUT changes are coming: extensive US Federal funding: one example – Battery-NY
    - Following the example of Europe

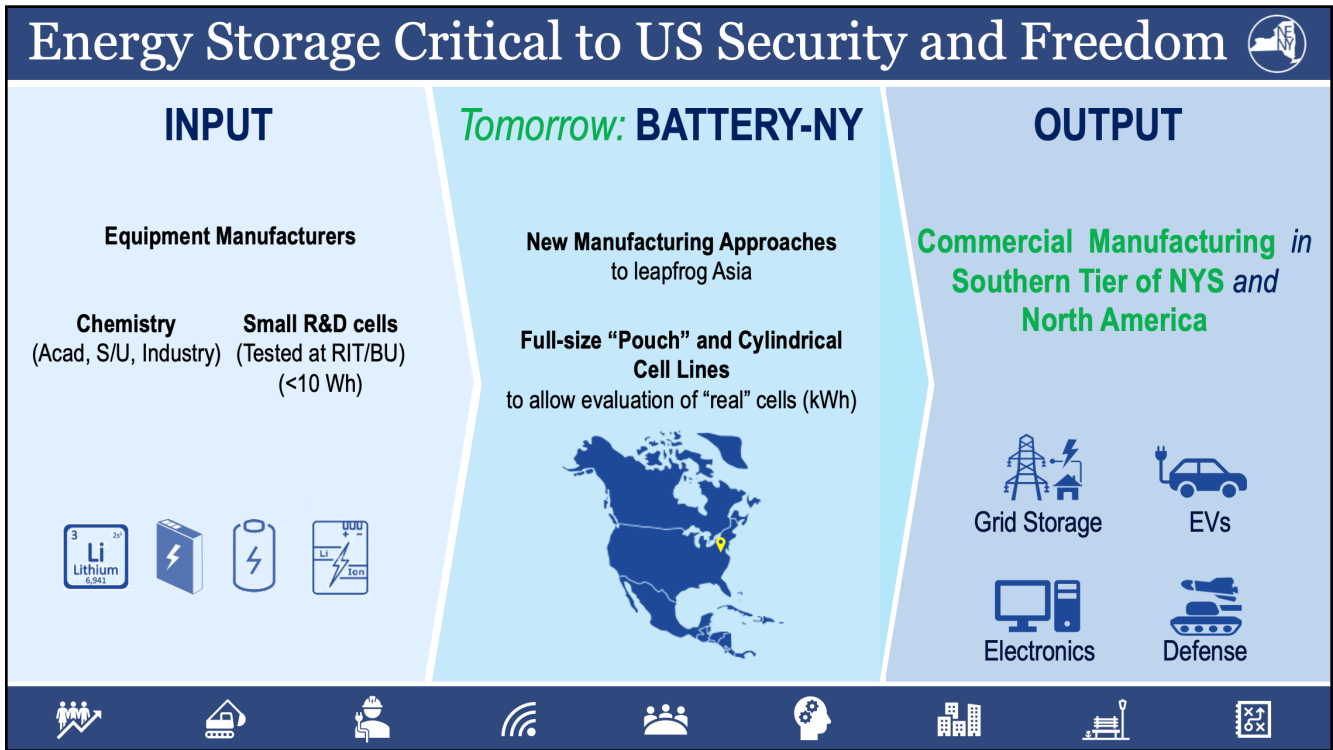
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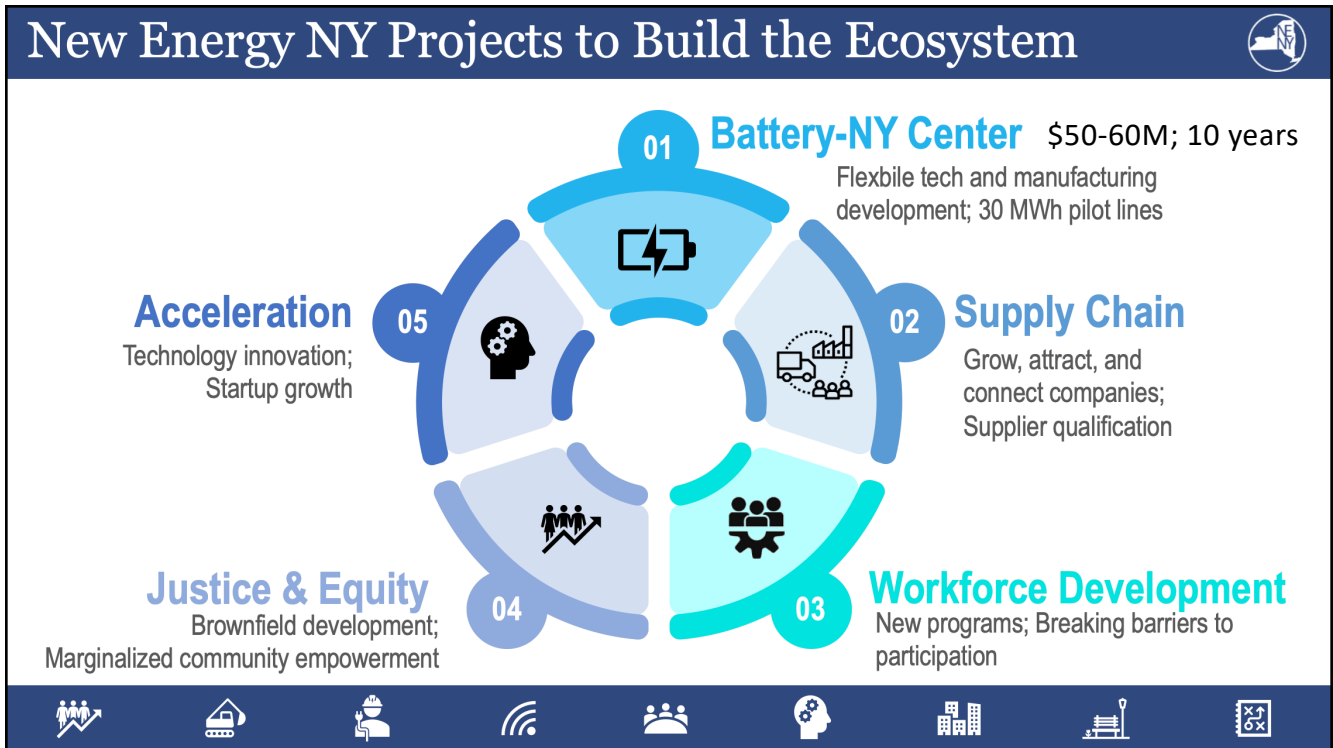
## Energy Storage Critical to US Security and Freedom



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# Battery-NY Technology and Manufacturing Center



- **Flexible technology development**

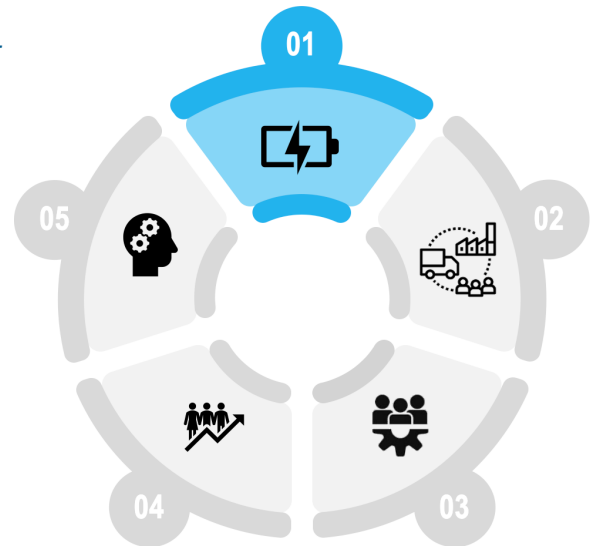
- Encourage American equipment manufacturers

- **Development and testing of new manufacturing methods**

- Leapfrog the Asians
- E.g. Eliminate bad actors, like NMP

- **Industry demonstration scale**

- 30 MWh pilot line
- Pouch and cylindrical/prismatic



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# Kick-off of New Energy New York and Battery-NY



October 20<sup>th</sup>, 2022



ALEJANDRA Y. CASTILLO @ IM3NY



SENATOR SCHUMER @ BINGHAMTON U



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## Frontiers in Battery Research and Development: From Materials to Manufacturing

- **North America is the leader in pushing the frontiers of battery materials**
  - DOE Battery500 world leading R&D consortium
  - North America leads the world in investing in start-ups
- **North America trailing in supply chain and manufacturing**
  - US Govt investments are critical and welcome
  - We cannot play catch-up
  - We must leapfrog the Asian technology – do better
  - All materials must be recycled, and stay within the region
    - Reduce imports of valuable materials

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