

DOE-OE Energy Storage Technology Advancement Partnership (ESTAP) Webinar

State of the U.S. Energy Storage Industry: 2022 Year in Review

January 10, 2023



U.S. DEPARTMENT OF
ENERGY

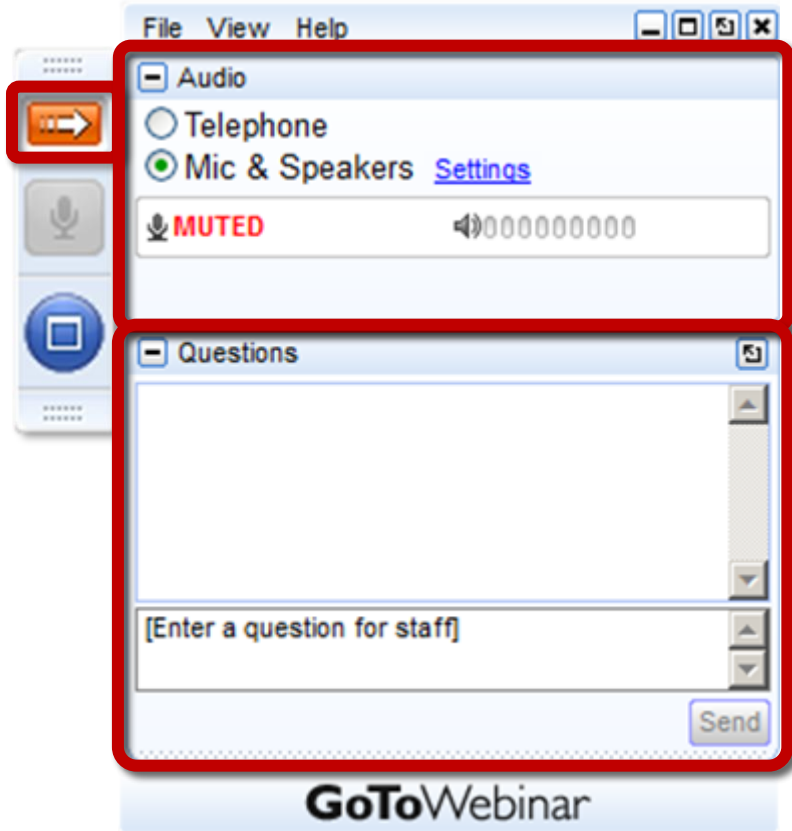


Sandia
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CleanEnergy States Alliance



GOVERNOR'S
Energy Office



Maryland
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Administration



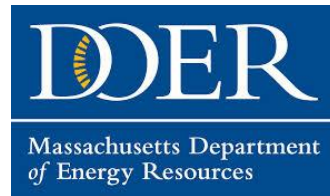
MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY



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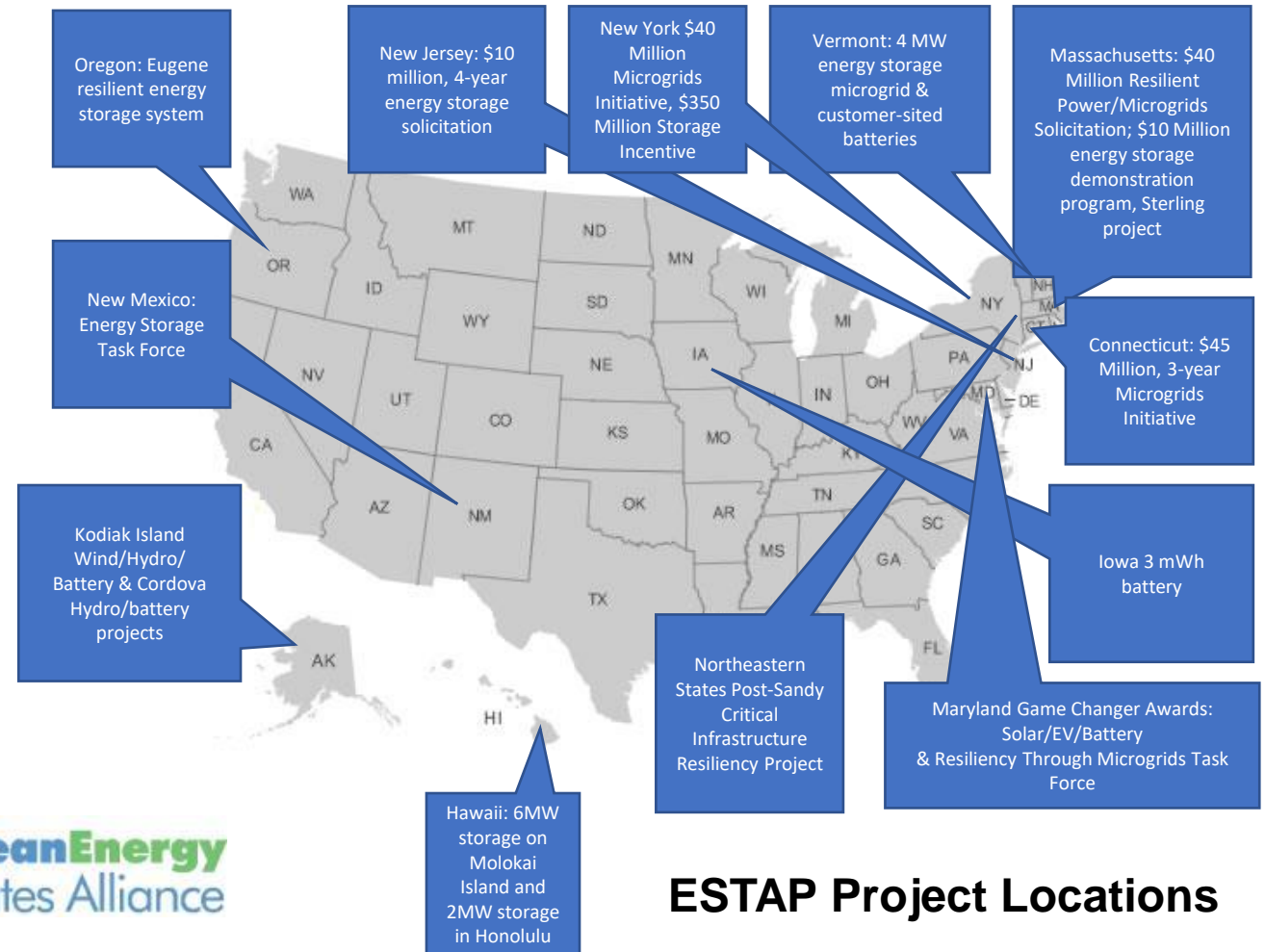


DOE-OE Energy Storage Technology Advancement Partnership

The **Energy Storage Technology Advancement Partnership (ESTAP)** is a US DOE-OE funded federal/state partnership project conducted under contract with Sandia National Laboratories.

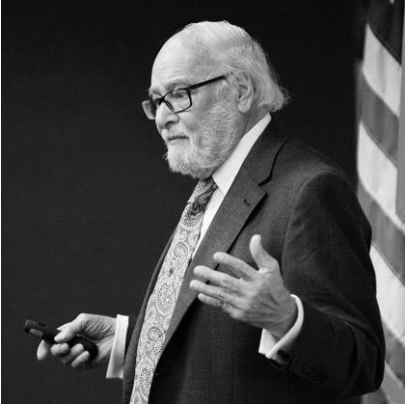
ESTAP Key Activities:

1. Facilitate public/private partnerships to support joint federal/state energy storage demonstration project deployment
2. Disseminate information to stakeholders
 - ESTAP listserv >5,000 members
 - Webinars, conferences, information updates, surveys.
3. Support state energy storage efforts with technical, policy and program assistance



ESTAP Project Locations

Thank You!



Dr. Imre Gyuk

Director, Energy Storage Research,
U.S. Department of Energy



Dan Borneo

Engineering Project/Program Lead,
Sandia National Laboratories



Webinar Speakers

- **Dr. Imre Gyuk**, Director, Energy Storage Research, DOE Office of Electricity
- **John Fernandes**, Senior Consultant – Emerging Technologies, Customized Energy Solutions
- **Todd Olinsky-Paul**, Senior Project Director, Clean Energy States Alliance (moderator)



U.S. DEPARTMENT OF
ENERGY



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 **The Company**

Established in 1998, **Customized Energy Solutions (CES)** is a consulting and services company that assists clients in managing and staying ahead of the changes in the wholesale and retail electricity and natural gas markets. Serving hundreds of clients, Customized Energy Solutions offers best-in-class hosted energy market operations platforms and a wide spectrum of consulting services. CES is committed to promoting economic development through the advancement of transparent, efficient, and non-discriminatory wholesale and retail electricity and natural gas markets.

Presence

Headquartered Philadelphia, PA



Over 200 Associates across 9 Regional offices in United States, Canada, India, Japan & Mexico. We support clients in all 7 US ISOs and RTOs

Resources

>11000 MW assets under Active Management

>300 MW Energy Storage assets under Management

Awards and Recognitions







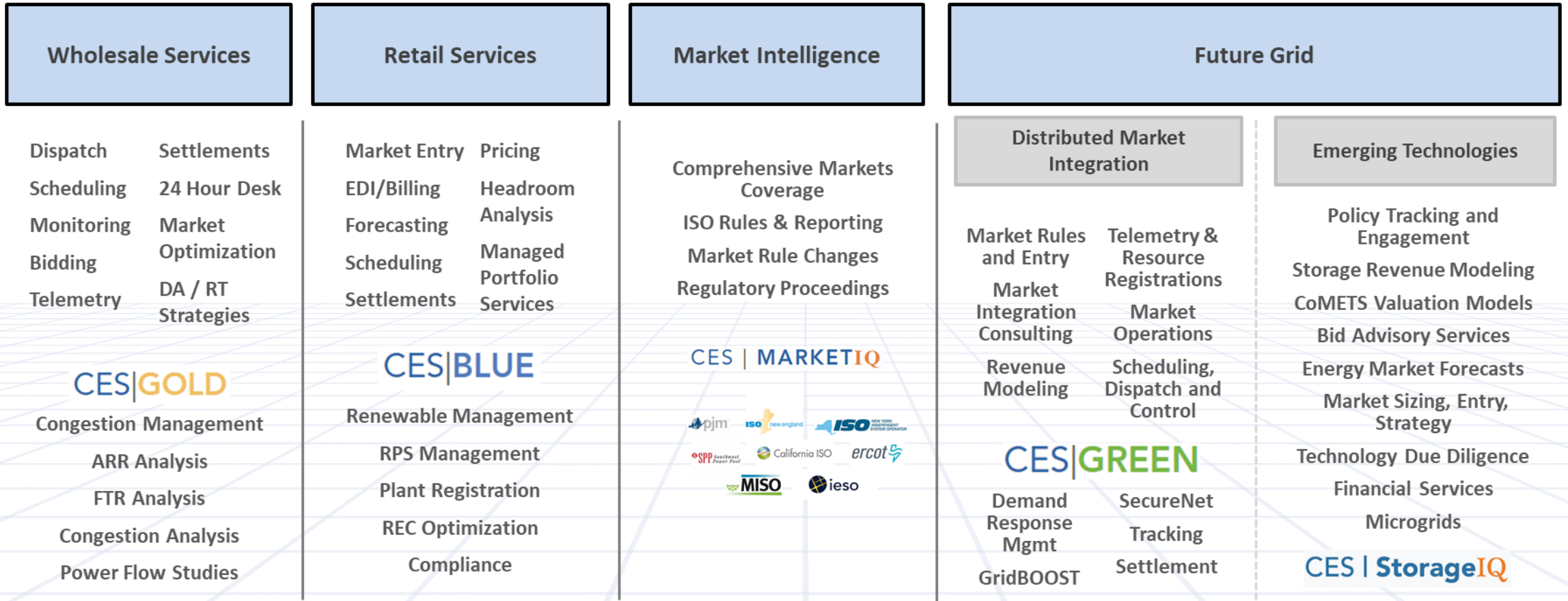
Inc. 5000 – Eleven Time Honoree, Philadelphia 100 - 2001, 2004 – 2012, 2019
Best Places to work: 2014, 2016
2016 Energy Storage Association Brad Roberts Award Winner

Clients

500+ Clients Worldwide



Our consulting services enables competitive suppliers, technology providers, marketers, utilities and customers to prosper through change, by turning knowledge into value



CES' business lines support market participants from conceptualization to operations



CES Emerging Technologies practice offers a range of consulting, software and services around Energy Storage Systems (ESS), their technology and market applications, to help project developers, investors, technology companies and other clients understand the evolving market rules and the value proposition of new technologies

| | | | | |
|--------------------------|--|-----------------------|-----------------------|-------------------|
| Market Advisory Services | <i>Our market advisory services help clients understand energy market opportunities, developments and policies</i> | Market Overview | Bid Advisory | Policy Support |
| | | Market Forecast | StorageIQ | Trainings |
| Financial Services | <i>Our financial services help clients understand Business trends, estimate revenues and cash Flows, optimize investments and abate risks</i> | Financial Modeling | Risk Analysis | |
| | | Due Diligence | Investment Advisory | |
| Software Services | <i>Our software services and analytical tools help clients simulate dispatch of energy storage projects and make critical investment decisions</i> | CoMETS | Behind-the-Meter | Microgrid |
| | | In-Front of the Meter | RE Integrated Layouts | Bespoke Solutions |
| Strategy Consulting | <i>Our strategy consulting services help clients successfully enter and navigate the energy storage market to achieve key objectives</i> | Market Potential | Market Entry | |
| | | Investor Search | Business Accelerators | |

Backed by our practical experience of running day-to-day operations of over 300 MW of energy storage facilities in competitive markets, our team brings unparalleled value to customers via our consulting services

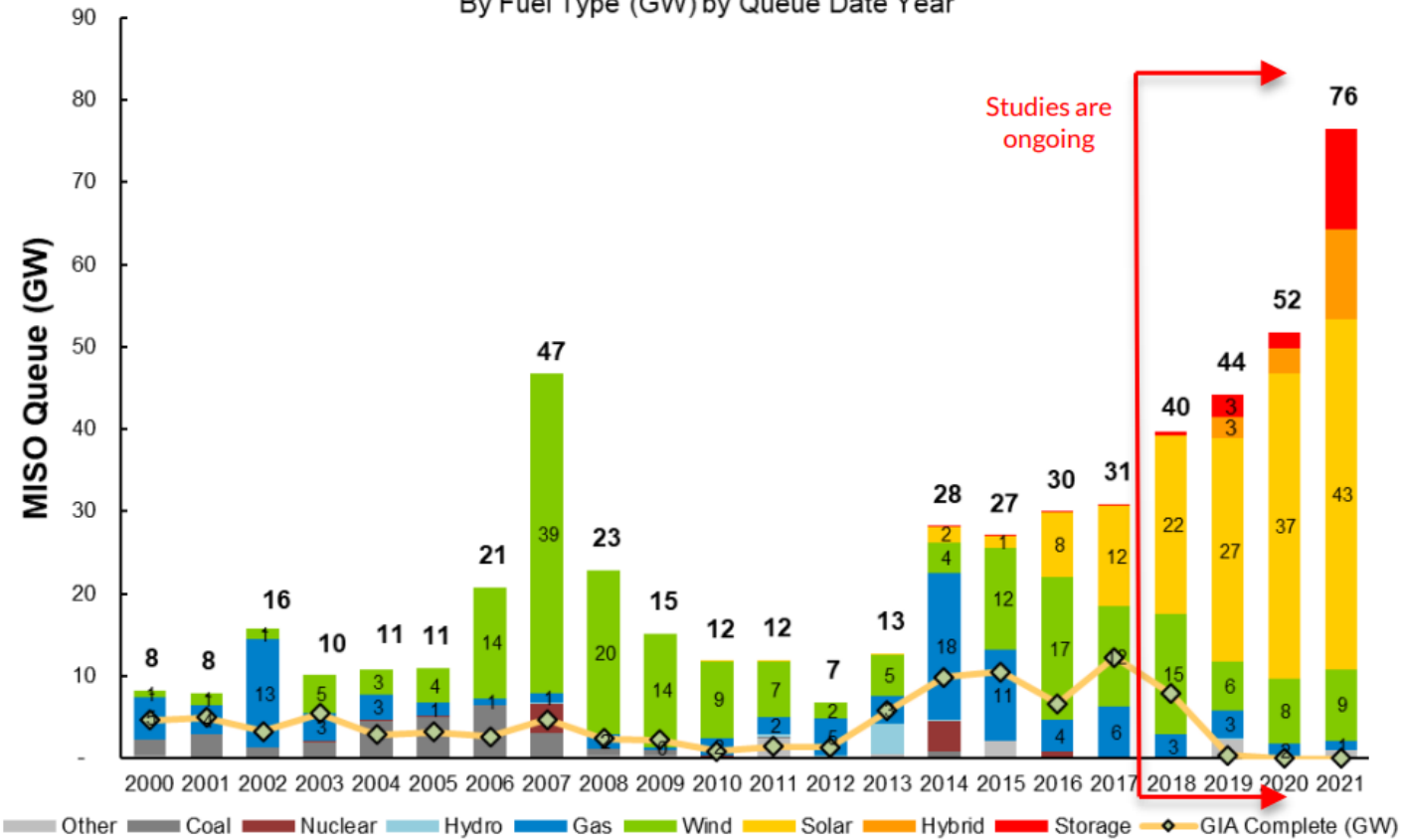


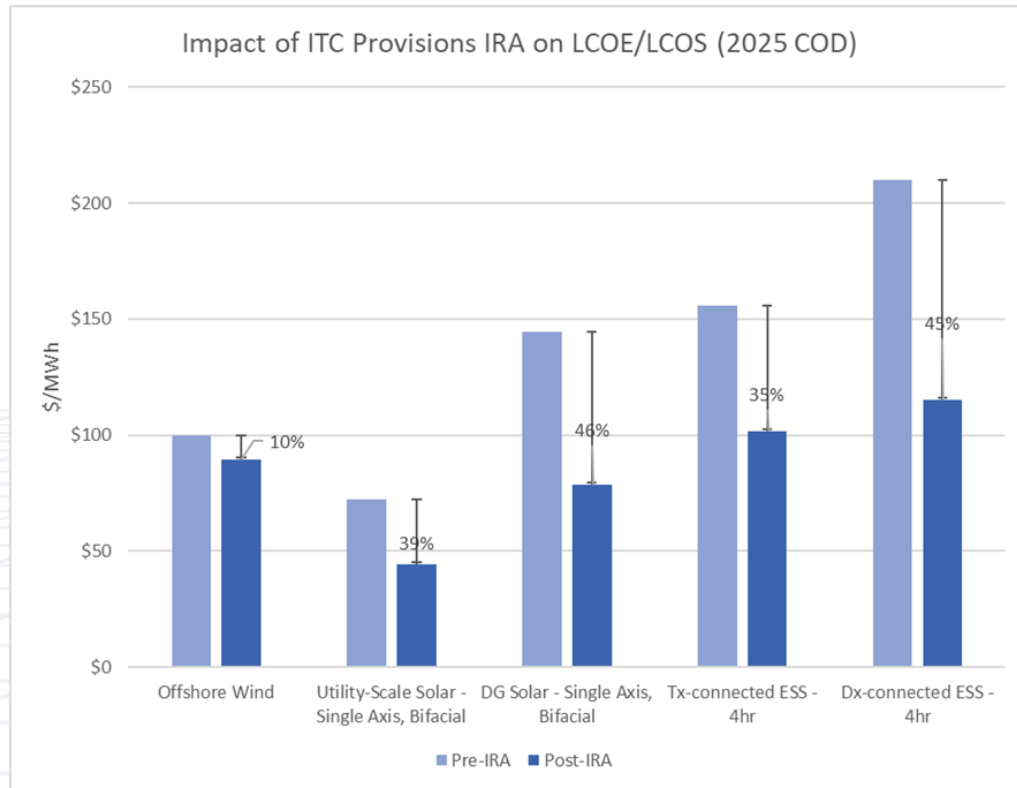
Hybrid Storage Still Going Strong



MISO Queue: Historical Trend

Requested Generation
By Fuel Type (GW) by Queue Date Year





ITC

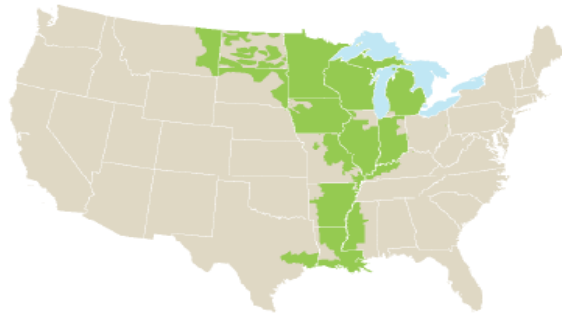
- 30% ITC available with prevailing wages and apprenticeship qualification. Additional 10%-30% bonus for projects meeting criteria for local content, energy community or low-income community (*see 2022.3 Market Module for the details*)
- Standalone Storage with “nameplate” capacity of 5 kWh or more, is also eligible for the 30% ITC, with no restriction on charging from RE.
 - Interconnection upgrade costs for storage projects up to 5 MW are eligible for ITC
- Levelized costs for the projects are expected to decrease considerably
- → *These provisions are expected to increase RE plus storage capacity significantly, but do little to clear local challenges such as interconnection*

| | | | | | |
|---------------------|-----|-----|-----|-----|-----|
| Pre-IRA | 30% | 10% | 10% | 0% | 0% |
| Post-IRA Max ITC | 40% | 50% | 60% | 40% | 50% |

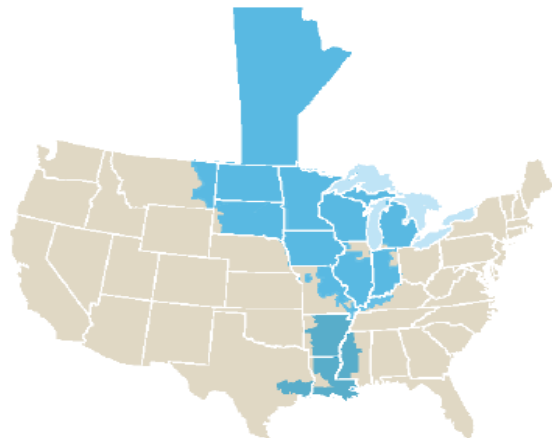
Note: Storage projects are assumed to do 1 cycle/day for LCOS calculations. Max ITC may not be achievable by a typical project



Resource Adequacy Still (*very much*) a Thing



MARKET AREA

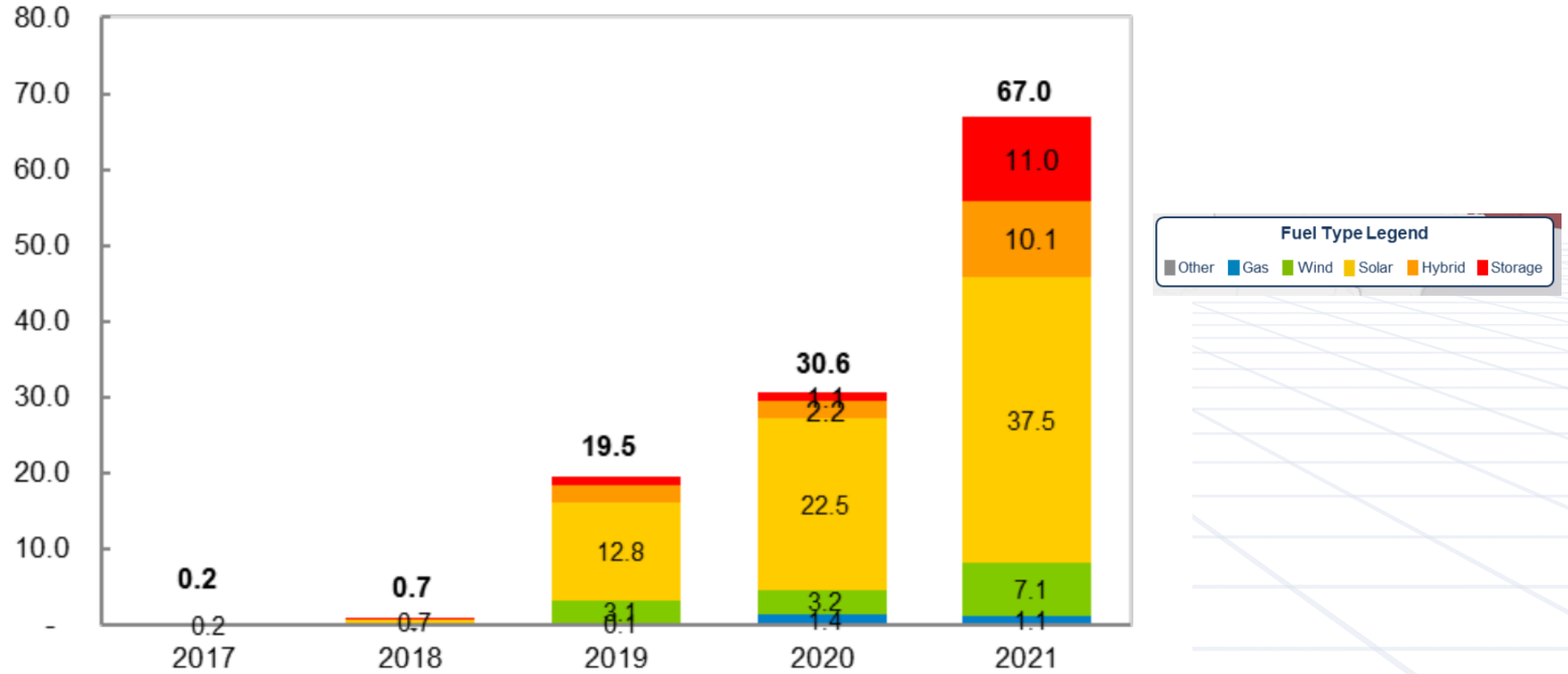


RELIABILITY COORDINATION AREA

- 2021/2022 PRA
 - MISO North: \$5.00 / MW-Day
 - MISO South: \$0.01 / MW-Day
- 2022/2023 PRA
 - MISO North: \$236.66 / MW-Day
 - MISO South: \$2.88 / MW-Day
- MISO is contending with vast amount of fossil retirements, concerns over transfer limitations, and aggressive federal and state policies impacting the regional fleet
- MISO is overhauling its capacity accreditation and procurement process
 - Seasonal resource planning and (4) capacity auctions
 - 65 Resource Adequacy (capacity-limited) hours per season; separate for MISO North and South
 - “ELCC adjusted by RA” for intermittents (*Effective Load Carrying Capability*)

DPP Trends

Active Projects by DPP Year (GW)

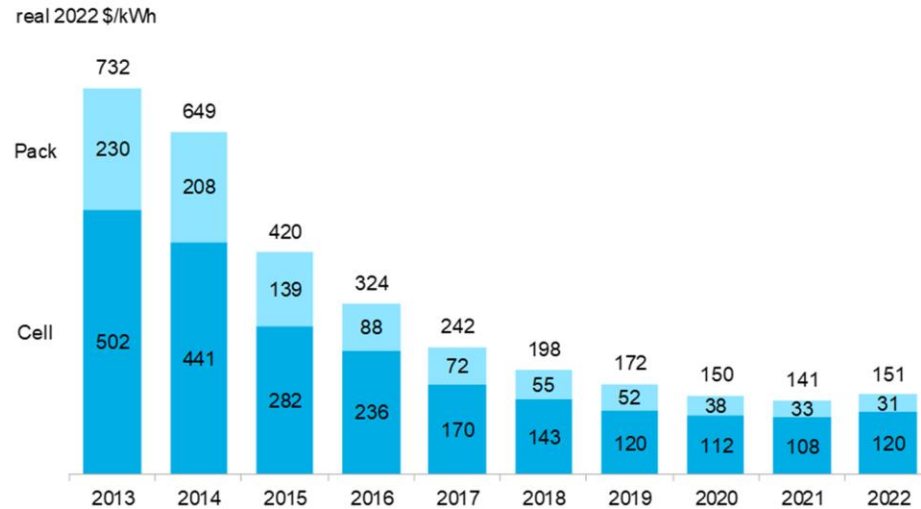


DPP = Definitive Planning Phase



But the Big Issue for 2022:

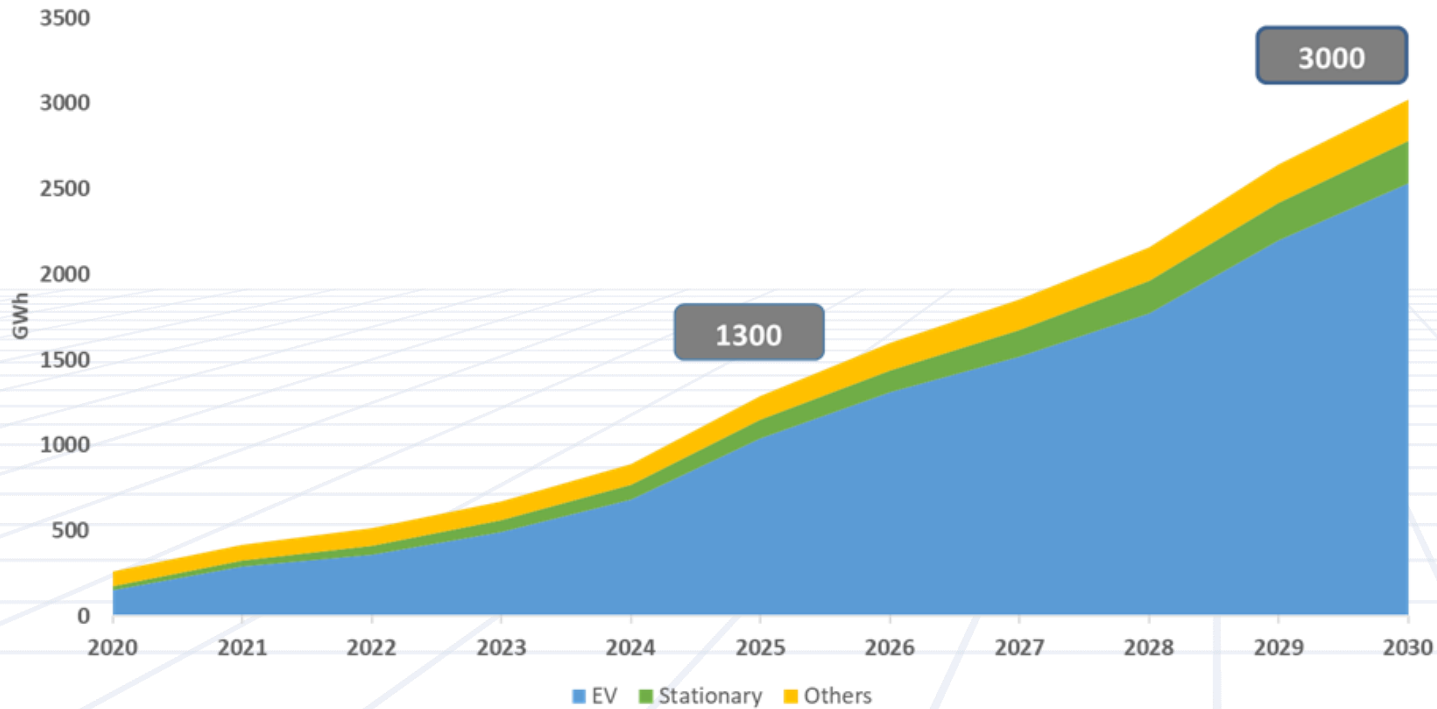
Figure 1: Volume-weighted average lithium-ion battery pack and cell price split, 2013-2022



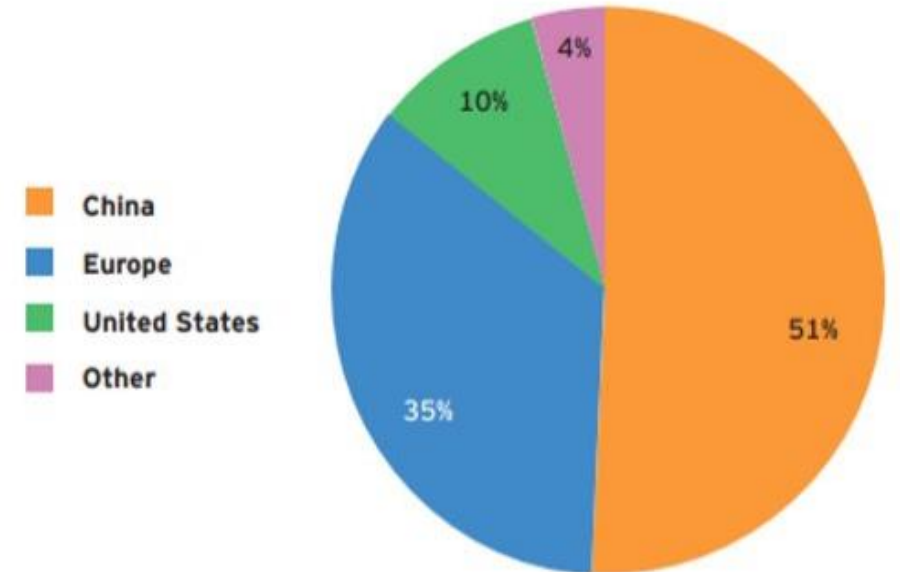
Source: BloombergNEF. All values in real 2022 dollars. Weighted average survey value includes 178 data points from passenger cars, buses, commercial vehicles and stationary storage.

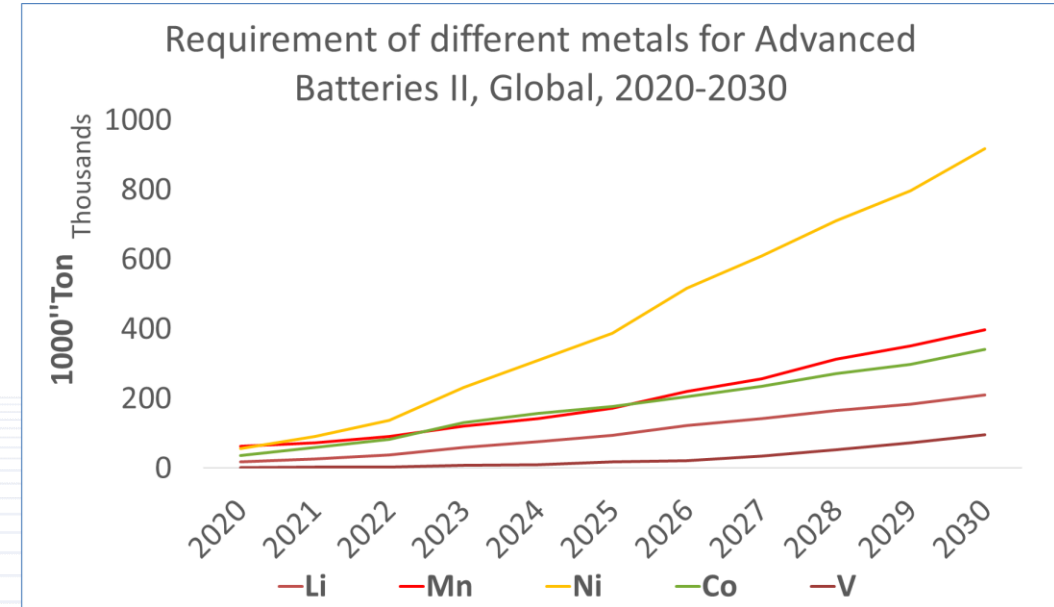
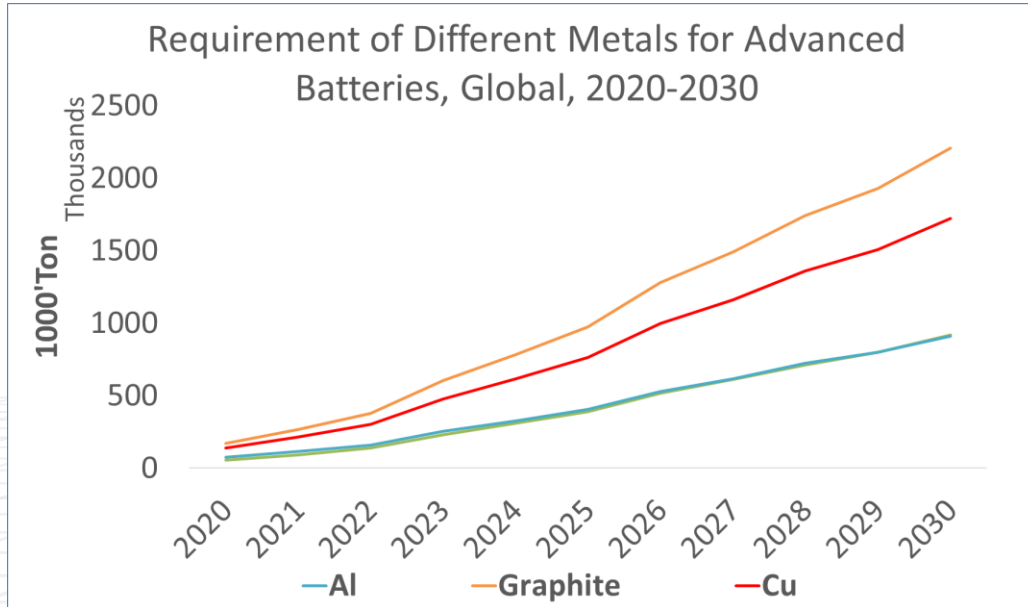
- As per BloombergNEF, after more than a decade of declines in li-ion battery pack price due to the rising of raw material and battery component prices and soaring inflation have led to the first ever increase in price.
- In 2022, pack prices are increased to \$151/Kwh from \$141/Kwh last years (7% rise).

Advanced Battery Market, 2020-2030, Global

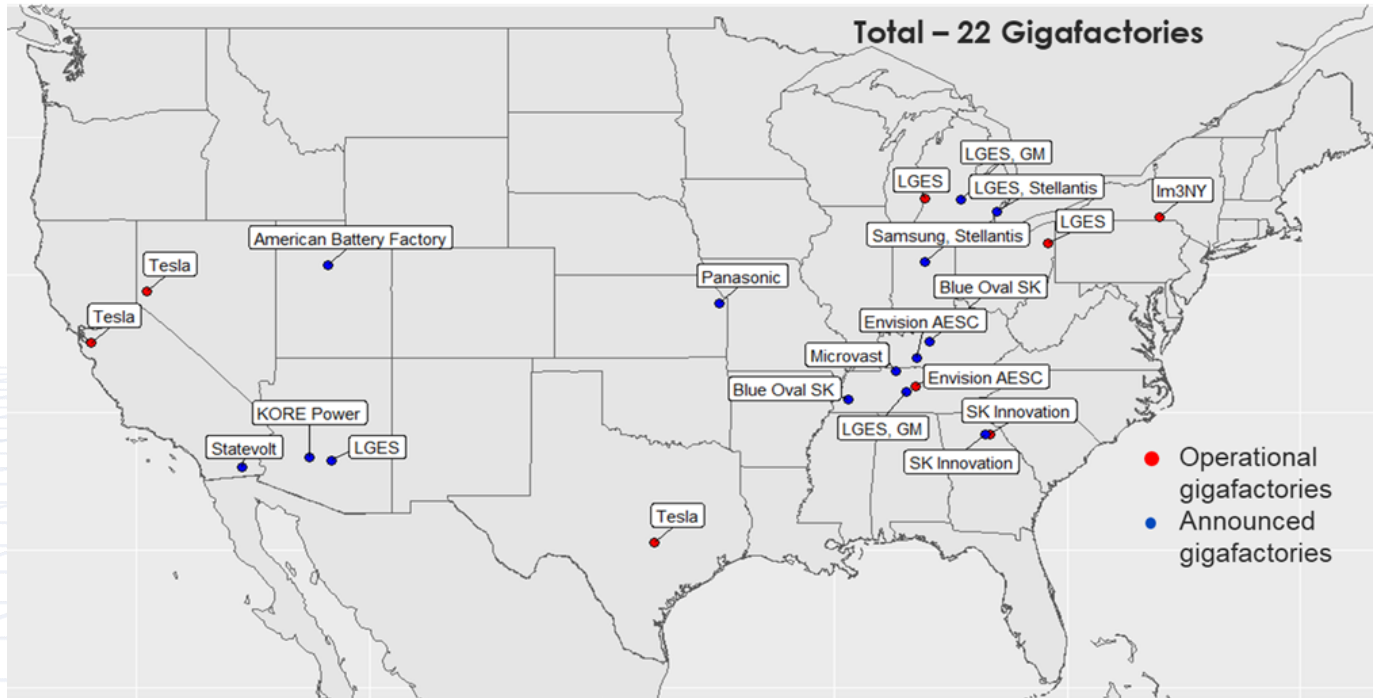


Electric car sales across geographies (in 2021)





- Li-ion battery market expected to grow 12X between 2020-2030; so higher demand for metals in different ratios.
 - Requirement for graphite, copper and aluminum will be greater followed by Nickel, Manganese and Cobalt.
- Most of the higher energy density chemistries are moving to higher nickel content at the expense of lower Co and Mn, hence Ni demand will grow the fastest among these.



SOURCE: Company announcements, media reports, NAATBatt North American Lithium-Ion Battery Supply Chain Database.

- 800 – 1000 GWh planned cell manufacturing capacity with investment exceeding \$40 billion to build out a key parts of the domestic supply chain for batteries and EVs
- As a part of IJA, DOE has selected 21 projects from 20 companies to receive a combined \$2.8B funding (the first phase of a total \$7 billion investment)
 - The projects are for component manufacturing, materials separation, processing and/or recycling

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This webinar was presented by the DOE-OE Energy Storage Technology Advancement Partnership (ESTAP)

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Upcoming Webinars

- Bringing Community Perspectives to Community Solar (1/23)
- Incorporating Equity into State Offshore Wind Policies and Programs (1/25)
- Assessing the Value of Energy Storage: A Framework for States (1/31)

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