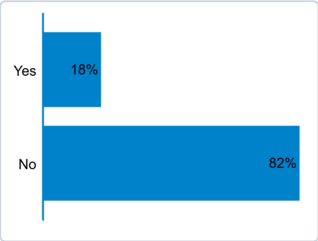
Untitled

Current run (last updated Mar 18, 2022 3:25pm)

14	282	137	45%
Activities	Participants	Average responses	Average engagement

1) Do you own an electric/plug-in vehicle?

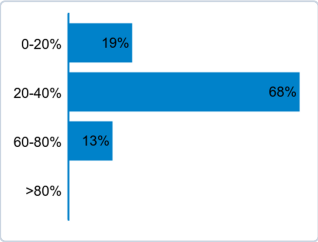


Response options	Count	Percentage
Yes	36	18%
No	**160**	**82%**

70% Engagement

196 Responses

2) In 2030, what percent of US new car sales will be electric? (Note: in 2021 EVs accounted for 3% of new car sales)

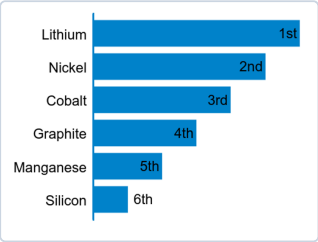


Response options	Count	Percentage
0-20%	39	19%
20-40%	**141**	**68%**
60-80%	27	13%
>80%	0	0%

73% Engagement

207 Responses

3) Rank the elements in a lithium battery in the order of their criticality from maintaining a secure and reliable supply chain.

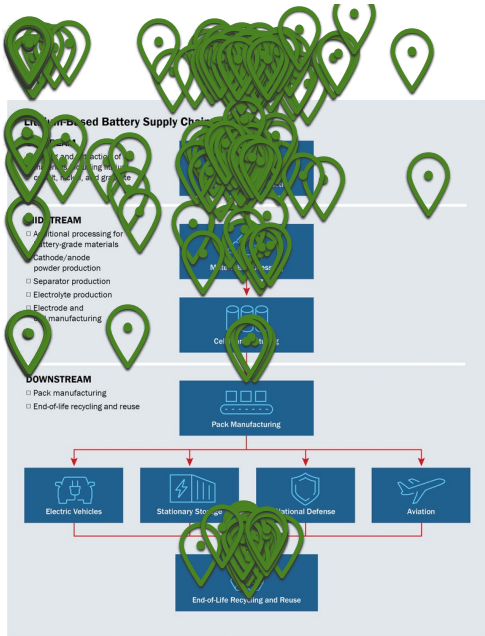


Response options	Rank
Lithium	1st
Nickel	2nd
Cobalt	3rd
Graphite	4th
Manganese	5th
Silicon	6th

65%
Engagement

184
Responses

4) Which part of the supply chain represents the biggest challenge for developing a secure domestic battery industry? Click on the image to submit your response.



Response options	Count	Percentage
	199	100%

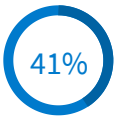
71%
Engagement

199
Responses

5) In 5 words or less: what unconventional sources should we explore to gain access to battery critical materials (e.g., mine tailings, coal ash)?

Responses

- Go to new chemsitries
- development mining capital for strategic minerals
- Stop exporting domestically mined materials out of the country for processing.
- recycling non-battery devices
- human waste
- outer planet
- Asteroid / Lunar mining
- International Collaboration
- Brine
- sand refining
- Asteroids!
- Approaches that deliver material in the next 5 eats, seawater is a 10-15 years issue
- There is a cobalt mine in Idaho, near Salmon (Iron Creek Project). It was run by First Cobalt, now called Electra Battery Materials Corporation
- early stage development capital to derisk strategic mineral mining
- People need to allow mining in their backyards, it's reality.
- Sea water
- Canadian tundra
- mine tailings
- issues: Permitting & access to non-nuclear green energy
- "recycling non-battery devices"
- Develop lithium-sulfur cells -- skip nickel, cobalt
- Global investments with a20 year horizon
- mines in Siberia supply 20% of high-grade "class 1" nickel
- Sea water deeper into mantle. Canadian tundra



Engagement

164

Responses

Responses

use low cost rail and waterways to move material

Asteroid Mining

AI and remote sensing

Maximize conventional resources

New formulations with domestically available materials

brine

Talon metals does Nickel-Copper-Cobalt mining; Need to encourage recycling - Redwood Materials, Li-Cycle; TMC the metals co. approach might be interesting

Invest in Africa

Recycling

Remove epa barriers to mining

recycling

US mint for copper and Nickel

Ni from sour crude coke.

Military batteries

environmentally-friendly recycling. not pyroslysis

Recycling

two price surges could significantly increase the costs of EV

design with recycling in mind

Municipal Solid Waste (MSW) to Energy conversion

Recyclling!

Faster permitting

global average price of lithium carbonate soared

recycling

mine tailings

Li hard rock and clays

Partnership

importing scrap batteries for reccling from other countries - have Trade.Gov US embassy trade reps help clear the road

Responses

coal ash

Use chemistries w/fewer critical minerals

global collaboration

Graphite extraction and proicessing

Strengthen North and South American partnerships

don't use lithium batteries for non-transport.

Meanwhile, the global average price of lithium carbonate soared from $12,275 in January 2019 to $52,634 in February, according to data from Benchmark Mineral Intelligence. The trend is unrelated to the crisis in Ukraine, as Russia is not a major lithium supplier. Instead, it stems from strong demand for electric car batteries outstripping supply.
The two price surges could significantly increase the costs of electric vehicles. In a note to clients last week, analysts at Morgan Stanley warned that the nickel surge alone could make it $1,000 more expensive to produce an EV.

Synthetic graphite with domestic assets

Recycling cemented carbide scrap (WC-Co) to produce pure Co chemicals for cathodes. ~ 6% of the world production of Co is consumed by the cemented carbide industry.

Address US-Based Nanomaterial production deficit

ocean nodules

Strategic relationships with US allies

Thacker pass Nevada

Exploration for critical metals - you need to look to find these resources

Landfill Mining

global partnership

Salton Sea

Lithium in brine/produced water

recycling

recycling

canada

Responses

Recycling of battery waste stream

graphite from biomass

urban mining via recycling

Solution mining landfills, bioaccumulation

Petroleum for conductive polymers

Synthetic graphite production using low cost energy and domestic coal and petroleum derivatives and feedstocks, purified natural flake graphite co manufacturing.

Borax mine

Expand relation with friendly countries

For Ni, Co: switch to LFP, with solid electrolyt

Invest in recycling to mimic lead-acid industry

While Russia supplies only about 7 percent of the world's total nickel, its mines in Siberia supply about 20 percent of high-grade "class 1" nickel, which is used in most electric car batteries, said Simon Moores, CEO of Benchmark Mineral Intelligence.

use non-critical materials

seawater

Mine tailings and clay deposits

reverse supply chain battery flow

Graphite from biomass sources

International mining/production partnerships

reuse of radioactive contaminated nickel

Mine tailings

Petroleum products

coal ash

geothermal brine

global collaboration is necessary with friendly countries.

Synthetic

Recycling

recycle mfg scrap

Responses

waste materials

Eea bed exploring

Mining and permits

volcanic residues

collaboration with allies and recycling

mine tailings

desal

But these efforts from top Democrats could rankle some climate advocates, who have opposed a proposed lithium mine in Nevada because of its potential environmental impact. It's all part of the "paradox of green growth," according to Chris Berry, an independent energy analyst who tracks mineral markets.

Brine aquifers for Li

"Traditional" non-research solutions

Mine tailings

Sea water

global partnerships and recycling

chemical precursor access

recycling

Conversion of tree biomass to graphite

Mine tailings

Invest in Canadian junior mines

stainless steel metal recycling

Brine extraction and Seabed Mining

President Biden last month announced new spending on U.S. mineral production, while Senate Finance Chairman Ron Wyden (D-Ore.) last week introduced legislation to spur domestic mining of nickel, lithium and other metals.

mine tailings

For Li: coproduction from geothermal brines

mine tailings and recycle feedstocks

Brine, Clay, recycling

Responses

renewable feedstocks for anodes | recycling

diplomacy

synthetic graphite, bio-derived carbon feedstock

global partnerships | recycling | recycling

large deposits in Canada | Recycling

Based purely on geological scarcity, Co is probably the most critical.

International collaboration | MINE TAILINGS

Relax mining regulations | E-waste

global partnerships | recycle | Mine landfills

urban mining | overseas resources

graphene fabrication | Recycling

Seawater and metal recycling | recycling

geothermal brines

Strategic collaborations with allies

Streamlining permitting for new mining projects.

what about lithium in brine from geothermal power plant production?

Petroleum coke | Geothermal brines

From Sea water | Mine Tailings | spent catalysts

Recycled NiMH batteries | sea bed mining

Recycling | sustainable global partnerships

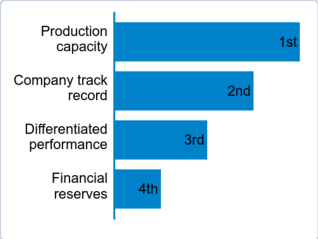
Mine tailings | mine tailings | seabed mining

Responses

increase diplomatic relations with allies

geothermal brines

6) When considering potential new suppliers, rank the various criteria that are important before signing a contract.



Response options	Rank
Production capacity	1st
Company track record	2nd
Differentiated performance	3rd
Financial reserves	4th

58%
Engagement

164
Responses

7) For OEMs and Battery manufacturers: In 5 words or less, what is the rate limiting step for qualifying a new supplier (e.g., calendar life testing)?

Responses

Approved Materials

quality control/product performance

environmental impact studies

ability to co locate

modularity of the batteries for different EV's

cost, performance

safety of cells

Ensuring high quality with minimum variability

time

performance assurance

manufacturing location

Collaboration track record

Quality/life validation and familiarity with in-depth testing for product

Large companies locking up supply

Documentation and PPAP validation

geopolitical; domestic source

Proof of consistent quality

quality assurance

Material production location

technology validation

trust

alignment with target specs

Research spending

quality control, domestic origin

ARGONNE1

quality control/product validation

Technical skills and Quality

Environment justice

variability across multiple batches

consistency of production from patch to batch

cost and quality, location

confirm quality

Engagement

102

Responses

Responses

Qualification Testing Process

Speed of production to meet demand

quality/delivery/price

scalability

Production scale-up

Price and flexibility

Quality and capacity

Accelerated aging/performance validation testing

Life testing to ensure quality

Time to production scale

cost

Verified, independent testing

ease of startups doing business with govt.

carbon footprint

Battery performance and life

Time between order and delivery

Quality and performance consistency

ownership structure - NO Oligarchs

Does not apply to me

product lifetime and design philosophy (no programmed obsolescence)

validation

Getting to real data vs data sheet

Qualification Testing Process

quality assurance

diversity of supplier's workforce

performance and cost

performance demonstration

Time to qualify

delivering according to our spec

Elongated OEM "Sample A/B/C" progression

Cost / performance / partnership

quality

COST

Responses

quality at needed scale

Demonstrated Quality and Certification

fit with ESG goals

ownership structure - NO Russian Oligarchs or other New Dirty Money

Scale Up, Production Validation (PV)

Purchasing stringing suppliers along

quality consistency, life time performance

cycle life with high level of confidence

N/A

geopolitical

cultural differences

Consistent perfomance

B-Sample cell characterization

engineering resource shortage

demonstration of growth

Supporting data

product/process validation

contracting

test standards

material validation

quality and capacity

Capacity Verification

ITAR certified

Quality control

Production design performance/life validation

domestic workforce and supply

Consistent performance over time

diversity of supplier

Rapid performance and life validation

carbon footprint

quality, capacity

Responses

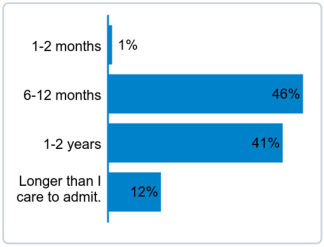
long time verification | geopolitical location

Fundamental Electrochemical properties; CE!

establishing good quality standards

historical performance | design validation

8) How long does it take to qualify virgin materials (e.g., a new source of lithium or a new cathode chemistry)?

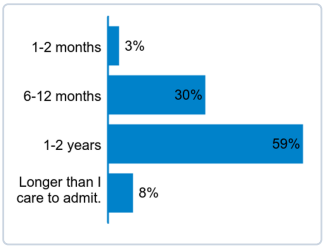


Response options	Count	Percentage
1-2 months	1	1%
6-12 months	**48**	**46%**
1-2 years	43	41%
Longer than I care to admit.	13	12%

37%
Engagement

105
Responses

9) How long does it take to qualify recycled materials?

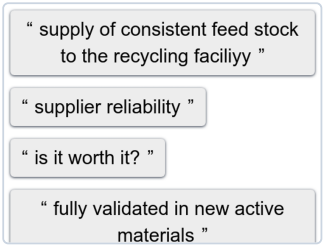


Response options	Count	Percentage
1-2 months	3	3%
6-12 months	27	30%
1-2 years	**54**	**59%**
Longer than I care to admit.	7	8%

32%
Engagement

91
Responses

10) In 5 words or less: what issues inhibit you from using recycled materials in your manufacturing line (e.g., batch to batch variation)?



Responses

supply of consistent feed stock to the recycling faciliyy

supplier reliability | is it worth it?

fully validated in new active materials | LCA and cost

accuracy | price vs new | lack of expertise

cost and certification

may not be electrochemically optimized

material certification | inpurities | Chemistry purity

no government incentives | Quality | Impurity

None

unknown quality consistency; validation timing

reliable material properties | Potential contamination

dealing with waste

Not sufficient production capacity | tainted material

batch to batch variation | high puriety

mixed cathodes | Uncertainty

defects/variation in material properties, inconsistent supply

inconsistency processing (slurry)

level of other impurities | performance gap

quality, consistency, contamination

Inconsistent supply | N/A! | Variability

Availability | standardization | availability

Engagement

99

Responses

Responses

material consistency

changes over time

no good standards for qualification

quality, diversity of impurities, risk, inconsistency

availability

Availability and consistency

feedstock availability and consistency

how to get the battery quality need?

Variation of chemistry

impurity, performance consistency

impurities

cost

purifying

volume

cost of transportation - cost/kg have skyrocketed

contamination

aluminum and/or copper contamination

Consistent availability

Variation in properties, potential contamination.

quality

availability

depreciation

From a good supplier, nothing

Recycling Process

consistent quality

quality

quality

Quality

purity level

Consistency of quality

Performance reliability

yield, reduced performance

Consistency

Not enough material currently.

consistent materail

lack of significant volume

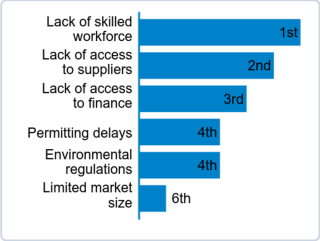
Confidence in consistency of properties

Nothing - we use recycled materials routinely!

Responses

capacity inhibition | cost of separation | quality | volume | quality vs original | batch to batch variations | Lack of adequate material certification | quality | Impurities | Reliability | Not ready yet | impurity | NOTHING | reliable supply | inconsistency in quality | quality | No history | Variation | product quality | quality control | availability | Reduced properties | availability

11) What challenges stop you from expanding production domestically? Rank them in order.

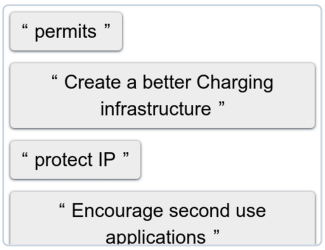


Response options	Rank
Lack of skilled workforce	1st
Lack of access to suppliers	2nd
Lack of access to finance	3rd
Permitting delays	4th
Environmental regulations	4th
Limited market size	6th

23%
Engagement

66
Responses

12) In 5 words or less: What is the single most important thing the U.S. government can do to make it possible for U.S. companies to compete with the companies that currently dominate the lithium-ion supply chain?



Responses

permits

Create a better Charging infrastructure

protect IP

Encourage second use applications

Prioritize manufacturing - scale and speed

Tax incentives for green energy production and recycling

Reuse second life batteries - reduced CO2

Have great technology - incentivize mfg. supply chain

Collaboration across supply chain to ensure viability

avoid monopoles

Fund Materials Manufacturing R&D

Partnership with China

Create an EV market through regulation; like China did.

develope workfoprce

ensure access to capital

capital and speed to scale

create a roadmap

Overseas suppliers such as China and Russia can produce inputs at a significant discount. Adjusting tariffs would help to stop their dumping practices.

support univerity R&D

Increase in Recycling capability

Domestic manufacturing to scale new technologies

Novel green technology

Get WH out of strategic energy process.

regulate exports of raw materials, scrap, EOL

Permitting and Subsidies

Engagement

175

Responses

Responses

Consortium of US companies like MANTech

Education and manufacturing

Regulation

fund research and development

Execute a national strategy

regulation

funding

Create basins, hubs of battery manufacturing

regulation and permitting assistance

develop tech to eliminate minerals from countries of concern

Consistent support over many years

workforce development

create true gov collaborations instead of coordinating

Open Source Patent

Bi-partisan funding and policy

Funding

inventive to domestic manufacturing

open doors to favorable business partnerships with China

Cost of carbon and inequity

research and renovation

Put a tariff

regulation

Funding

easier permitting process

Streamlne permitting

encourage data sharing

NA

Consistency beyond election cycles

Unsure

initial capital & ongoing tariffs

access to EV telemetry to get BMS history for second life - show stopper - applies to 1st life and resale of used EVs too -

Creating a Consortium

Responses

UL certification and NFPA 855 effects on cost of conversation EV to stationary storage

removing regulation for 5 years

protect IP

Reward domestic manufacturing vs. imported products

sustained govt commitment

tariffs

Closed loop battery

require environmentally responsible lifecycle/production

streamlining reguylations

Public Private Partnership Support

Incentive

promoting collaboration among domestic partners

require proof of concept

Get an answer for NIMBY

pathway for integrating new materials

Recognize US's higher emission requirements and penalize countries of origin that have poor standards - China

Incentivize markets to buy U.S.A

Learn from China. Pick winners.

Working with Canada

Limit legal liability supply chain for second-life -

Innovation clusters

no cost share

Grant to more parties

Environmental Impact standards for imports

A US supply chain doesnt require US-based companies throughout. Trying to make supply chain purely US company based will fail.

Responses

More smaller grants rather than fewer large ones so there are more opportunities for innovation and research

more funding with fewer strings attached

Financial Incentives

Support indigenous domestic OEM's

incentivize foreign investment in US

invest in advanced electrode manufacturing

reduce rpolicy volatility

encouraging consortiums

Invest in Free world and don't support communist countries

Move to hydrogen fuel cells

Building new processing facilities

Regulation to guarantee the demand for EVs.
Regulation has created the demand in China.

Stop subsidizing oil

Domestic workforce

Battery Form factor, recycling regulations, and standardization

agility in standard framework development to account for new technology

Reduce regulations

Corporate

counter china moves

Enhance global collaboration

local content requirements

invest in alternative battery chemistry

support domestic suppliers

Streamline permitting and regulations

Responses

Incentivize domestic supply and collaboration

Eliminate need for critical minerals

dominate the production regions

Invest in advance manufacturing facilities

diverse battery systems

demand US-produced materials

Relax regulations

capital and speed to scale

invest in R&D

Mining permits

secure critical raw materials

tax incentives

Less bureaucracy

Invest in education

Drop political infighting

Streamline mining and refining permitting

Support upstream supply chain

pave the way for business focused relationships with China and Europe

More competition / diversified supply sources

Look at real scientific data rather than trying to push political agendas

paradox of green growth

facilitate and expedite standup of upstream, notably precursor manufacturing.

Approve permits quickly for new Li mining in US

Invest in USA

more funding

funding for technology develoment

Support Skill Development

increase diplomatic relations w/ allies

Responses

promoting domestic suppliers

permitting and precursor chemicals mtg

Get beyond NMC chemistry

more funding in research

focus on grid-scale

Minimize time to permit

Stop allowing material mined here to leave the country.

Identify weakest links / biggest technology or mfg. gaps

Tarriff on foreign supply on the entire value chain

Create trade schools

minimize permit reuirements

tax credist

Subsidies, stream line permitting

Mining regulations

Collaboration not competing

Continue to support EV adoption

policy creating equitable market

Increase in Recycling capability

Support cell manufacturing process innovation

no cost share

funding of small businesses

new spending on U.S. mineral production

incentives

source of startup funding

Streamline the grant application process

protectionist measures

promote collaboration

tax credits after grants to sustain

cost cutting

secure demand

invest in raw material processing

avoid monopol

invest in education for batteries

provide subsidies or tax holidays

Responses

Mining of Raw Materials

policy consistency for long term

Relax mining regulations

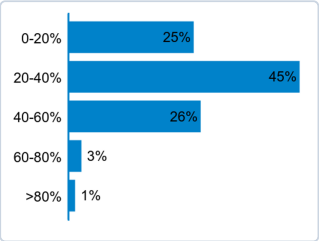
Build complete supply chain - End to end

subsidization

Streamline permitting

MOVE FAST!

13) In 2030, what percent of the US manufacturing capacity will focus on LFP cells? (Note: today's percent is trivially small)

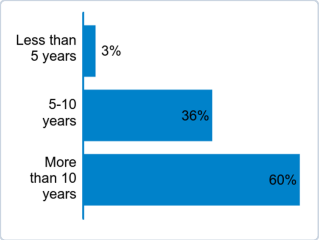


Response options	Count	Percentage
0-20%	19	25%
20-40%	**35**	**45%**
40-60%	20	26%
60-80%	2	3%
>80%	1	1%

27%
Engagement

77
Responses

14) When will non-lithium-based batteries (e.g., sodium ion, flow batteries…) become widespread (i.e., 10's of GWh yearly production capacity) for vehicle or grid applications in the US?



Response options	Count	Percentage
Less than 5 years	3	3%
5-10 years	31	36%
More than 10 years	**52**	**60%**

30%
Engagement

86
Responses