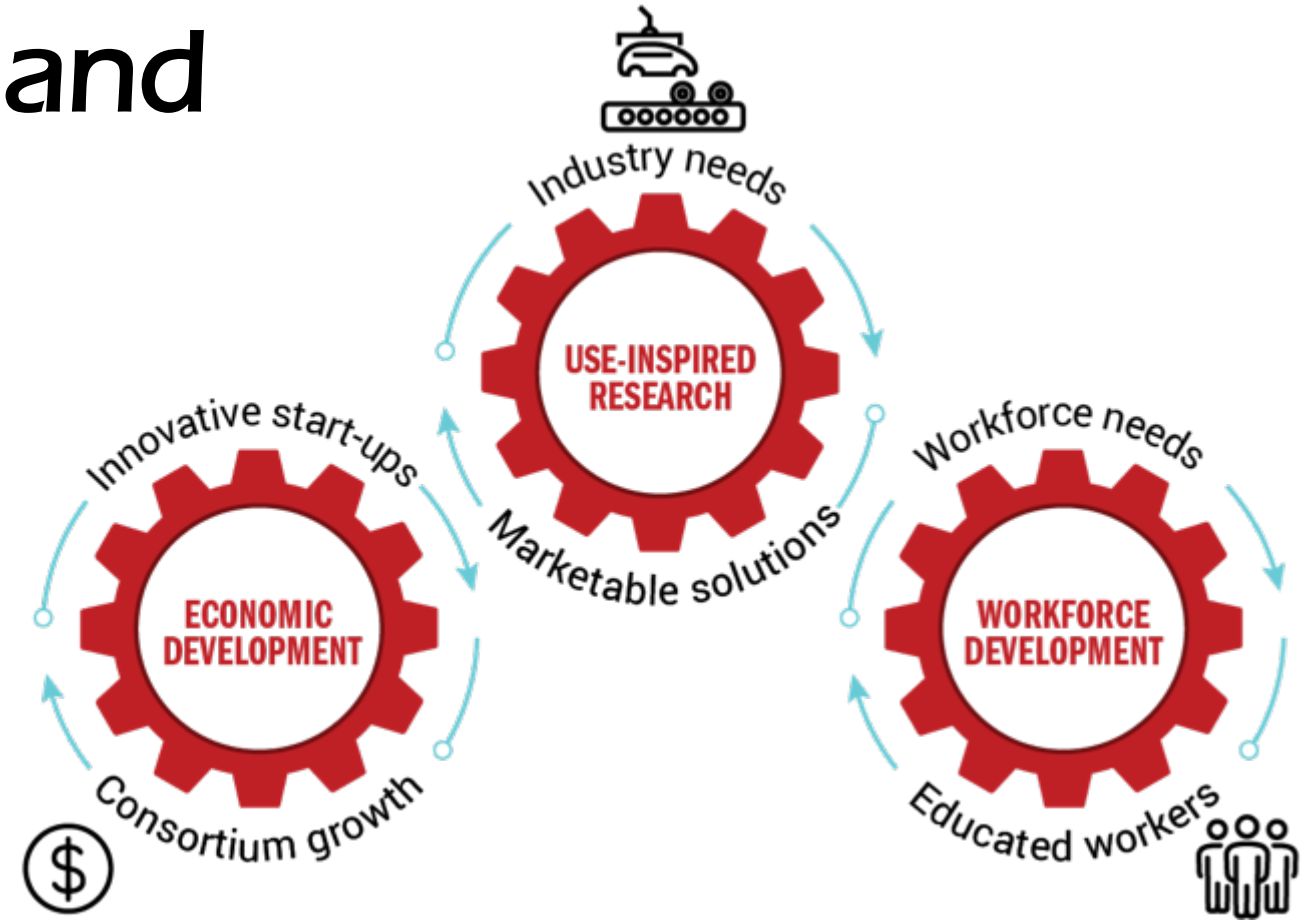
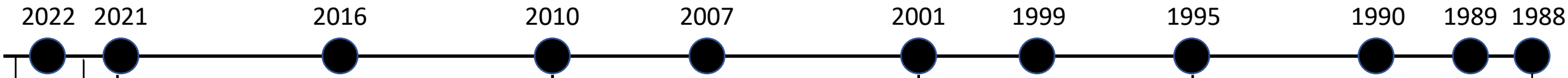
Alabama Mobility and Power center

Mike Oatridge

Executive Director AMP



Michael Oatridge



Executive Director – Alabama Mobility and Power Center
08/2022 - Current
- Develop and implement strategies to support EV adoption in the USA
- Develop Battery research center in Alabama
- Develop Grid infrastructure research center
- Drive workforce initiatives to support economic development opportunities

Strategic Workforce Solutions | Birmingham President/Owner
06/2021 – 07/2022
- Develop and implement strategies to interest potential workforce candidates to seek out opportunities in Alabama
- Developed public and private partnerships to ensure funding of over $4,000,000 for the development of ALEX systems and software
- Partnered with The World Games to capitalize on the unique opportunity the games offer to showcase the State of Alabama

Honda Motor Company North America
•*02/2016 - 01/2021*
- Controlled company operations more than 1.2 billion dollars annually.
- Spearheaded strategic benchmarking initiative to gain insight regarding plans and strategies towards EV
- Provided leadership of Honda's Light Truck Steering committee to create a long-term strategic electrification plan

Honda Manufacturing of Alabama | Lincoln, Alabama
Vice President of Manufacturing Operations
02/2010 - 02/2016
- Managed all areas of Honda Manufacturing of Alabama including New Model development, Logistics, manufacturing, safety, inventory control and process implementation, achieving over 97% productivity while increasing output from 270,000 units per year to 360,000 units per year
- Worked with Plant managers to implement company's policies and goals.
- Collaborated with design team members on product enhancements and features, including HEV, PHEV and BEV requirements

Honda Manufacturing of Alabama | Lincoln, AL
Plant Manager Plant 2
02/2007 - 02/2010
- Provided leadership strategies and methods to produce the first Hybrid SUV for Honda to be produced on the same line as ICE products

Plant Manager Plant 1
06/2001 - 02/2007
- Improved workflow processes to maximize resulting in stable production characteristics capable of producing 700 vehicles a day

Honda Manufacturing of America | Marysville, OH
Strategic Planning
02/1999 - 02/2001

- Directed preparation of a Light truck position for the company, including manufacturing options and plant configurations

Honda Motor Co | Siatama, Japan
M.A.P.L.E. Project
06/1995 - 02/1997

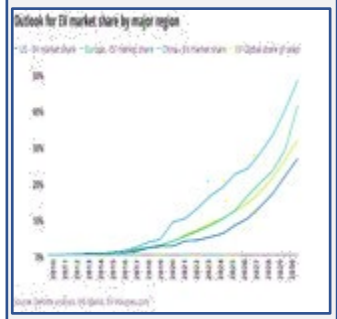
- Assigned to the MAPLE project (Minivan for the America's Produced though Lean Engineering), to enter the light truck market in the USA
- Worked in Japan, to develop Honda's first light truck product and manufacturing methods resulting in 2 U.S. patents

- **Honda Ontario Canada**
- **Honda Torrance California**

Mechanical Engineer
- Toronto Metropolitan University

EV eco-system consideration

EV Consumers



EV sales in 2030 are estimated to be:

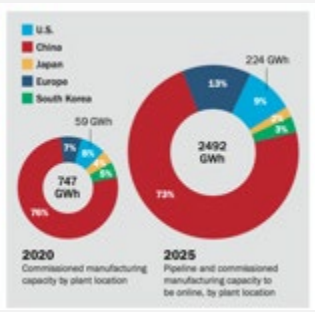
Low forecast - 320,000 units
(2% of new vehicle sales)

Medium forecast – 2,200,000 units
(12% of new vehicle sales)

High forecast – 6,800,000 units
(40% of new vehicle sales)

DRIVE Summary Report on EVs at Scale and the U.S. Electric Power System - November 2019 hppt://energy.gov

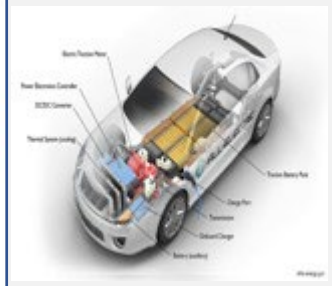
Raw Materials



Battery industry growth globally

325% growth in 5 years

Component manufacturing



BEV module structure offers R&D opportunities

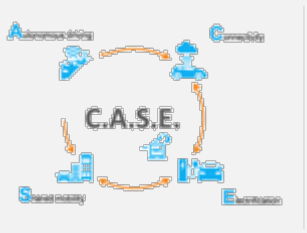
1. Energy Storage

EV battery technologies related to cost, production, capacity, charging, range and recycling

2. Drive systems

EV drive technologies such as the electric motor, drive train and power control systems.

OEM manufacturing



Additional work required due to CASE technology is can be absorbed through modular assembly. This will allow the manufacturing line to remain intact and in production.

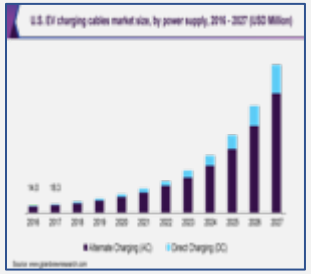
This is an opportunity for Economic development near existing O.E.M.s

Aftermarket service

Aftermarket workforce

- Fire fighters
- EMT
- First responders
- EV technicians
- Level 1~ 2 residential chargers
- Level 3 public chargers
  - Installation
  - Maintenance

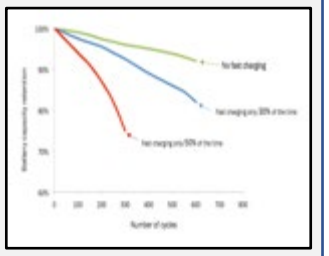
Power distribution



Projected growth of AC (level 2) and DC (level 3) chargers in the US. Projected growth of approximately 300% in 5 years

Power demand and availability will be heavily influenced by charging methods and load equalization though predictive state of charge applications.

Material recycling

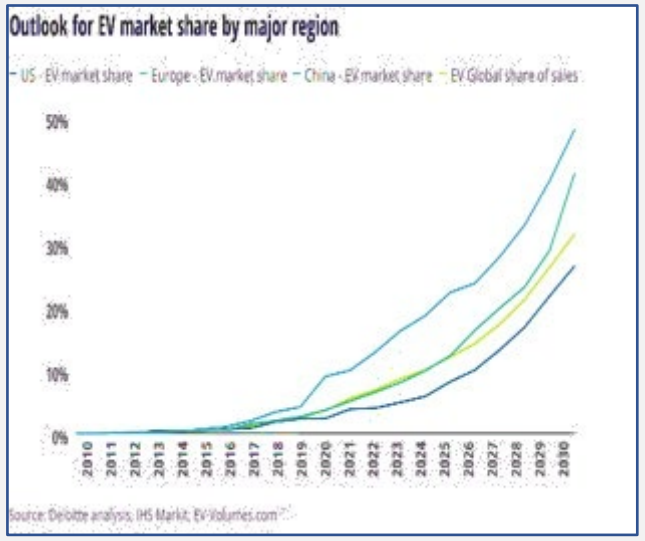


Although most EV batteries have not reached EOL, cell degradation is an inevitable outcome.

A comprehensive EV strategy must also encompass this outcome.

EV Adoption trends

EV sales forecast



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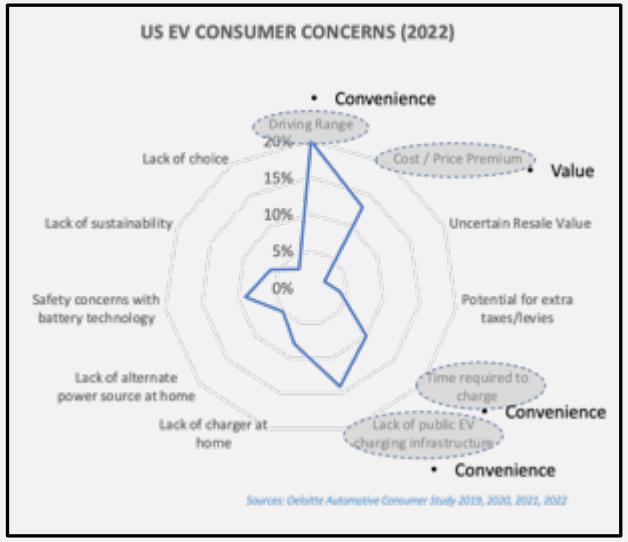
EV consumer concerns



US EV consumer concerns:

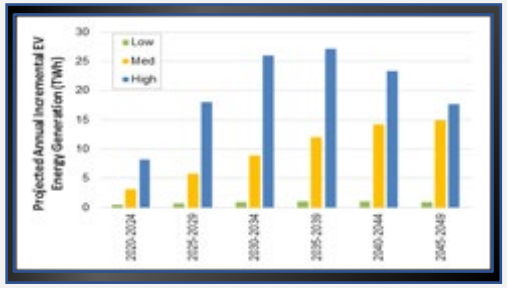
- Driving range
- Affordability
- Charging Infrastructure
- Charging time

- Utility Company concerns
  - Grid loading
  - Load balancing

Variables

Charging Infrastructure

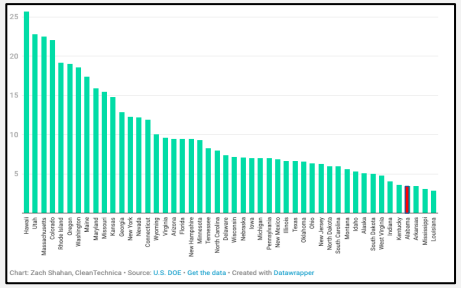
Power stability



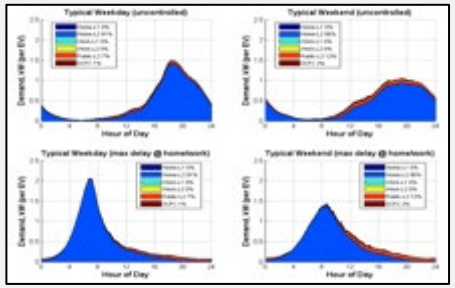
EV range

EV affordability

Outlook

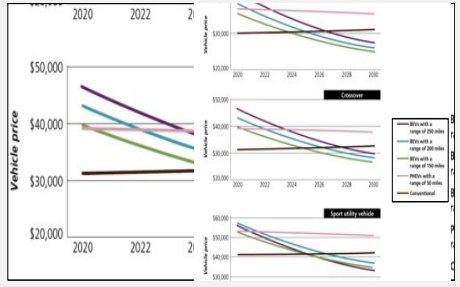


Focus area



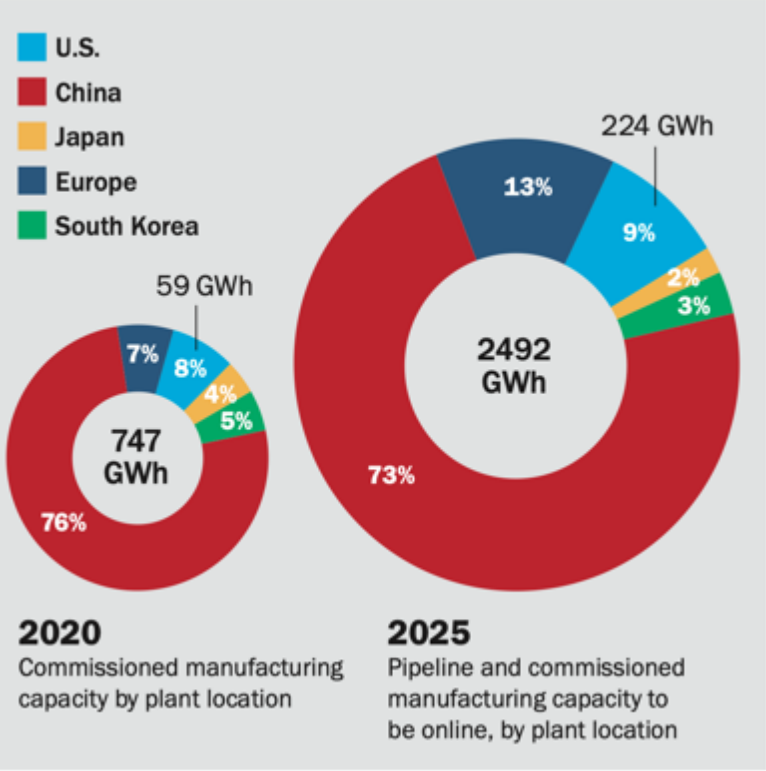
Focus area

Parity in 2 years



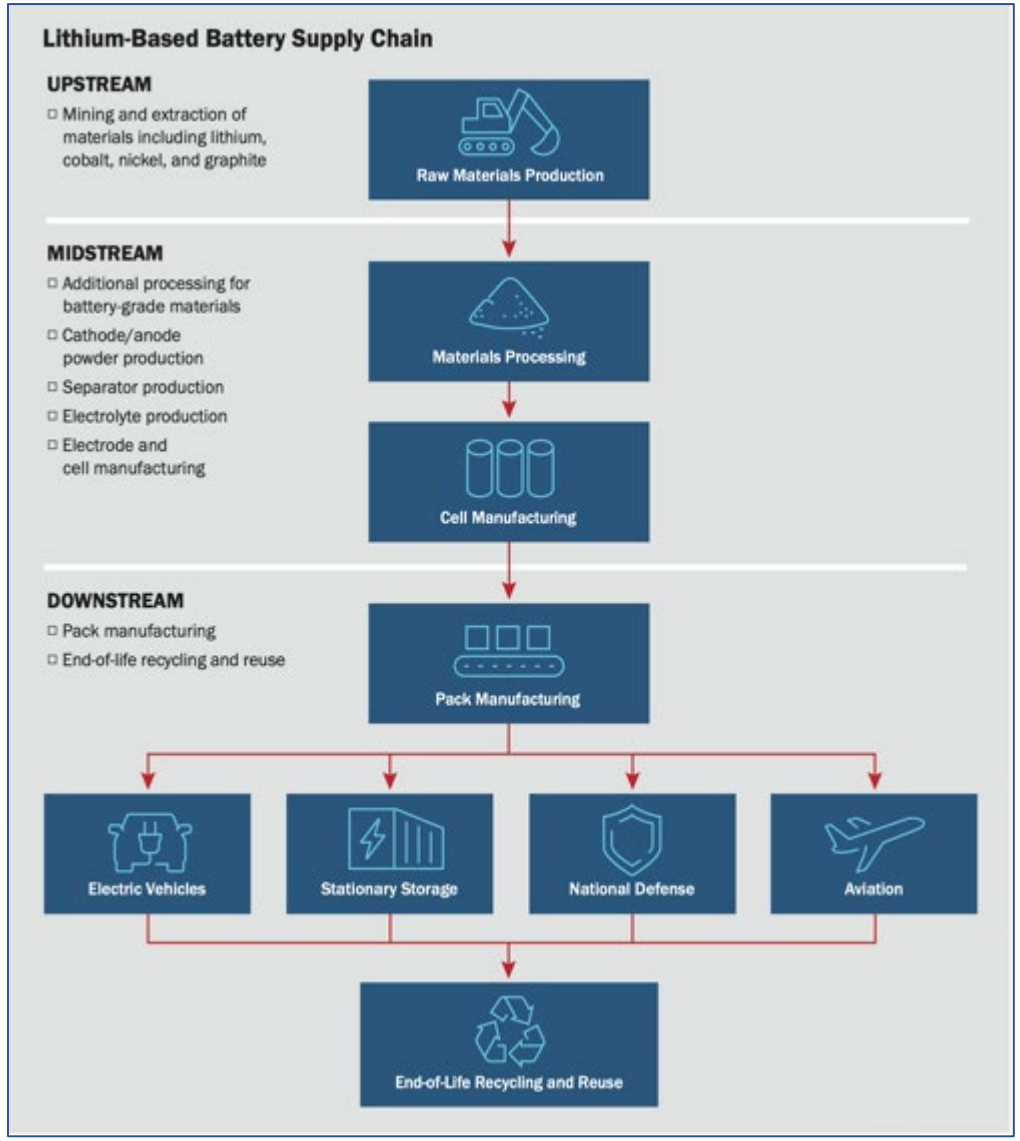
Parity in 3 years

Raw Materials



Country	Cathodes Manufacturing (3 M tons)	Anode Manufacturing (1.2 M tons)	Electrolyte Solution Manufacturing (339,000 tons)	Separator Manufacturing (1,987 M sq. m)
United States	—	10%	2%	6%
China	42%	65%	65%	43%
Japan	33%	19%	12%	21%
Korea	15%	6%	4%	28%
Rest of World	10%	—	17%	2%

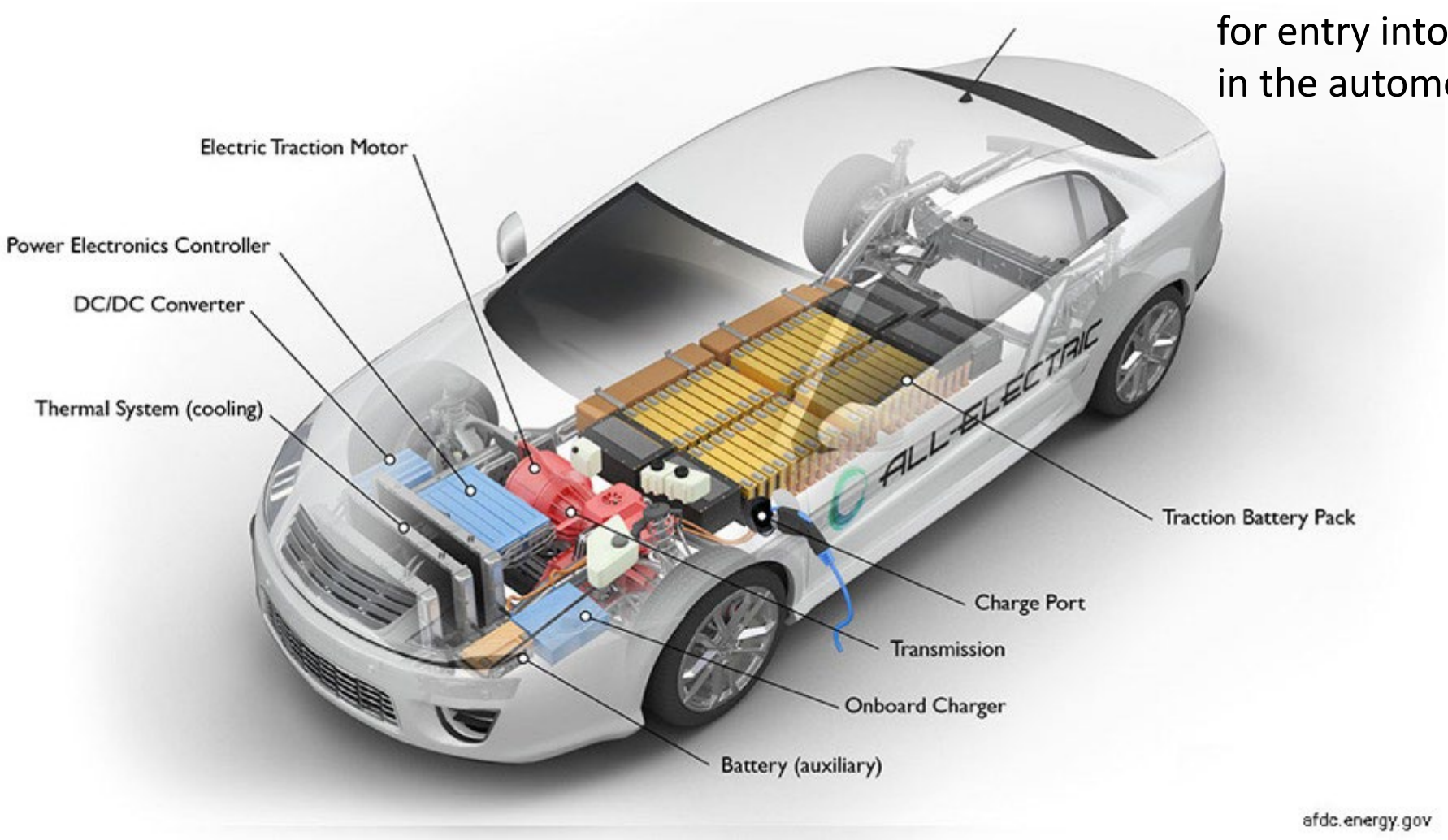
Source: BloombergNEF, Battery Components Manufacturing Asset Map 2019, Accessed March 15, 2021.



Alabama is positioned to become the national graphite mining and processing leader.

Alabama's Coosa, Bama Mine and Ceylon graphite projects give the State a unique advantage in natural graphite production once the mines become operational. According to the USGS, the United States does not have any domestic graphite mines as of 2021[3]. In 2019 the US imported 50,300 metric tons for applications such as batteries, brake lining, and lubricants. Natural graphite is a key chemical for electric vehicle battery production.

Component manufacturing



BEV module structure offers opportunities for entry into the research and development in the automotive sector.

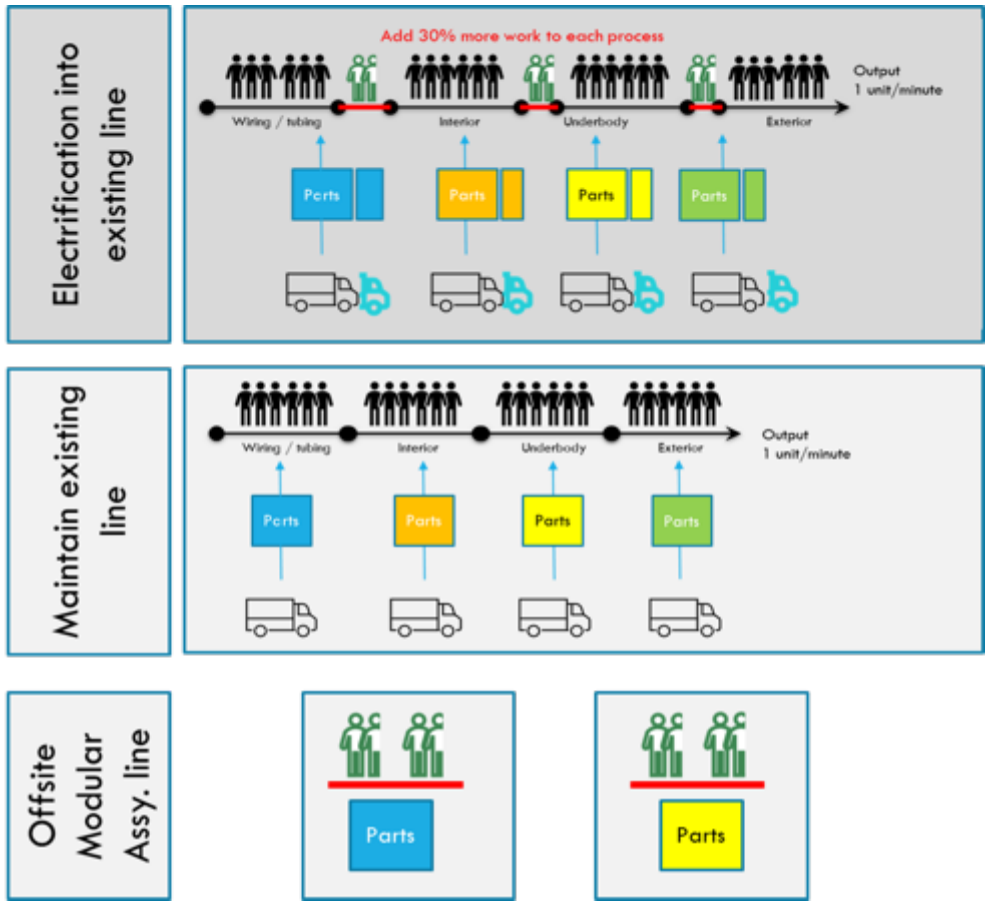
1. Energy Storage

EV battery technologies related to cost, production, capacity, charging, range and recycling

2. Drive systems

EV drive technologies such as the electric motor, drive train and power control systems.

OEM EV manufacturing



Additional work required due to CASE technology is can be absorbed through modular assembly. This will allow the manufacturing line to remain intact and in production.

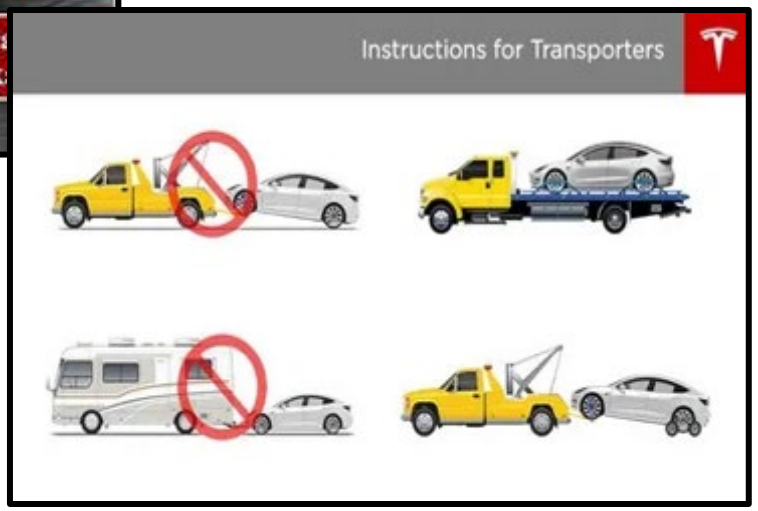
This is an opportunity for Economic development near exiting O.E.M.s

Aftermarket service

- Fire fighters
- EMT
- First responders

- Level 1~ 2 residential chargers
- Level 3 public chargers
  - Installation
  - Maintenance
  - Troubleshooting

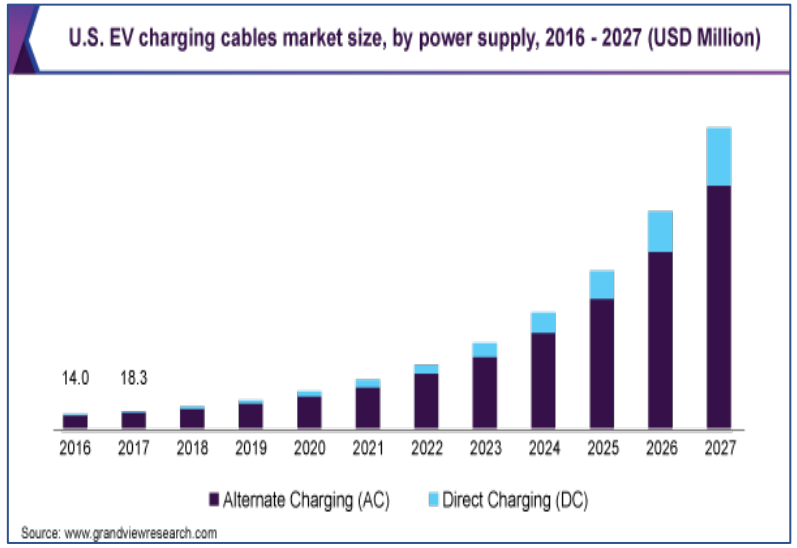
- Automotive technicians
  - Maintenance
  - Troubleshooting
  - Power storage
  - DC to DC
  - On board charging
  - High Voltage



- Roadside service
  - Towing
  - Emergency removal

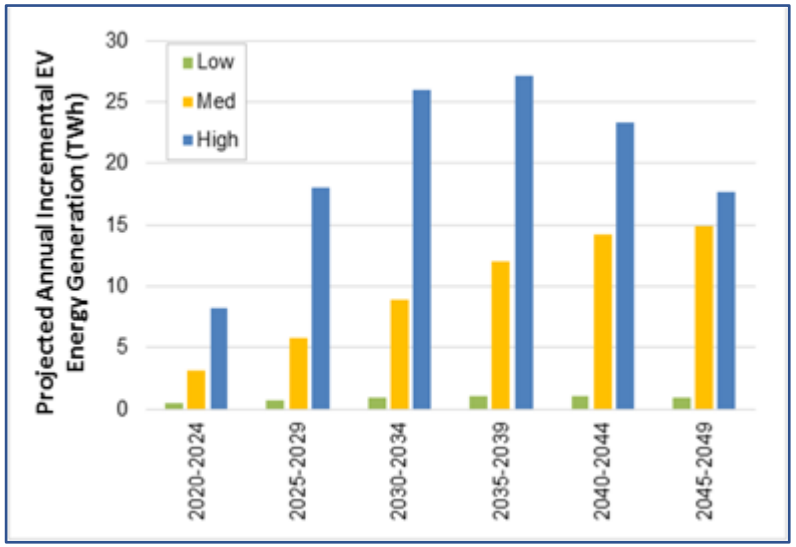
Power distribution

EV charger forecast



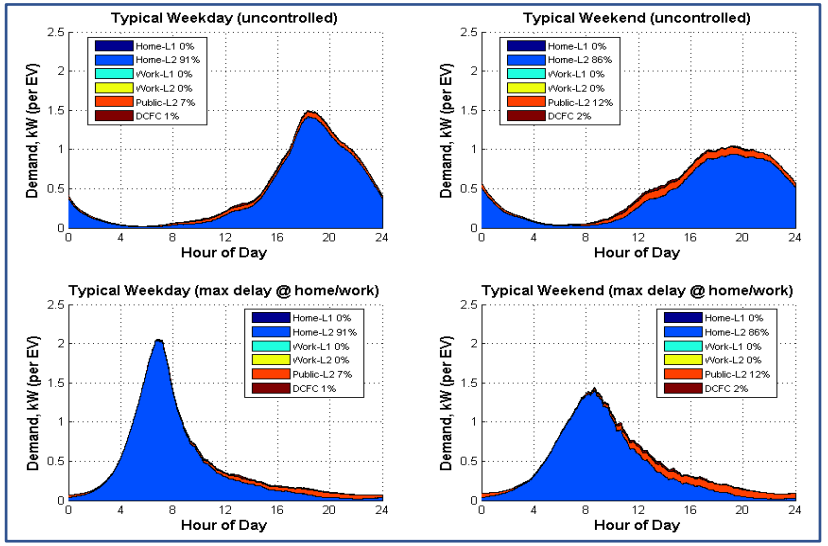
Projected growth of AC (level 2) and DC (level 3) chargers in the US. Projected growth of approximately 300% in 5 years

Additional un-mitigated load



Projected annual incremental energy generation to support EVs, averaged to five-year periods for the low, medium, and high market penetration scenarios.

Mitigation forecast



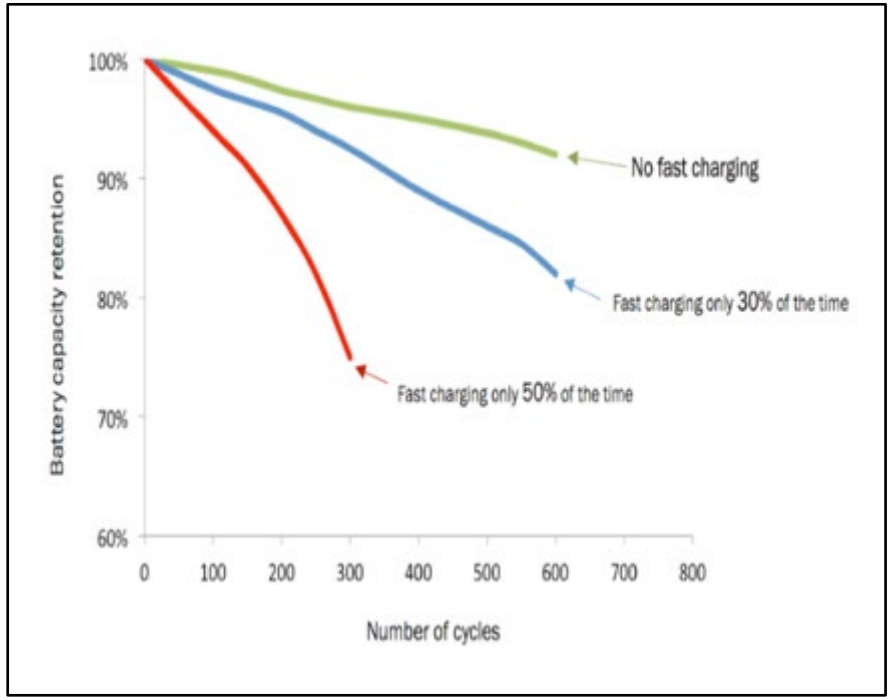
Demand left uncontrolled will lead to spikes in demand. Systems must be put in place to equalize the load though out the day.

Power demand and availability will be heavily influenced by charging methods and load equalization though predictive state of charge applications.

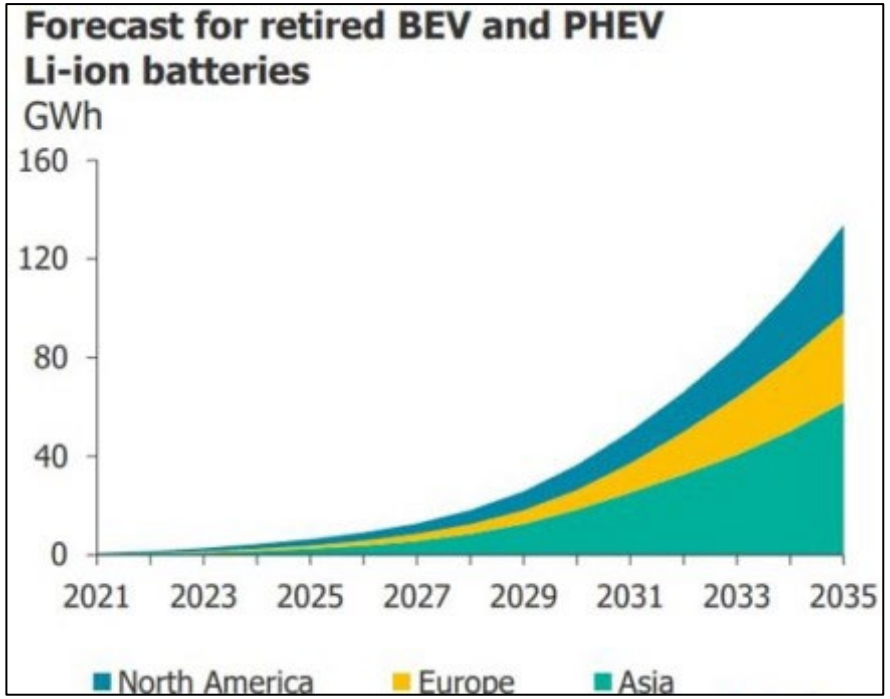
source: energy.gov

Material recycling

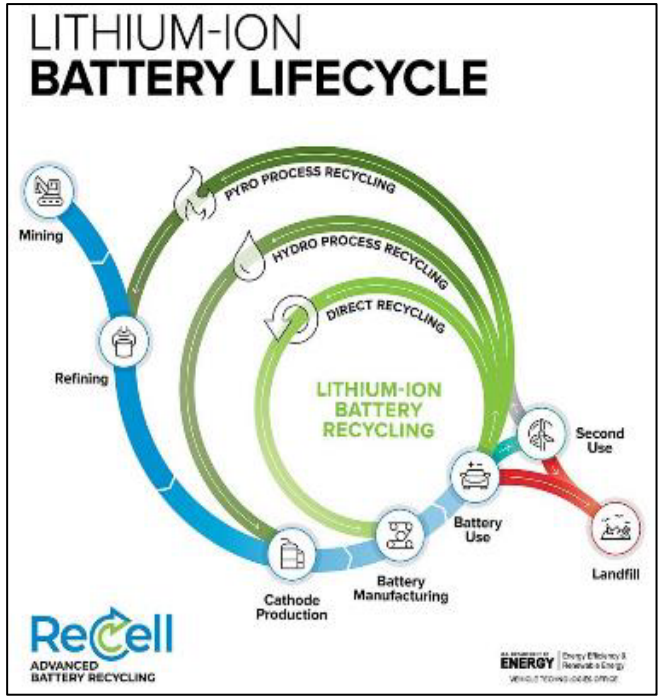
EV Battery degradation



EV end of life forecast



EV material recovery

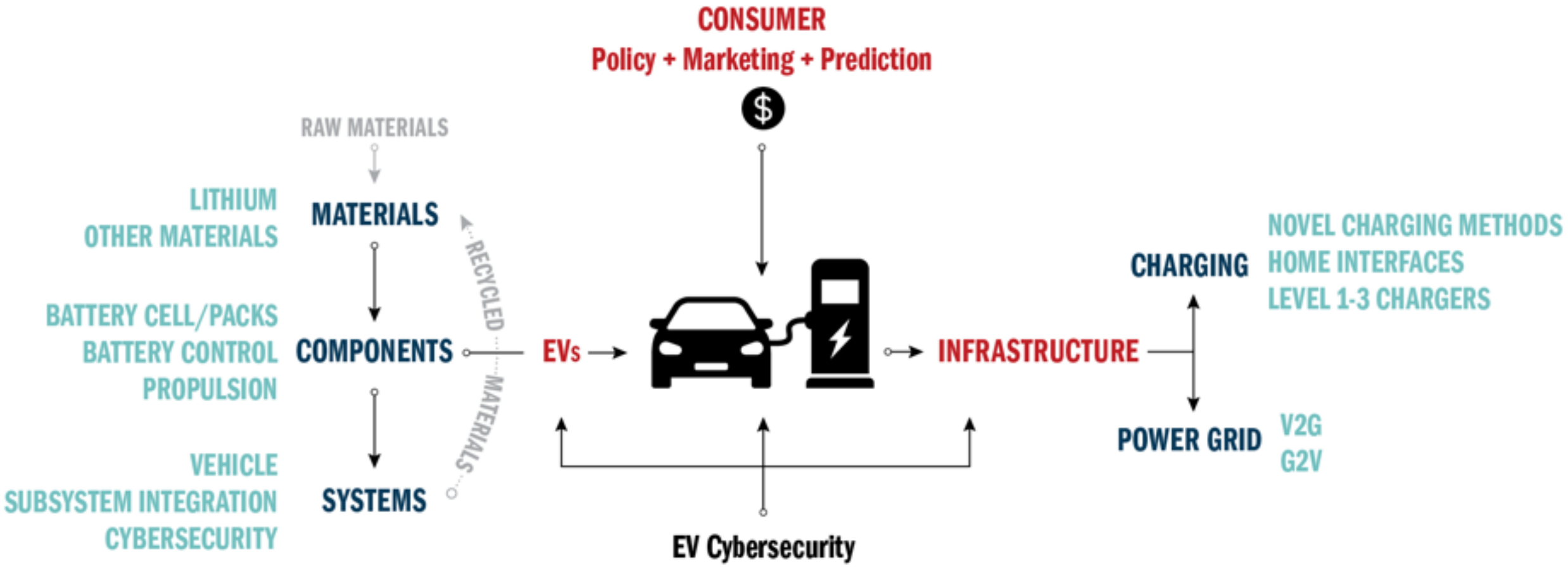


Although most EV batteries have not reached EOL, cell degradation is an inevitable outcome.
A comprehensive EV strategy must also encompass this outcome.

Sources: 1) ReCell. 2) QNOVO

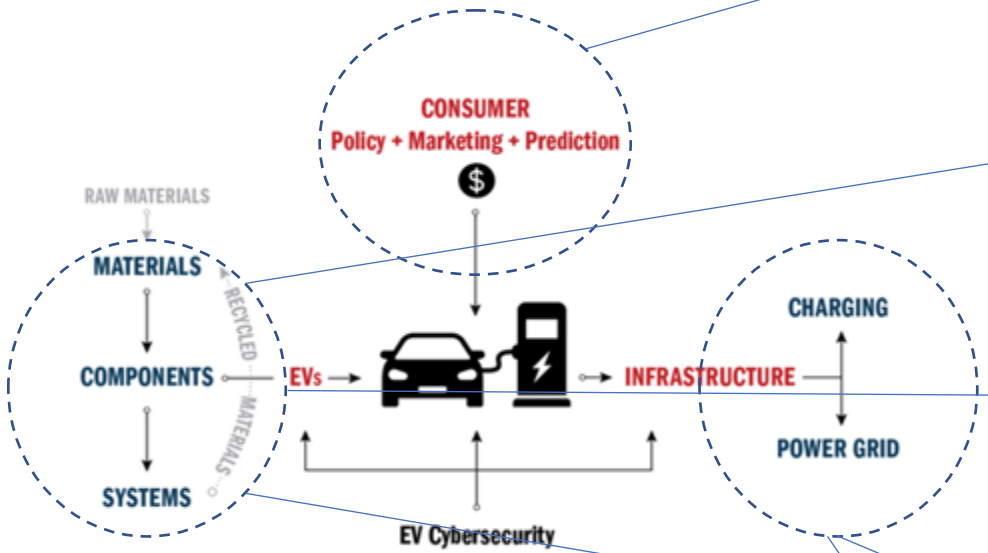
THE UNIVERSITY OF ALABAMA | Alabama Transportation Institute
Alabama Mobility and Power Center

Electric Vehicle Eco-system

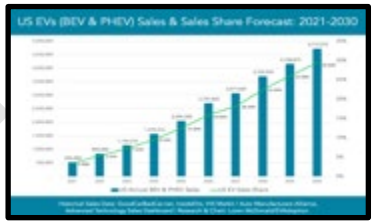


All areas of the EV eco-system offer economic development growth opportunities
Consumers behavior will determine the extent and scope of the opportunities.

AMP Center Strategic plan linkage to Economic Development potential



EV eco-system Economic Development opportunities and scope

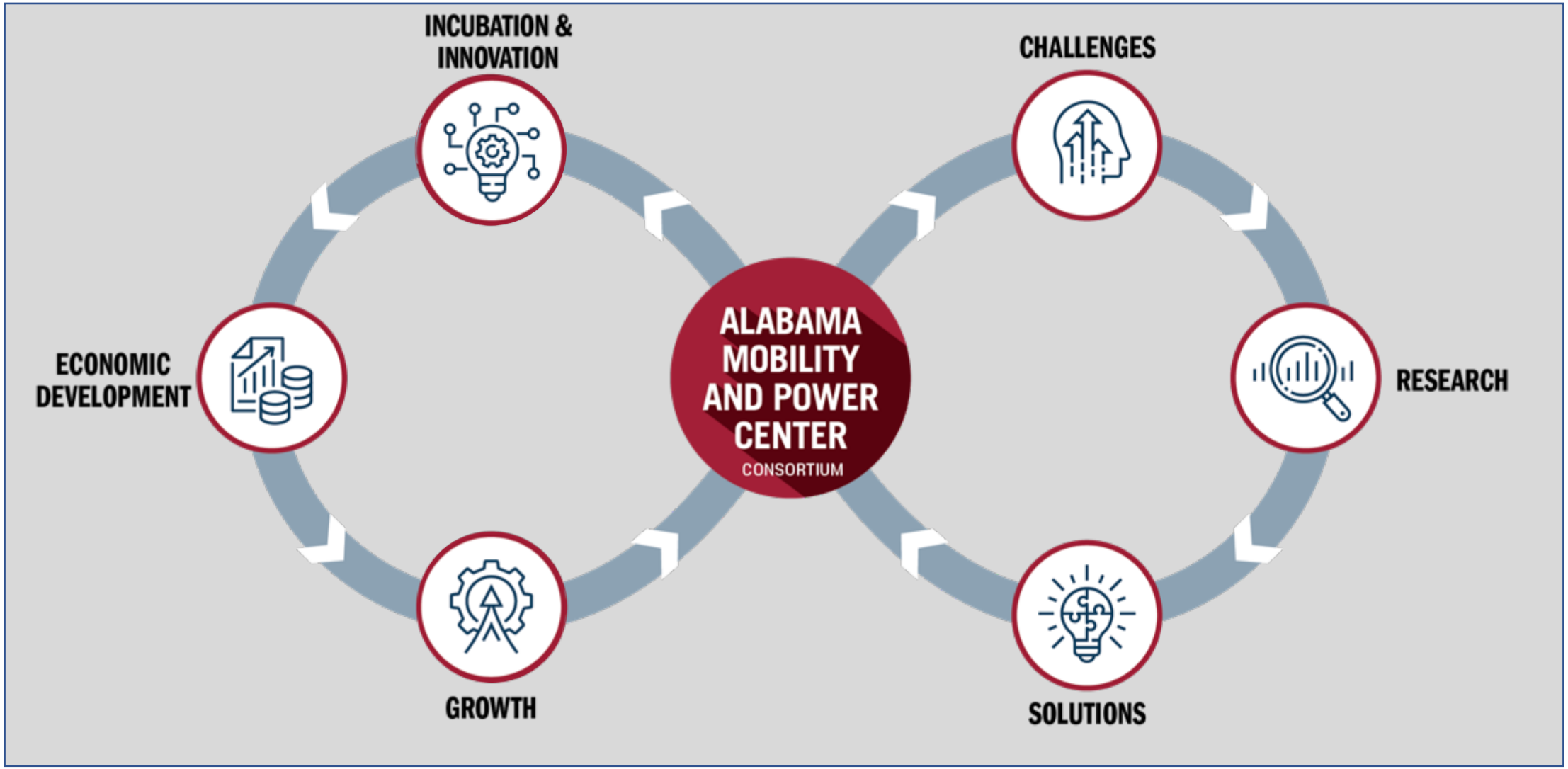
Target sector		Industry prediction
Enabler: BUSINESS INTELLEGENCE RESEARCH	Market growth	
BATTERY INDUSTRY OPPORTUNITIES	Industry Growth	
BATTERY RECYCLING OPPORTUNITIES	Industry Growth	
BATTERY MANAGEMENT OPPORTUNITIES	Industry Growth	
POWER DISTRIBUTION OPPORTUNITIES	Usage growth	

Economic opportunity

2020 – 2030 forecast

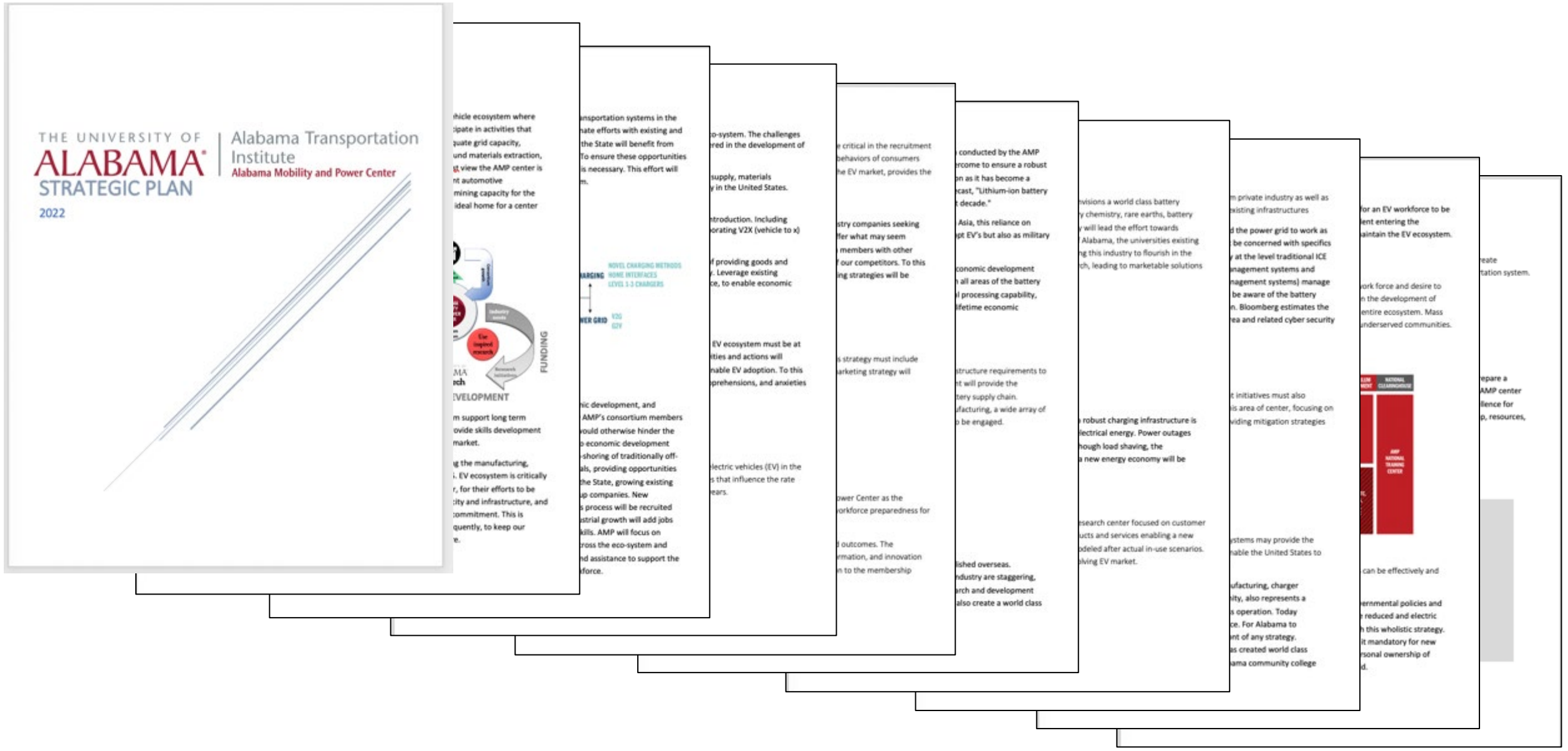
2020 Market value	2030 Market value	CAGR
50B$	225B$	18.9%
4.1B$	37.3B$	30.5%
4.2B$	21.1B$	20.45%
35.8B$	417B$	35.25%

Forecasted **606B$** economic Development in the US in 10 years

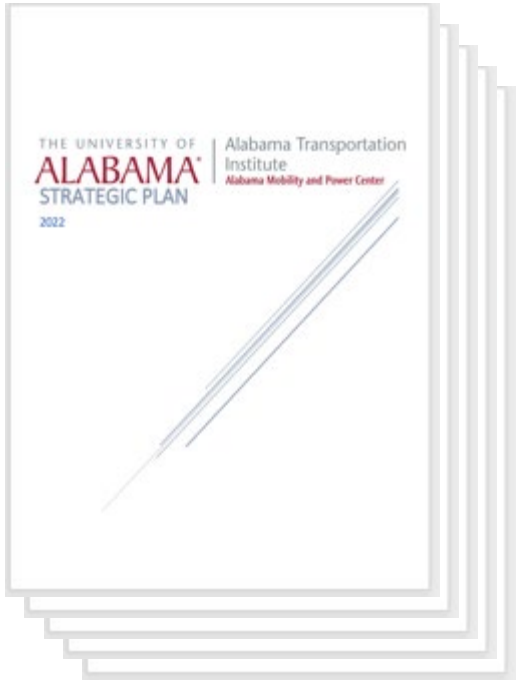


WORKFORCE DEVELOPMENT

Alabama Power and Mobility Center 5yr Strategic plan



Alabama Power and Mobility Center 8 Strategic initiatives



Action Item 1.0

Market Analysis / Business Intelligence

Develop a robust forecasting tool to predict the adoption rates of personal electric vehicles (EV) in the State of Alabama. This tool would allow input and analysis of critical variables that influence the rate consumers adopt EV's, resulting in a forecast of EV adoption in the next 15 years.

Action Item 2.0

Consortium Value and Membership

Develop a marketing strategy for the AMP Center. This strategy includes several key components to ensure the long-term success of the center. The consortium will promote the Alabama Mobility and Power Center as the premier center for research and development, economic development, and workforce preparedness for EV's in the nation.

Action Item 3.0

Domestic Battery Industry Strategy

Create a statewide task team to identify, components, skills, capital and infrastructure requirements to effectively sustain battery production in the state of Alabama. This assessment will provide the framework for Alabama to effectively and profitably interact in the global battery supply chain.

Action Item 4.0

Domestic battery research hub

AMP envisions a Laboratory for Advanced Battery Component Research center, a world class battery research and industrial incubator. This center, focusing on the battery chemistry, rare earths, battery cell manufacturing, battery packs, as well as spent materials recovery will lead the effort towards domestic battery sustainability.

Action Item 5.0

Robust Charging Infrastructure

Develop and fully utilize AMP's testing facility. This state-of-the-art research center focused on customer use of stored energy will provide a test bed for development of products and services enabling a new energy economy. Initial testing equipment and capabilities will be modeled after actual in-use scenarios.

Action Item 6.0

Battery management system research and business incubation

The AMP battery research center along with industrial battery development initiatives must also develop BMS software to facilitate a smooth transition to electrification. This area of center, focusing on IT solution will lead the effort towards EV market saturation, while also providing mitigation strategies for growing grid demand, the new electric economy and standardization.

Action Item 7.0

EV ecosystem Workforce Development

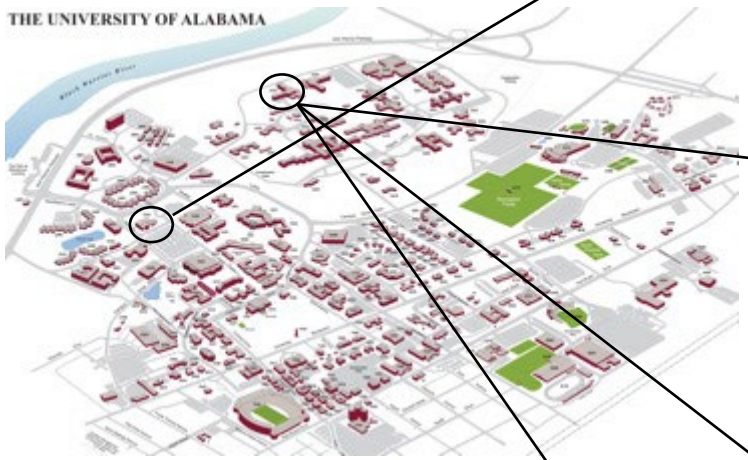
The AMP Center will focus on the development of programs, systems, and facilities to train and re-train individuals spanning the entire ecosystem. Mass adoption of EV's will enable development of innovative programs focused on underserved communities. Social equity should be at the forefront of any workforce initiative.

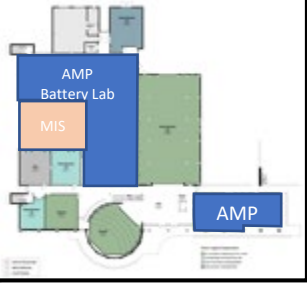
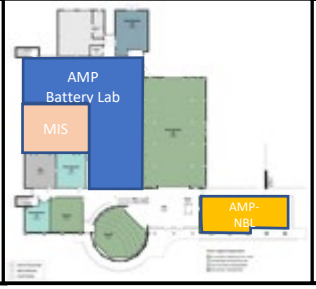
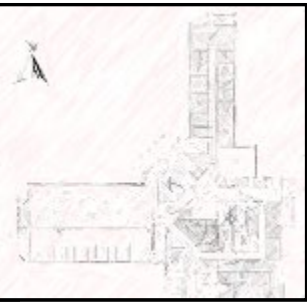
Action Item 8.0

EV policy and regulation

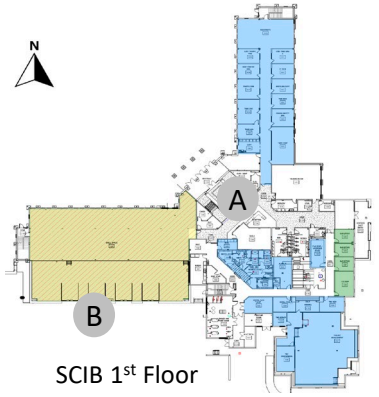
The AMP center will leverage policy experts from the public and private sectors to help create regulations and laws including taxation strategies that can support an electrified transportation system

AMP Center on site facilities at the University of Alabama



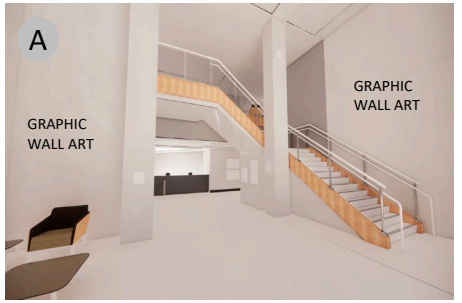
	January 2023 #1,2,3,7,8		August 2023 # 4		November 2023 # 1,2,3,5,6,7,8	
AIME 1st Floor		 Temporary - AMP OFFICE 1. Mike Oatridge - Executive director 2. Kim Harbin – Administration 3. Consortium Leader 4. Battery lab leader 5. Power distribution leader		 Permanent National battery lab - AMP 1. Cathode development 2. Separator development 3. Anode development 4. Cell manufacturing 5. Pack manufacturing		Permanent National battery lab - AMP 1. Battery lead 2. Cathode lead 3. Anode lead 4. Cell lead 5. Pack lead Battery management systems- MIS 1. Software development
SCIB 1st Floor		Under Construction		Under Construction		Power economy canter 1. Grid Stability 2. Power distribution 3. Charger infrastructure 4. Customer interface 5. Transactional Energy Economy
SCIB 2nd Floor		Under Construction		Under Construction		Permanent - AMP OFFICE 1. Mike Oatridge - Executive director 2. Kim Harbin – Administration 3. Consortium Leader 4. Power distribution leader 5. Flex collaboration space
SCIB 3nd Floor		Shell only under construction		Shell only under construction		National Training Center 1. STEM 2. AMP NTC 3. Consortium Leader

AMP spaces at UA's Smart Communities and innovation building (SCIB)



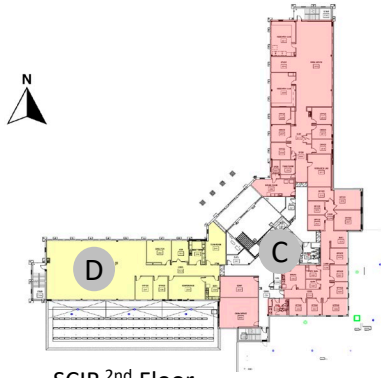
SCIB 1st Floor

Funding requested though State supplemental budget appropriation		
PROJECT NAME: Smart Communities And Innovation Building		
SCIB- AMP 1st Floor Build-out Preliminary Budget		
BUDGET ITEM		BUDGET
Construction - 1st Floor Buildout	$	1,350,000
Construction - Electrical Infrastructure	$	1,500,000
Contingency	$	285,000
A/E Design Fee	$	205,950
PM Fee	$	141,075
AV	$	250,000
Telcom/Data	$	50,000
Access Control	$	25,000
Furniture	$	200,000
Other Fees & Services	$	98,180
TOTAL PROJECT BUDGET	$	4,105,205



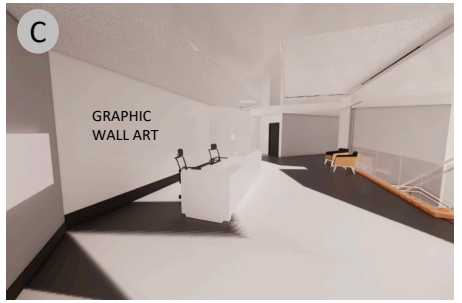
Main entrance with graphic wall art depicting power and mobility. Digital screens showing power distribution and sustainable energy

Power distribution and charging research area in 1st floor west wing (AC/DC/Solar)



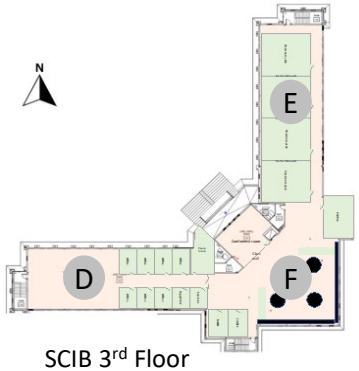
SCIB 2nd Floor

Included current scope no additional funding required



Second floor lobby entrance to AMP collaborative space and main offices with graphic wall art depicting power and mobility.

Second & third floor AMP collaborative space graphic wall art depicting power and mobility mainly white board spaces.



SCIB 3rd Floor

Funding requested though State supplemental budget appropriation		
PROJECT NAME: Smart Communities And Innovation Building		
SCIB 3rd Floor Preliminary Budget		
BUDGET ITEM		BUDGET
Construction	$	1,500,000
Contingency	$	150,000
A/E Design Fee	$	92,426
PM Fee	$	74,250
AV	$	295,178
Telcomm/Data	$	50,000
Access Control	$	40,000
Furniture	$	699,016
Other Fees & Services	$	68,740
TOTAL PROJECT BUDGET	$	2,969,610

Immersive display (F) estimated at an additional 800k

Third floor AMP training area flexible classroom spaces

Third floor AMP national training area innovative and flexible spaces

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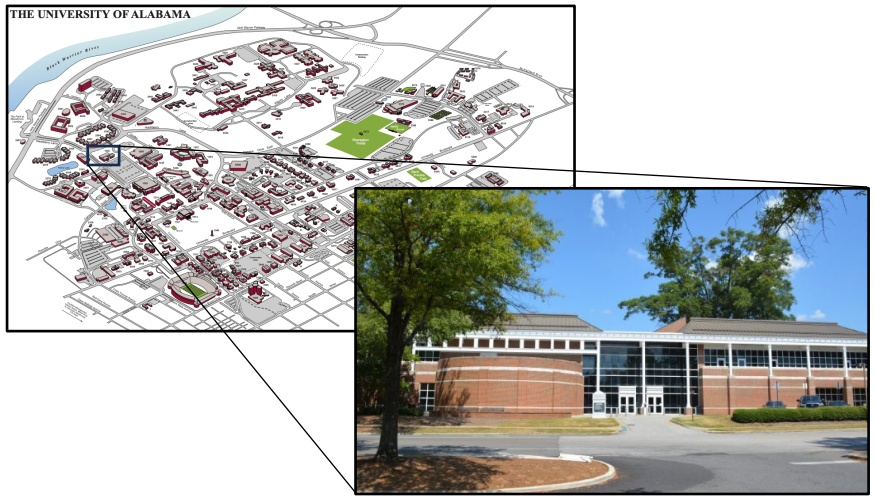
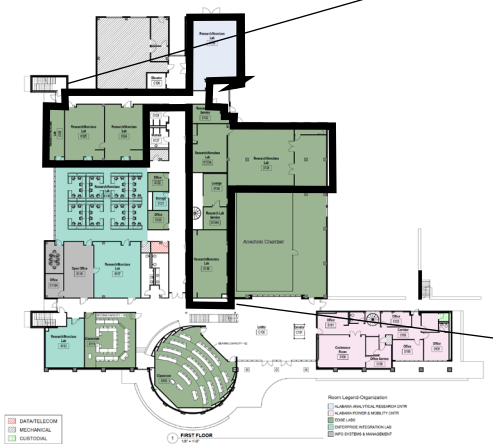
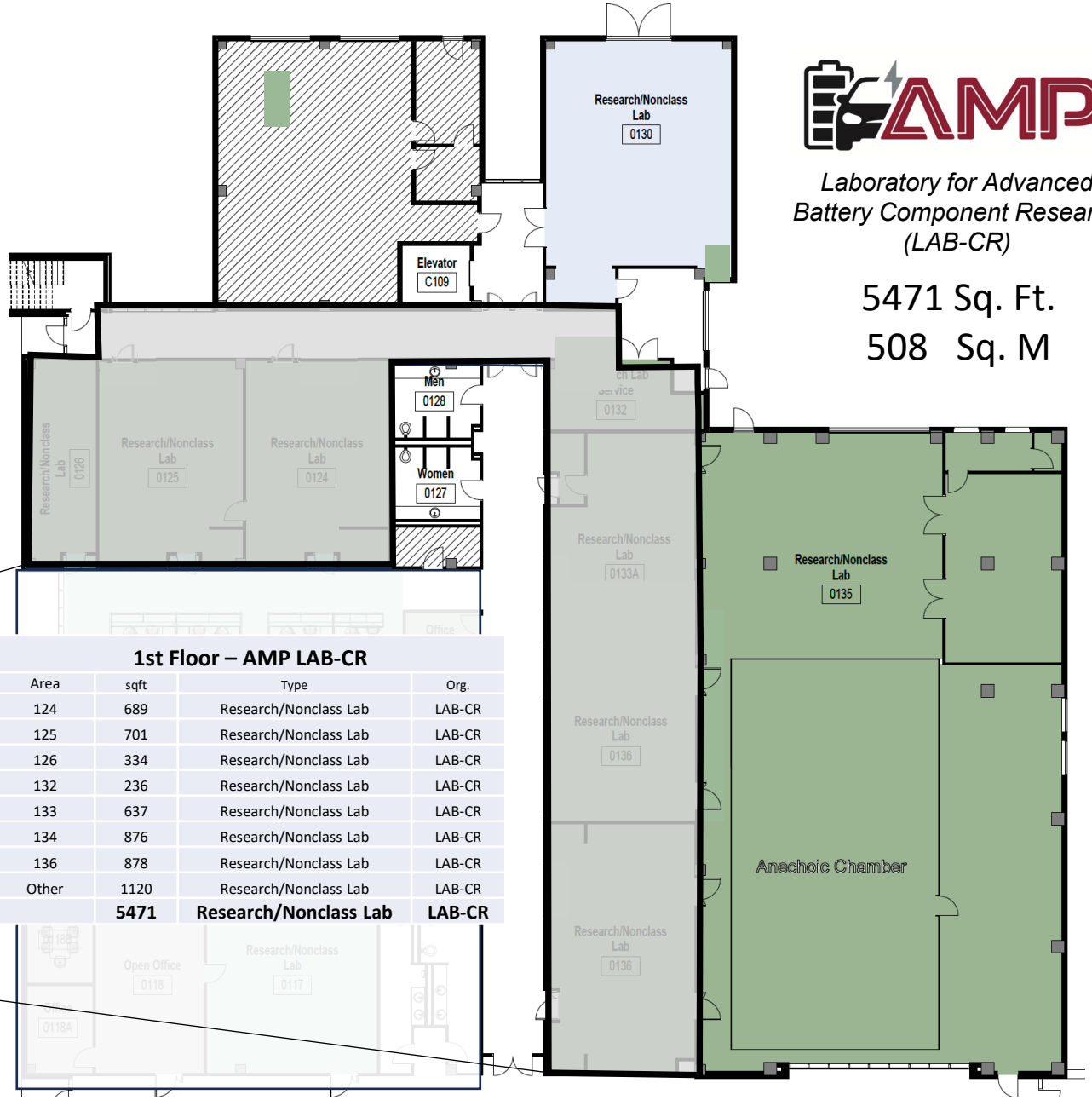




AMP

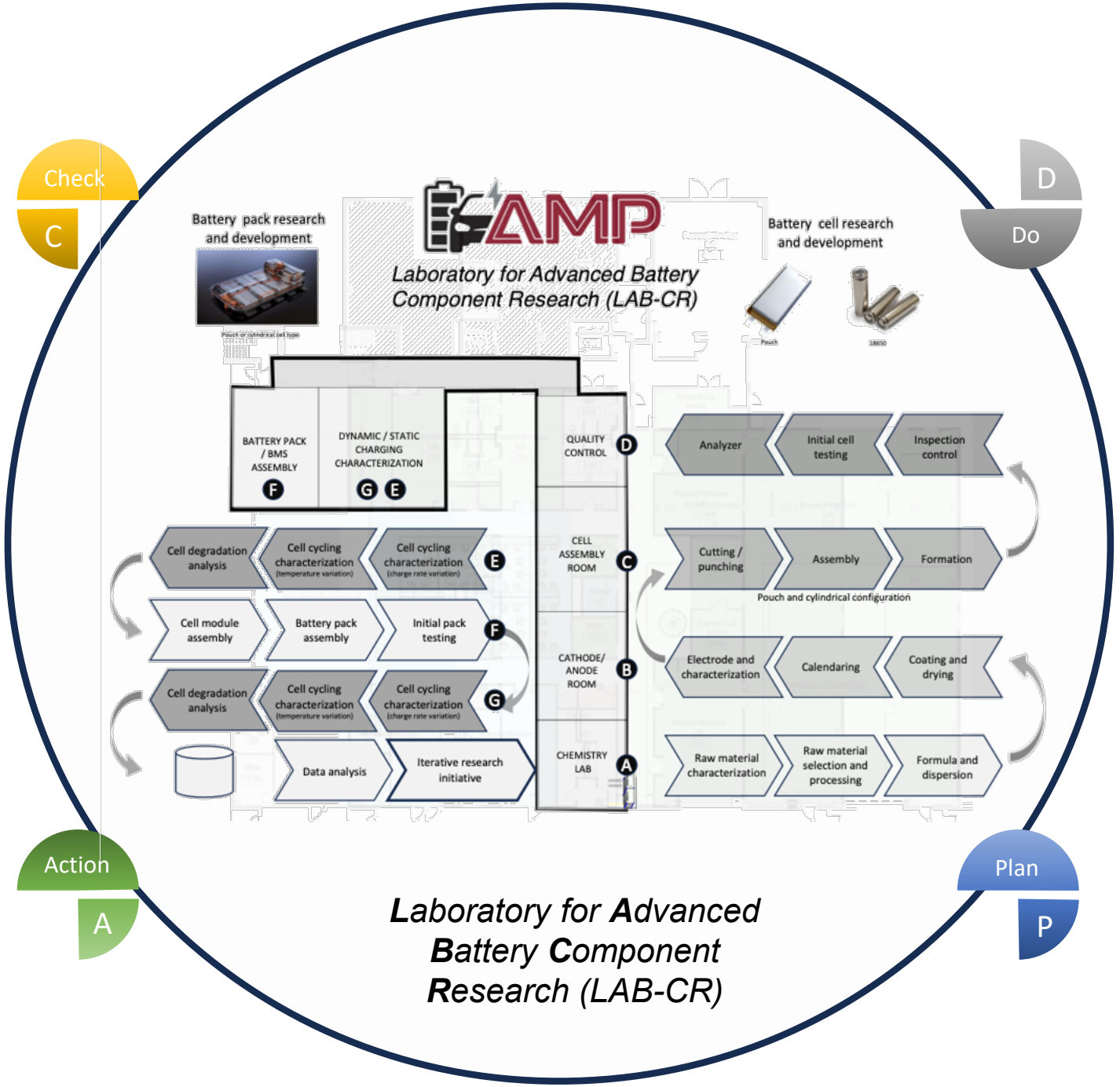
Laboratory for Advanced Battery Component Research (LAB-CR)

5471 Sq. Ft.
508 Sq. M



1st Floor – AMP LAB-CR

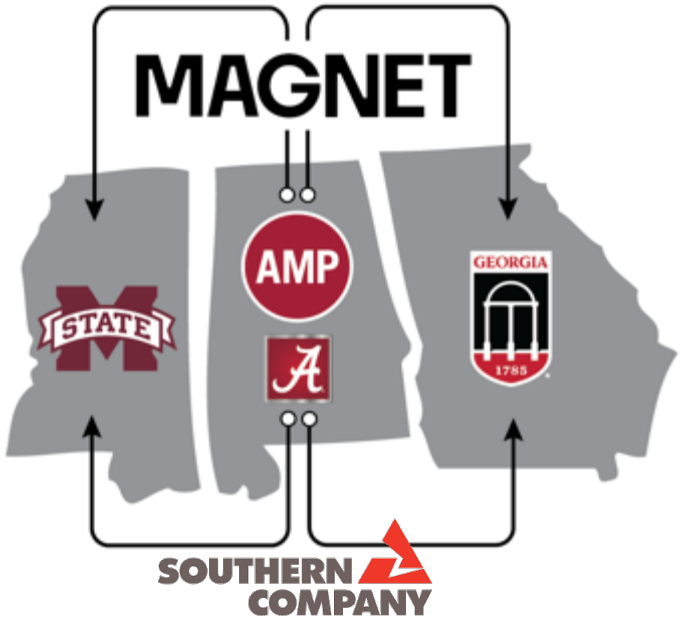
Area	sqft	Type	Org.
124	689	Research/Nonclass Lab	LAB-CR
125	701	Research/Nonclass Lab	LAB-CR
126	334	Research/Nonclass Lab	LAB-CR
132	236	Research/Nonclass Lab	LAB-CR
133	637	Research/Nonclass Lab	LAB-CR
134	876	Research/Nonclass Lab	LAB-CR
136	878	Research/Nonclass Lab	LAB-CR
Other	1120	Research/Nonclass Lab	LAB-CR
	5471	**Research/Nonclass Lab**	**LAB-CR**


Check
C
D
Do
Battery pack research and development
Laboratory for Advanced Battery Component Research (LAB-CR)
Battery cell research and development
BATTERY PACK / BMS ASSEMBLY
F
DYNAMIC / STATIC CHARGING CHARACTERIZATION
G E
QUALITY CONTROL
D
CELL ASSEMBLY ROOM
C
CATHODE/ ANODE ROOM
B
CHEMISTRY LAB
A
Analyzer
Initial cell testing
Inspection control
Cell degradation analysis
Cell cycling characterization (temperature variation)
Cell cycling characterization (charge rate variation)
E
Cutting / punching
Assembly
Formation
Pouch and cylindrical configuration
Cell module assembly
Battery pack assembly
Initial pack testing
F
Electrode and characterization
Calendaring
Coating and drying
Cell degradation analysis
Cell cycling characterization (temperature variation)
Cell cycling characterization (charge rate variation)
G
Raw material characterization
Raw material selection and processing
Formula and dispersion
Data analysis
Iterative research initiative
Action
A
Plan
P
Laboratory for Advanced Battery Component Research (LAB-CR)

UNDER REVIEW

Mississippi Alabama Georgia Network for Electric Vehicle Technologies

National Science Foundation



- **$1M planning grant, 2 years**
- $160M full grant, 10 years

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Alabama Mobility and Power Center

AMP MISSION

INDUSTRY, ACADEMIA & GOVERNMENT
working together focused on
RESEARCH
enabled innovation driving
ECONOMIC
and
WORKFORCE DEVELOPMENT
through understanding the needs of the
EV INDUSTRY

Join the AMP consortium

The AMP Consortium provides a collaborative environment for academia, industry, and the government to conduct innovative electric vehicle-focused mobility and power research.

amp.contact@ua.edu