Lithium-ion Car Battery Recycling Advisory Group Meeting Minutes July 16, 2020

1. **Call to Order, Roll Call, and Establishment of Quorum – Caroline Godkin**
   - Roll Call
     - Present:
       - Caroline Godkin
       - Teresa Bui
       - Mohammed Omer
       - Terry Adams
       - Dan Bowerson
       - Mark Caffarey
       - Todd Coy
       - Perry Gottesfeld
       - Steve Henderson
       - George Kerchner
       - Bernie Kotlier
       - Nick Lapis
       - Alison Linder
       - Geoff Niswander
       - Lou Ramondetta
       - Courtney Smith
       - Teija Mortvedt
       - Toshiya Fukui
     - No response:
       - Alissa Reinhardt
       - Jennifer Krill *(joined late)*
     - Quorum is established with 18 out of 20 members

   - What has changed since last meeting in January
     - New members have been added: Courtney Smith from the California Energy Commission, Toshiya Fukui from Honda Trading America, and Teija Mortvedt from Tesla.
     - Toshiya Fukui and Teija Mortvedt are to replace Jon Weisman

2. **Agenda Items and updates**
   - Mohammed Omer: Hello and welcome to new members. This live webinar will be recorded and available on the website after the meeting.

    - There will be opportunities to ask questions from committee members and members of the public. Protocol for asking questions: email or write in chat that you have a question
    - Minutes from the May 27th meeting are approved and will be put on the website.
- Perry Gottesfeld: China launched new battery recycling legislation last year titled, “The Interim Measures for the Management of Recycling and Utilization of Power Batteries for New Energy Vehicles”. Does anyone have a translation in English?
    - Alissa Kendall: We can have it informally translated by a member of the UC Davis research group.

3. Fair Political Practice Commission – Salwa Bojack

- Five-member nonpartisan commission- conflict of interest laws for persons on state lobbies
- FPCC regulations require that state bodies develop conflict of interest codes.
    - Designated employees are required to file form clarifying financials
    - Conflict of interest code is not required if there is no designated employee; the 2832 Advisory Group requested an exemption based on meeting specified criteria.
    - Exemption approved Jan 14, 2020, pending public comment or request for reconsideration.
    - No comments were submitted, and the approval/exemption continues to stand. Approval remains effective until the end of 2-year period and can be extended if nothing has changed re: Advisory Group meeting criteria.
    - So, the Advisory Group does not need to develop conflict of interest code, designate employees, or file a form 700 statement of economic interest.
    - Anyone who is concerned about a conflict should speak with CalEPA staff.
- Mohammed Omer: Since the first meeting we have created an agenda and scope/schedule to meet the needs of agenda meeting. Today’s meeting will focus on recycling pathways/technology. First presentation will be from Hanjiro Ambrose.

4. Presentation Material Recovery: Dr. Hanjiro Ambrose, Union of Concerned Scientists & UC Davis Institute of Transportation Studies

- Defining metrics:
    - Collection rate: amount collected and enter into recycling.
    - Recovery rate: proportion of collected material recovered in usable forms.
    - Recycling rate: proportion of total products recycled.
    - Recycled content: amount of recycled material in the manufacturing of a product.
- Material recovery from EV Batteries:

    - Half of the materials in a battery represent critical materials.
        - These are highest value inputs and therefore highest value outputs. The cathode is a small percent but the highest value recovery.
    - Increase in metal demand: 4-5X increase in lithium, 6-8X increase in nickel; these increases will become motivators for recovery.
    - The material availability and economics will drive the recovery. The selection of materials will hinge on the volume of batteries, materials, and supply and demand.
    - We are observing an increasing rate of exhaustion (static depletion rate in years is lower today than estimates from 2010).
- Potential Processes in battery material recovery:
    - Discharge & dismantling
    - Physical processes – mechanical pre-treatment
        - This includes dismantling, discharging, mechanical pre-treatment, and sorting.
        - Batteries must be removed before they can be shredded, although not necessarily to cell level.
    - Two classes of processes that can be applied to the pre-treatment. Either heat based (pyrometallurgy) or wet and chemical - leaching (hydrometallurgy).
    - Upstream processes - refining and synthesis. Needs to be considered for the materials to go back into the battery processing.
- Challenges of pyro and hydro:
    - Pyro: high fuel inputs, toxic flue gas that is intensive to treat, emission concerns. More economic but tradeoffs due to environmental concerns.
    - Hydro: reagent inputs, cost and tech dependent.
- Trends:
    - More hydro is being used but most are a combination of both processes. There are some good reasons why hydro is preferred given the high energy inputs and need to treat gasses.
    - The majority is a combination of the two. Moving forward, the potential for further development and design for higher yields will happen.
- Pathways:
    - There is an opportunity to enhance circularity through remanufacture and refunctionalization. Feeding those back into the process and avoiding the refining process.
    - Direct recycling and cathode refunctionalization has been seen effective. Showing high performance that is promising. There is a lot of opportunity for remanufacturing scrap to put back into the manufacturing process. The value of recovered materials will drive the economics of recycling.
- Policy considerations:

    - Design of material recovery infrastructure should encourage environmentally preferable approaches and best available control technology
    - Targeted incentives to address economic barriers
- Questions:
    - Perry Gottesfeld: If a company in the table only says mechanical, does that indicate that they are only doing pretreatment?
        - Hanjiro Ambrose: Yes, we think so.
    - Nick Lapis: Is pyro basically smelters? We know they have pretty big impacts on the community. How does that compare with hydro?
        - Hanjiro Ambrose: Yes, hydro won't have as big of impacts as a pyro facility. There are often requirements to treat gasses but there's also a lot of history of significant negative impacts to communities and environmental impacts. From the standpoint of impacts, there are less from hydro, although there are still some. We can provide papers looking at these impacts.
        - Nick Lapis: that would be helpful especially knowing the history of impacts from lead acid battery recycling.
    - Mark Caffarey: All battery recycling processes will use hydrometallurgical recycling; comparison should be between mechanical and pyro not pyro and hydro. There is a new facility under development in New York State we should keep our eye on. Recovered elements may be non-metallic; for example, Umicore uses the energy stored in the battery as an input into their recycling process. Does this count towards recovery? The European community doesn't think so. Is the recovery of heat?
        - Nick Lapis: In CA legislation energy is considered disposal and not recoverable.
    - Grayson McCall: Are these presentations available online?
        - Mohammed Omer: I will collect these presentations and send them to anyone who registered. For them to be available online we have to go through a process to make them available for all disabilities and it will take some time.
    - McKenzie Hubert (EDF): After you pretreat material, is this still considered hazardous material?
        - Hanjiro Ambrose: Once the battery is removed from the vehicle, it is considered hazardous waste until it is refined into a product for sale. Then it is no longer "waste" and governed under different regulations. Wastes from recycling process are considered hazardous waste
    - Mohammed Omer: Next is Li-Cycle, if there are no more questions.

5. Kunal Phalpher, Li-Cycle:

- Li-Cycle Overview:
    - Founded in 2016
    - Mechanical and hydro process. The mechanical is commercialized and in the process of commercializing the hydro process.
    - Goal is to bring more material supply from a secondary source (urban mining of batteries) and become sustainable and vertically integrated.
    - Currently in North America but opportunity is broader.
- Material demand/supply:
    - In the last ten years we have seen a strong growth in demand.
    - We focus on EVs but there are also electrics, other motive opportunities such as buses and trucks. Anything that moves can be electrified with LIBs.
    - There is always a discussion about removing cobalt but there is always cobalt even in NMC 811.
    - The question is usually, will there be enough batteries to recycle? Driven by the US and china. Over 9 billion dollars of materials left in these batteries in 2040. Solutions to access these batteries and get them to the end of the line, create a lot of value and offset mining.
    - There is a gap between location of manufacturing and the retirement of materials.
- Without Li-Cycle, what happens to batteries:
    - Exported, sent to landfills.
    - Reuse: falling battery costs eroding the business case; bringing materials back into value chain is more valuable than reusing the battery
    - Current recycling methods recover under 50% of raw battery materials, only 30% of costs.
- Li-Cycle patented spoke and hub tech:
    - Spoke: A mechanical process that dismantles to module level. Less pre-treatment before shredding.
    - Hub: The hydro process that takes the black mass and produce cobalt and lithium. The other materials are recovered but not at battery grade.
        - The functional material recovery is at 95%.
- Benefits
    - Process is automated, meaning there is low risk to workers
    - Minimal water, energy use
    - Suitable for all LIB types
    - The decreased cost of batteries has changed the business case because remanufacturing isn't as economical. The reuse would be good for backup power but difficult to make the case for grid scale that charge and discharge.
- New facility in Rochester, NY
    - Launched sometime this year.

    - The facility can take 60k ton per year.
    - They are looking to have another in Nevada or SW.
    - Ability to produce significant quantities of useful quantities of cobalt, nickel, and lithium for the supply chain is important to be able to engage in the battery supply chain and with manufacturers.
- Policy that would spur recycling
    - Educate- there is a public misconception that lithium batteries are not practically recyclable.
    - Incentivize along the whole value chain.
    - Increase local production, encouraged recycled material use in new products.
    - Localize manufacturing and attract critical pieces of the value chain to CA.
    - Make permitting efficient and attractive for companies to begin manufacturing.

- Questions:
    - Caroline Godkin: Does the market forecast and GHG calculation include second life?
        - Kunal Phalpher: The GHG takes into account the battery coming straight to us and the transportation to us.
    - Caroline Godkin: How do the batteries get to the facility?
        - Kunal Phalpher: The team works at the dealership level and uses third party carriers to deliver. A lot of people are working with dealerships but the future will likely be at the junk yard when there is a higher stream of retired EVs.
    - Mark Caffarey: What is meant by battery grade material?
        - Kunal Phalpher: Meeting the specifications that a cathode producer needs. The pilot plant can confirm that we have met these and we are comfortable with scaling.
    - Geoff Niswander: I was mistaken last meeting, automotive batteries are considered waste. Once EVs get a larger grasp on automotive sales, what are we seeing as the transition point from road to recycler? Batteries are going to go to a TSDF, is this a bottleneck.
        - Kunal Phalpher: Yes, at the volume now, a dealership is not hitting those limits. But in the long run we may hit that. Maybe they will have to be registered. The small quantities are straightforward. We may have to use a third party.
    - Perry Gottesfeld: Is the process using a mix of all chemistries?
        - Kunal Phalpher: Yes
    - Perry Gottesfeld: Is the functional recovery of 95% including the slag? If you subtract slag, what would be the recovery?

        - Kunal Phalpher: This is mass in and mass out recovery. The mass is recovered in different products.
    - George Kerchner: All batteries are classified as universal waste if they are hazardous waste. We are talking about automotive batteries so that doesn't fall under universal waste?
        - Mohammed Omer: We are talking about lithium-ion, a different chemistry than the lead acid.
    - Lea Malloy: What kind of regulatory barriers (e.g. licensing, EPA certification, etc.) were most challenging in the build out of the Rochester spoke?
        - Kunal Phalpher: Emerging industries inherently take time to permit. It isn't a regulatory barrier, just takes time and requires educating the people permitting.
    - Mackenzie Hubert: When the batteries arrive at the facility, what level are they at? Would labels telling chemistries help process in any way?
        - Kunal Phalpher: Sometimes we get packs, modules, and scrap; we can take it all. The manufacturers cite the chemistry from production and therefore labelling isn't as needed. It is more difficult with the portable electronics. Overall, it would be better to know if there are faults in the battery.
    - Alison Linder: Is the type of plastic in the battery recyclable and is recycling the plastic part of the process?
        - Kunal Phalpher: Recycling plastics is a different industry. There is a small niche that can take mixed plastic. We collect it and then use these third parties to recycle it. Most are polyethylene and ABS.
    - Hanjiro Ambrose: What type of additional measures and what is the process in testing for faults?
        - Alison Linder: This has to be done at the supply side. For process it doesn't matter, it is more about the storage. If there is an issue it goes to the front of the line for processing.

6. **Jeff Spangenberger, ReCell**
    - Setting the stage:
        - We are in a really good position because we all are talking about recycling now and we are at the tip of the iceberg.
        - Even material demand cannot be met without recycling- especially with cobalt. This isn't to the same extent with lithium and other materials.
        - Processes are mature and any progress will be incremental. There is no novel approach.
        - The economics are challenging because these processes make a lower value material.

    - The US is trailing behind other countries in recycling. We import most of our batteries and the materials.
    - We need to bolster our battery manufacturing. The chemicals and processing of materials are not done here.
- ReCell:
    - Mission: decrease the cost of recycling lithium-ion batteries and ensure future supply of critical materials.
    - Goal is to be collaborative and work together with companies, universities, etc. to fill gaps
    - Four goal areas
        - Direct cathode recycling, design for recycling, other material recovery, modeling and analysis.
        - DfR is tricky because manufacturers design products to meet consumer satisfaction and are not usually open to changing.
    - Direct Recycling
        - Pyro, hydro will still be used; everything we have discussed today is part of a better recycling system.
        - Direct recycling keeps and fixes cathode to be used as a direct input into battery manufacturing.
        - This makes more sense as you discuss LMO/LFP batteries
        - Goal is also to recover electrolyte and salts; otherwise where will those materials (e.g. fluoride) end up?
        - Also have projects dedicated to improving performance of old cathode chemistries, relithiation
    - EverBatt model
        - Uses GREET and BatPaC to calculate cost and impact of recycling different chemistries using different recycling processes
        - Parameters
            - Labor, material, utility cost; plant life; location of production; transportation mode
            - Default parameters are already populated but you can also manually enter your own values
    - Facilities
        - Laboratory ReCell space
        - ReCell Industry collaboration meeting in Nov 2019; 134 people from 76 organizations.
    - Collaboration and acknowledgements for diverse orgs and institutions that support ReCell
- Questions
    - Mark Caffarey: How often do you think you can recycle the cathode?
        - Jeff Spangenberger: We do not have sufficient information to answer that

- Caroline Godkin: You mentioned DOE had a goal of $80/kWh. By what date?
  - Jeff Spangenberger: Unknown, he will add this to the slides
- Perry Gottesfeld: Can you enlighten us on the economics of recycling and what will happen if the proportion of cobalt in EVs drops by 50, 80 or 90%. How will that impact the economics?
  - Jeff Spangenberger: There will be such an uptick of EVs, there will be a lot of demand. As far as economics in direct recycling, economics doesn't matter as much as other recycling.
- Ajay Kochhar (Li-Cycle): How do they think about where their process will fit in given changing cathode chemistries?
  - Jeff Spangenberger: There will need to be upfront sorting. We are focused on higher NMC cobalt chemistries because they come off the line now. The upcycling process should address the changing chemistries. Chevy bolt blends NMC and LMO together.
- Terry Adams: With mixed batteries going into the process do they expect to meet the original equipment manufacturer quality standard or a lower-tier production?
  - Jeff Spangenberger: The intent is to reincorporate into electric vehicle manufacturing.
- Meg Slattery: If direct recycling is more viable for lower-value batteries like LMO and LFP, it seems like it would be a better application for buses or stationary storage systems that don't need to be as energy dense. Is this something they discuss at all?
  - Jeff Spangenberger: They are not focused on LMO or LFP because there is a lower anticipated volume of those batteries, but those are the chemistries that are difficult to recycle otherwise.

Lunch Break 12:20 – 1:00

- Caroline Godkin: Email from Ryan Barr, RePurpose Energy: Re-emphasized benefits of repurposing and implores advisory group to seize opportunity to encourage repurposing batteries

7. Thoughts and takeaways from each committee members

- Lou Ramondetta: I like the discussion about upcycling and proactively looking at the manufacturing prospective so that they are more compatible for the recycling perspective. Viable options when thinking about policy.
- Geoff Niswander: Great presentations and very informative. It sounds like the means of recycling are dependent on the price point of recovered materials. I am concerned about the cost being overly burdensome if it is on municipalities or households. I was interested to hear Argonne is considering looking at recycling

and it could be up to a decade since the battery was produced and how to reuse that chemistry.

- Geoff Niswander: Echo Lou, good presentations, take-aways;
    - Means of recycling are going to affect what can be recovered
    - Costs could be too burdensome if municipalities or small businesses are responsible.
    - What do we do with older batteries when they reach a recycling facility and changing battery chemistries over time? Improve chemistry while keeping packaging the same.
- Alison Linder: The chemistry is not my expertise, but I think the concepts presented were useful. What stood out to me was the chart which shared opportunities to shorten the loops. Materials don't have to be refined to pure state to have a useful secondary purpose.
- Nick Lapis: The main gaps that I still see are the economics (more than anything), are we looking at adding this to the cost of a car, and if so is it 100, 1000 or 5000 dollars? This would shape policymaking. Would like to have a better understanding of regulatory issues, since it's been a barrier in the past in California (e.g. CRTs, solar panels).
    - Heard the suggestion of incentives, but this isn't really how recycling usually works. Almost nothing is viable for recycling economically except some outliers (e.g. Lead acid batteries, or precious metals). But actually from bottle fees, advanced disposal fees, rate payer fees, etc. This isn't bad, it is internalizing the cost of handling this material, and that is not wrong. We need to find a way to make the economics work and that is the charge of this group.
    - Extended producer responsibility: I think that EPR is one form of producer responsibility. But Producer responsibility is anything that puts the price of handling the material into the price of the product itself is that. So recycled content, and buying back your own material are all versions of PR.
    - Design for Recycling (DfR)– not happening, and right now manufacturers don't have an incentive because everyone else pays for EOL management. By having the price of this embedded, then there is a much better incentive for DfR. The cheaper it is to recycle, the cheaper the effect on the cost. Internalizing these costs needs to happen to make this happen.
    - California vs the world: California is the fifth biggest in the world, so we are at a scale that we should be looking to handle our own materials.
- Jennifer Krill: Main reflection is on the idea for design for recycling, aligning with what folks in the environmental and EJ community have been suggesting.
- Bernie Kotlier: we as a committee and state need to be doing everything we can on policies that support market solutions to drive demand. Commodity prices are a critical aspect of this, and market solutions work best, but when they don't work

(don't provide the demand we need), we must find other solutions. A backstop to ensure that materials get reused and don't get dumped.
    - Further information of interest: Alternatives of second and third uses and recycling. Do we know what the total GHG picture is/accounting of these alternatives? While recycling will happen for reused batteries too, do we know what the total GHG accounting numbers are for reusing in 2nd or 3rd life uses instead of direct to recycling. Would be great to have a presentation on that or do those calculations.
- George Kerchner: Understanding the recycling options that are really there are frequent questions. Should have incentives to set up recycling here in California. There are a lot of potentials for new, green jobs. How can California lead the way on this? Down the policy/regulatory route we should focus on incentives to set up that industry within the state and should be part of our mandate.
    - A huge help would be able to determine this issue of when batteries become waste. An issue that we frequently are struggling with. Bringing in someone from DTSC who could define this, it would also help us guide policy recommendations.
- Steve Henderson: Good to see knowledge from across sectors. One thing that is clear is that at this point economics will not drive the recycling we want to see. At Ford we sell throughout the world and see this as a global issue (not just CA or national). On the question on design for recycling, to date the designs are bespoke – physical and chemical designs. Don't see that changing soon due to IP, packaging, etc. Modularity would be great, but so far we don't seem to see it in industry.
- Perry Gottesfeld: The economics of recycling was missing from the content of the presentations. And this is key to addressing recycling. If it were profitable, we'd be seeing a higher percentage of current LIBs going to recycling would be higher. So what are the economics to boost the current recycling rates to much higher? Perhaps we can look to economists, even academic economists, to understand the subsidies that might be required. This is somewhat applicable to reuse, but not much. Lead Acid battery recycling is really profitable, but on the other hand e-waste recycling is not profitable and will always require subsidy. Where does EV LIB recycling lie in this spectrum? Understanding today's costs would help us understand. If any recycling companies want to talk about the economics…
- Todd Coy: Since this is a California group, from a regulatory perspective it's important to think about permitting, universal waste rules, etc. California has different conditions. There are distinct differences between Federal guidelines and guidance and California.
- Mark Caffarey: There are companies working on recycling technologies. The problem is how to get batteries from point A to point B. The economics of logistics weigh heavily. We need to look at economics. Also are we talking about total costs and not just material costs? We need to look at total costs.

- Dan Bowerson: Looking at locations and countries where recycling is taking place. China's two facilities are the capacity of the rest of the world. We are behind. Li-Cycle's new technologies, and Jeff's presentation confirmed the need for a full range of stakeholders/supply chain needs to be involved to get to the CE ideal. Moving batteries is still a key question. Take care to not stifle innovation with a focus on, say, design for recycling.
- Terry Adams: Our charge is to provide recommendations on how to achieve 100% reuse and recycle of LIBs. Looking at this as an auto-dismantler – this is where all vehicles pass through, and where batteries will be managed. We should anticipate the losing/negative intrinsic value of these batteries. The costs for safe removal. California is a hard place to do business, determining wastes as hazardous with DTSC jurisdiction, for example. Need to consider the financial responsibility of EOL vehicles. At this point it will be on auto-dismantlers and will be up to them to safely manage. It's possible in licensed facilities, but there are a lot of "fly by night" facilities. How have other regions managed extended producer-responsibility policies?
    - Labeling such as labeling of chemistry, and diagrams for removal are important. And training, and having information available requires good communication between OEMs and dismantlers. This might be something policy addresses
    - Encouraging in-state recycling. We'd love to see it, but it is truly a challenge if it is in a TSDF. This will require a major change in permitting and regulation.
- Teija Mortvedt: This is a global issue, this should be a solution that thinks about standardizing across the globe
    - Chemistry labeling: that is very important not just for EVs, but for that to be on smaller product batteries too. Especially if we think about the time and space delays between purchase and retirement.
    - When the battery becomes a waste is important.
- Toshiya Fukui: Challenges faced include:
    - Economic model which comes down to logistics (up to 50% of the cost of recycling) and feedstock. As others have mentioned, finding out more about hazardous and universal waste will be interesting since they are important on logistics costs. Regarding feedstock, we don't have a lot of EV batteries coming through the process right now. There are already companies in Asia that are looking to import US origin black mass from recycled batteries. If you are an overseas battery producer, and you need battery raw materials, you may be willing to import California battery raw materials recovered from recycling at a break-even cost or even small loss. North America is a potential source. Thus, it is important to think about how to keep that material in North America. How do we develop systems that are economically feasible, and a business model that is sustainable?

    - Design for Recycling: Great idea in concept, but auto companies are in competition and working with different companies and different chemistries. Some are at least thinking about standardizing pack size and shape so they can source across different suppliers. But the idea of an AA type interchangeable battery isn't there at least not for a long time.
- Courtney Smith: From an energy climate perspective, hearing about embedding the cost of recycling in the cost of the vehicles, could have a real impact on the growing ZEV market. Particularly now with the pandemic, unprecedented gas prices, the choice between ZEV and ICE are challenging. So important to think about all externalities.
    - May be premature, but conversation on policy models – in terms of waste policy – are there models in other countries that we could start a conversation around? Are there other groups outside CA talking about this?
    - A primer on what are models from a policy framework to start a conversation. It would be great to understand what models are out there that we can start from.
- Teresa Bui: We are going to have a presentation on other policies.
    - DfR: there are specific product design standards to reduce hazards and ease recycling. As an example, association of plastic manufacturers have a guideline for best practices for design for recycling. CalRecycle manages the payment side of recycling. Some kind of tracking system is required to make sure that recycling even overseas is happening correctly.
- Mohammed Omer: Waste classification comes up a lot. It is something that I've thought about, but because we are an outward facing body I don't want to present an opinion that isn't fully vetted through the organization. In the meeting in October, we'll be talking about policies in other countries as well as how California sees batteries (i.e. in how they fit in waste classifications). This might be as important as economics, and these two are the most important elements.
- Gavin McHugh: This is Gavin McHugh with the State of California Automobile Dismantlers Association. This is our first participation in a meeting of the working group. There are approximately 1000 licensed auto dismantlers in CA, the bulk of them are full and self-service auto dismantlers. Their business models include the recovery and sales of safe, viable and cost effective used vehicle components and parts from end-of-life vehicles for repairs in an environmentally responsible manner.
- Maria Kelleher: shared studies relevant to questions that arise and will be shared with the group.
- Mark Caffarey: Why are these batteries hazardous (i.e. toxicity, reactivity, etc.)?
    - Caroline Godkin: It certainly sounds like we really need to dive into the economics of the various parts of this process. How can we make recommendations to meet the charge of this group? Who would be the

best people to present on that? There is also a time element, who will be removing the battery matters. Who would you like to hear from?

- Mohammed Omer:
    - Oct. Regulatory schemes across the world, and classification questions from DTSC
    - Dec. Logistics and infrastructure and safety questions.
    - Will meet quarterly and more frequently in 2021.
- Bernie Kotlier: tentative dates in 2021? Can we have some tentative dates for 2021?
    - Mohammed Omer: I will send an email this week regarding dates.
- Todd Coy: Spurred by Courtney's comment – there are tremendous amounts of resources in that organization. Courtney was talking about different points of views and looked at NAATBatt and other groups. Reps from across the supply chain. NAATBatt has a committee on recycling (Todd Coy heads that up).
- Teresa Bui reading Alex Grant's email: Is the government using life cycle assessment techniques to quantify and understand the environmental impacts of different routes to produce battery chemicals including production from natural resources vs. recycling of LIBs of vehicles?
    - Jeff Spangenberger: We do that with EverBatt. Not perfect but does give us information on that. EverBatt does LCA and Economics.
- Caroline Godkin: We had about 70 people join us. Thank you and I look forward to connecting in October. I hope everyone is safe.