

Lithium-Ion Car Battery Recycling Advisory Group

Meeting Minutes for 3.15.2022

1. Call to order, roll call, and establishment of quorum (Caroline Godkin, CalEPA)

CG: Welcome to the 17th and probably final meeting of the advisory group. It's amazing to reflect on the journey we've been on as humans and as a group

Roll call

- Ana Marie Stoian Chu (AMSC): present
- Mohammed Omer (MO) present
- Hannon Rasool (HR) absent
- Terry Adams (TA) present
- Dan Bowerson (DB) joined after roll call
- Mark Caffarey (MC) absent
- Todd Coy (TC) present
- Toshiya Fukui (TF) present
- Steve Henderson (SH) present
- George Kerchner (GK) present
- Bernie Kotlier (BK) present
- Jennifer Krill (JK)
- Nick Lapis (NL) present
- Alison Linder (AL) joined after roll call
- Teija Mortvedt-- Nathan Nye (NN) present as proxy
- Geoff Niswander (GN) present
- Lou Ramondetta (LR) present
- Les Swizer (LS) present

CG: I want to start by offering thanks to everyone who has gotten us this far and especially a big shoutout to the UC Davis team (Alissa Kendall, Jessica Dunn, and Margaret Slattery), they received a lot of public comments and have worked furiously on incorporating them so thanks for all their help and especially during the home stretch. And as always, a big thank you to Mohammed and Brenna who work behind the scenes to get these meetings set up and make sure everything runs smoothly, and thank you to all the committee members who have shown up consistently for the past two years and provided insight. We have had a lot of robust discussions and crafted a thorough report which we will be sharing on time so a huge thank you to everybody for that.

I want to provide a couple of updates following from our last meeting. The investments that were announced in January in the Governor's budget added an additional \$6b including investments in infrastructure and zero-emissions vehicles, so the total budget is \$10b. The focus is on equity and scale. Hanon has been our connection and there

has been a lot of collaboration between different agencies. There is also continued work on lithium valley, which presents an opportunity for California to become a world leader in lithium production, expand EV production, and increase geothermal resources. It also would support employment and restoration of the Salton Sea. Their report will be issued in October 2022. Hanon is visiting the Salton Sea today and certainly if anybody has any follow-up questions, I can direct you to the folks who are working on those initiatives.

2. Review and Potential Approval of Draft Minutes from December 7, 2021, Meeting (Mohammed Omer, DTSC)

MO: Thanks Caroline. I echo your thanks to the UC Davis team and everyone on the Advisory Group who have shown up and done a great deal of work over the past two and a half years. I am Mohammed Omer, I am the Unit Chief of the Permitting Division at DTSC. This meeting is being video recorded and will be made available with CC on our advisory group webpage, as will the draft meeting minutes. The live webinar is available at video.calepa.ca.gov. During this meeting there will be opportunities for public comment and a final opportunity to ask questions or comments on items that are not on the agenda before we adjourn. I'd like to move to approve the minutes from our last meeting on December 7 2022.

no objections

The minute are approved by the Advisory Group (AG).

AG Updates (none)

3. Redwood Materials California Pilot: Alexis Georgeson (Redwood Materials)

Alexis Georgeson: Thank you and good morning, thanks for including me today. First, I'll give a brief overview of Redwood Materials.

- Founded by JB Straubel, who left Tesla in 2015 to focus on a circular supply chain.
- Redwood is developing a closed-loop domestic supply chain. They are collecting batteries from consumer electronics, EVs, and stationary storage, recovering and refining materials, and refining them into cathode active materials and copper foil that can be directly reused in the battery supply chain.
- Feb 2022: Launched EV Battery Recycling pilot program in California to establish safe and efficient recovery pathways. Supported by Ford and Volvo. Accepting all LIBs and NiMH in the State of California from any automaker. "Learn by doing" approach to understand the end-of-life pathways. The most significant cost of pack recycling is related to logistics so they are looking to optimize logistics, and they are hopeful that as scale increases the cost will decrease and the process will become more affordable. They are working with dismantlers and dealers to identify packs then safely packaging and shipping them to their facility in NV. They are less than a month in and their goal is to learn and share findings with

the industry. Still in an early education phase but they are already surprised by how many batteries are in the field and in unique places.

GK: Thanks and thank you for that summary of the program. I saw the video that was released with JB and the governor, and noticed JB mentioned that they are going to do this for free. Can you expand on that and is the program in California intended to bring batteries into the facility, dismantle them, and ship them off to facility in Nevada? Can you explain what's involved with processing the batteries?

Alexis Georgeson: Certainly, and I'd like to call out Steve Henderson and Jackson Switzer, feel free to chime in. Redwood is going to be the administrator; we aim to generate information about the flow about of batteries. Ford and Volvo are contributing to the cost of logistics associated with their respective vehicles. We are accepting the batteries for free, meaning we pay the cost for collection and logistics. We believe there is value to recycling so initially Redwood and partners will bear the cost but over time we believe the batteries will become an asset. Step 1 we are taking them for free and down the road we may assess and may consider changing the model. We are also working with trade associations; ARA has been really helpful. We are disassembling batteries at our facility in Nevada and then remanufacturing them into copper foil.

GK: A point of clarification—what are you doing at the facility in California?

Alexis Georgeson: All batteries are shipped to Nevada; we are considering a footprint in California to better consolidate and dismantle batteries and I would expect that we will soon have a physical presence there

SH: I wanted to first thank Alexis and the Redwood team on behalf of Ford, they have been great partners and we are doing a lot of other things in partnership with Ford. I also want to shoutout the Advisory Group, the information you have provided inspired Alexis and I to come up with this idea.

LC (in chat): Is Redwood's recycling process a combination of pyrometallurgy and hydrometallurgy? Is it possible for the public to learn more about Redwood's recycling process?

Alexis Georgeson: Redwood is pursuing several processes developed in house and we are agnostic about our feedstock. So we are pursuing a variety of technologies but all of our material is processed in a hydrometallurgical process. Some batteries begin recycling in a calcination process which is a low-temp Redwood-developed IP, it makes use of the residual energy left in batteries to power the process. We are working with Stanford on a life cycle analysis of our process.

JS: We are focused more on material-specific processes, things like production scrap vs. electric toothbrush vs. an EV battery; these shouldn't go in the bucket. We are focused mainly on the environmental footprint, as well as the economics and scalability. We are trying to solve the broader economic challenge. We see it beyond adapting

traditional processes, we think this is a space for innovation and have developed our own material-specific processes.

GN: For consumer electronics, are you open to only LIBs or also lithium primary batteries and potentially nickel compound batteries also?

JS: We can recycling lithium primary batteries and NiMH. Nickel cadmium we would divert to a specific facility, but everything else provides a great source of nickel, lithium, cobalt, manganese.

Alexis Georgeson: Almost half of our feedstock today is production scrap. The other half is largely smaller devices and consumer electronics. EOL vehicle packs are a smaller percentage, but we of course expect that to grow in the coming years. At the same time that we are doing this pilot we are also working in CA and other states directly with consumers to collect materials for recycling. In the Bay Area this weekend we have a program with Rotary clubs in the area to gather as many EOL consumer devices that are sitting in junk drawers as possible

GN: Thanks, I appreciate that. I work in household hazardous waste, and more options to recycle lithium and nickel batteries are welcome.

Alexis Georgeson: Yes, and we have learned some surprising facts about where batteries are, including municipal waste facilities.

Billy Puk, In chat: 1) Is Redwood Materials' recycling process taking on any liability on the EV batteries due to current patents from various batteries manufacturers? Any patent infringement liability due to this is a new industry? 2) EV batteries can be Li-ion and lead acid. Has Redwood's recycling process only targeted on the Li-ion?

JS: We take ownership of the battery as soon as we pick it up and assume liability for safety and handling. We do want to make sure we have full coverage to produce battery materials. We are focused on the previously-mentioned battery types, there are well-established pathways for lead-acid batteries and Redwood would not bring immediate value to the market today if we tried to insert ourselves there.

CG: Thank you both. If folks want to participate, what is the best option for them to find more information and get involved?

Alexis Georgeson: You can reach us at recycling@redwoodmaterials.com, or to me personally at alexis@redwoodmaterials.com

CG: We will now turn it over to the UC Davis team to talk about public comment. I want to express appreciation for all the public comments we received.

4. Review of Public Comments Received on the 12/13/2021 Draft Advisory Group Report (Alissa Kendall, UC Davis)

AK: I'm pleased to be able to go over the public comments we received on the last version of the report and summarize some changes. I'll be calling on Jessica Dunn and

Meg Slattery who have been fantastic at handling these comments and making sure we were able to update the report in a timely manner.

Our process included reviewing all comments provided during the public comment period. We incorporated suggested edits that did not change policy options that had been voted on, and clarified rather than changed the content of the report. We received comments from 21 institutions, including

- Supply chain: Alliance for Automotive Innovation (AAI), Crown Battery Manufacturing (CB), Cobalt Institute (CI)
- Research institutions: Argonne National Lab (ANL), Baker Institute for Public Policy (Rice University) (BI), University of Toledo (UT)
- Vehicle recyclers: Automotive Recyclers Association (ARA), LKQ Corporation (LKQ), State of California Auto Dismantlers Association (SCADA), Institute of Scrap Recycling Industries (ISRI)
- Auto auctions: Copart (C), Insurance Auto Auctions (IAA), National Auto Auction Association (NAAA)
- Battery repurposers and recyclers: Li-Cycle (LC), Redwood Materials (RM), ReJoule (RJ), Umicore (U)
- Non-profit sector: Basel Action Network (BAN), Call2Recycle (C2R), Responsible Battery Coalition (RBC), World Resources Institute (WRI)

MS: Thank you, Alissa. And a huge thank you to all those that participated in the public review process. I will summarize the public comments we received.

We received support for the following recommended policies:

- Core exchange and vehicle backstop supported by ISRI, RM, WRI
- Producer takeback supported by LKQ, WRI
- Enabling access to battery take-back supported by ARA, LKQ, SCADA, CB, WRI
- Targeted incentives for reuse, repurposing, and recycling supported by LC, WRI
- Support enforcement of unlicensed dismantling laws supported by LC, SCADA

We also received support for policies that the AG did not vote to recommend to the legislature.

- Design for reuse, repurposing, and recycling supported by ISRI, BAN, CB, RJ, WRI
- Medium- and long-term recycling efficiency targets supported by LC and CB

We also received opposition to requiring pre-approval to bid on EVs at auto auctions by CP, IAA, NAA, C2R. Reasons for this opposition are the following:

- Wholesale auctions sell to licensed motor vehicle dealers. They already have a screening and verification process, and are required to provide a report of sale to the DMV

- Salvage auto auctions require individual public buyers to provide verified contact information and purchase vehicles through a broker. Dismantlers, repair shops, and dealers are classified as “regulated buyers” and must provide a business license.

A high-level synthesis of the additional comments we received:

- Suggestions for enabling access and tracking battery information
- Support for recycling domestically or within California
- Requests to establish a waste hierarchy and promote the best and highest use of batteries
- Mentioned the need for solutions regarding EOL management of hybrid vehicle batteries
- Areas for further research
 - o Potential impact of EOL battery export
 - o Potential for producer responsibility to impact consumer prices
 - o Further validation programs for reused and repurposed batteries
 - o Studies that inform circular economy policies

Jess will now talk about changes we made to the report

JD: Thanks Meg. There have been two versions sent out so I will go over changes in each version individually.

Version posted 3/9/2022

- Clarifying edits and additions
 - o Modified background information about auto auctions
 - o Updated recycling capacity and landscape in the US and Canada
 - o Added information about existing utility-scale repurposing installations
 - o Addressed grammatical errors (thank you!)
- Summary of substantive comments in Section 9
 - o Support and opposition for specific policies
 - o Additional commentary and considerations for implementation
 - o Areas for further research

Version posted 3/14/2022

- Recycling capacity
- Images in verbatim public comment
- Included changes to language in one recommended policy option

We have updated the recycling capacity of Li-cycle, so it now states 10,000 t/year currently built and a total planned capacity of 85,000 t/year.

We have also changed the policy option ‘Pre-approval to bid on EVs at auctions.

Current language includes unsubstantiated statement on vehicles going to unlicensed dismantlers and implies current auction process does not require registration. Proposed changes include:

- Strike sentence stating that unlicensed dismantlers acquire most of their inventory at auto auctions
- Add footnote explaining existing registration process for auto auctions

The policy will now state the following:

- To minimize unlicensed dismantling, the Advisory Group recommends requiring that interested parties apply for pre-approval before participating *in auto auctions*. The pre-approval process should include registering and verifying contact information (e.g., name, address, etc.) in order to track the battery.

The footnote will then state:

- Public comment pointed out that individual (public) buyers who wish to participate in California auto auctions are currently required to purchase vehicles through a broker and provide identification, including proof of address. They are also limited in the type of inventory they are allowed to bid on.

Any questions?

GK: We talked a lot about the danger of unlicensed dismantling, and this was intended to prevent that.

JD: Yes, thank you for that comment. It is still true that there is concern about unlicensed dismantling in California. The unsubstantiated statement public comments were concerned about was that they acquire most of their inventory at auto auctions.

TA: It's true that most of these auctions require a DMV license to participate, I think most unlicensed dismantlers probably get vehicles from tow companies or more informal channels, so I agree with this revision.

AL: Did the UC Davis team verify the accuracy of the public comment?

JD: Yes, we investigated the registration requirements and auction company policies.

Gavin McHugh: The auctions do not require a dismantling license to bid on vehicles at the auctions. They do require registration, but there are also repair shops, used car lots, and other folks.

JD: Thank you

TF: The issue regarding unlicensed dismantling was that they had a higher probability of not having facilities or capabilities to meet requirements concerning EV batteries. We want to make sure the batteries are handled in compliant, safe locations and in a safe manner.

Billy Puk (in chat): Is the pre-approval required an individual buyer to provide the proof of address that is not PO Box? Or does PO Box allow to be used as a proof of address? Must the proof of the address be in the State of California only?

MS: That is the level of detail about implementation that would likely be determined after this advisory group has concluded if the legislature were to follow up on these recommendations.

MO: Thanks Meg, Jessica and Alissa for going over the public comments that we received. They were detailed and well thought-out, and we thank everyone for their engagement. I will hand it over to Caroline for the potential final approval of transmitting this report to the legislature.

5. Potential Final Approval from Advisory Group to Transmit Advisory Group Report to the Legislature (Caroline Godkin, CalEPA)

CG: I'm seeing questions in the chat, and I want to remind folks that people who are following on the webinar cannot view those, so we ask you to refrain from using them in the chat. Next, we will be asking the AG to approve transmitting the version of the report that was presented today to the legislature in the coming weeks. I'm going to pause and ask the advisory group if they have any questions. Seeing none, I'll ask if you think the final version that was presented should be submitted to the legislature.

TA: I approve and support sending this version to the legislature.

DB: Likewise, support

MC: *Absent*

TC: I think we should scrap the whole thing and start over... just kidding! Support

TF: Support

SH: Support

GK: Support

BK: Support

JK: *Absent*

NL: Support and looking forward to figuring it out in a bill

AL: Support

NN: Support

GN: Support

LR: Support and thank you

LS: And echo the thank you for everyone's hard work

AMSC: I support sending this final version and thank you for your hard work

MO: Support and echo everyone's thanks, it's been an honor to work with everyone

CG: Support

6. Where Do We Go From Here? Next Steps for the Advisory Committee Final Report and Recommendations (Caroline Godkin, CalEPA)

CG: Now I want to talk about where we go from here, and where the report goes from here. We will do the final copy edit and publication, making sure everything is ADA compliant for posting. There is a process described in statute about how we communicate these reports to the legislature as well as any briefings to staff in the legislature. Within the report there are a wide scope of recommendations. There are some that would require statutory changes, there are coordination recommendations, and some that recommend changes to funding priorities. The report has really captured the complexity of the discussion and these decisions. The Administration does not have a plan to put any specific recommendation into the budget or a bill. After we transmit the report to the legislature, we will provide technical support and work with them if they want to develop any specific proposal. The Advisory Group and everyone who has joined us has an enormous amount of expertise. Should any of these recommendations be taken forward, that is when the nuance and details will be figured out. This committee has had a lot of discussions about potential loopholes and where clarification will be needed on specific terms, and that will be extremely helpful for the legislature. I expect that there will be interest in turning these recommendations into a bill and we welcome any engagement this advisory group has moving forward. That's a brief overview of where we go from here. Any final comments or questions on the next life of this final report?

DB: Procedural question—is there a specific committee in the legislature that has jurisdiction over this, or where will this go?

CG: Transportation committee, committees with jurisdiction over haz mat—environmental safety and toxic materials, and the budget committees. Report is also required to be sent to legislative counsel and legislative analysts. We will also be sending a copy to Senator Dahle as it was his bill who convened the AG.

Reading questions in chat:

Megan Warfield: Can anyone venture a guess to what the legislature might do with this report? Have there been any conversations with individual legislators?

CG: We did brief Senator Dahle but I am not aware of any conversations with specific legislators.

7. Public Comment on Items Not on the Agenda

Emil Nusbaum: After having reviewed both the draft report and law authorizing the creation of the advisory group, I was wondering what the environmental concerns are with the disposal of lithium-ion batteries. There seems to be some confusion as to whether disposal or putting lithium-ion batteries in landfill actually has a negative environmental impact?

CG: This is discussed in the background of the report

Vishant Kothari, WRI: Any thoughts to offer insights from this report tailored to the federal level?

CG: I don't have insight, are any of our committee members working with federal partners who would like to offer their thoughts?

DB: We have had some discussions but no specific details, other than to point to the work of this committee as a resource.

CG (Reading comment from email): "Wondering why California is passing \$10b when the facility is in Nevada?". To clarify the \$10b is for all zero emissions vehicle programs, not specific to recycling.

DB: The bipartisan infrastructure bill had up to \$7.5 billion for charging infrastructure. Additionally, there was around \$6 million for battery and recycling R&D. There are a lot of opportunities within federal funding.

CG: One last call for comments and thoughts?

MO: One last comment in the chat—from Dennis Raymund Franco, "Do you have a prefer type of packaging for End of life or damage batteries going to CA.?"

GK: That is a federal requirement so even if California had a preference, it is federally mandated by 49 CFR.

8. Adjournment (Mohammed Omer, DTSC)

MO: With that I'll move towards wrapping up the meeting by summarizing our accomplishments. First, we convened the meeting, roll call, quorum, administrative reminders. Caroline reviewed the governor's budget for ZEV programs and updates on the Lithium Valley effort. Alexis Georgeson from Redwood Materials gave an overview of their EV battery recycling program with Ford and Volvo. Next Alissa, Meg and Jess went over public comments and summarized the changes made to the final report. Caroline then led us through the final discussion and approval to transmit the report to the legislature, then mentioned that there has been a great deal of interest and we will likely receive more questions moving forward. Finally, we fielded questions and comments from members of the public, and now I'd like to ask Caroline to formally adjourn this final meeting of the Lithium Car Battery Recycling Advisory Group.

CG: Once the report is transmitted, we will make sure everyone receives the final version. Thank you to everyone who has participated, assisted, facilitated, and supported us. It feels strange to adjourn this and not have a future meeting planned but we are adjourned.