



Mining and Metallurgical Society of America

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President's Message
LITHIUM - NEXT STEPS

By Michael D.S. Blois

Elon Musk certainly knows how to keep the spotlight on his company Tesla and on Electric Vehicles (EVs) generally. Earlier this month he simultaneously revealed plans for a battery driven big-rig truck and a new version of Tesla's Roadster. This car is supposed to go from a stop to 60 miles per hour in an amazing 1.9 seconds. There has been a subsequent tweet in which Elon suggested that a special upgrade package for the Roadster could "maybe" enable it to fly short hops!! My more down to earth request is that Tesla focuses on delivering the numbers of the Model 3 that it forecast in its ramp-up schedule.

But then, who are we in the mining industry to talk about keeping to forecast ramp-up schedules for our projects: "pot calling the kettle black!"

In my August Newsletter article, titled "Mining the Lightest Elements", I discussed the first part of the lithium value chain and how it is currently driven by the perceived future demand for lithium-ion batteries (LiBs) for EVs.

As a recap, it is worth noting that the UK and France have banned the sale of internal combustion engines (ICE) vehicles by 2040. China is heading in the same direction. India will only sell EVs



Michael D.S. Blois
MMSA President, 2017-2018

by 2030. I understand that Norway will be 100 percent EV by 2025. There is obviously some ambiguity if EVs include trucks and commercial vehicles. It is also worth noting that Austria, China, Denmark, Germany, Ireland, Japan, the Netherlands, Portugal, South Korea and Spain have set official targets for electric car sales. "Countries around the world are racing to phase out gasoline and diesel cars" [CNN: September 11th, 2017 & the International Energy Agency].

Industry forecasts for the demand for lithium materials have stayed constant over the past 12 months. According to Deutsche Bank AG, the demand for Lithium Carbonate Equivalent (LCE), a normalized reporting standard for the lithium industry, was 184,000 tonnes in 2015 and is forecast to rise to about

534,000 tonnes in 2025. Lithium Americas, with prospects in Argentina and Nevada, has projected significantly increased demand to a level of 2 million tonnes by 2027 and 3.1 million tonnes per year for 20 years starting in 2028! In 2015, 14 % of the demand was for EVs. The forecasts for 2025 are that 38 % of the total demand will be for EVs with a further 14 % being used to power “E-bikes.” Even if these forecasts are viewed as optimistic, the growth in demand for lithium materials will be very large indeed.

To bring these numbers down to everyday applications and uses, a cell phone contains 3 g of LCE, a laptop contains 30 g, power tools have a range of 40 – 60 g of LCE.

These numbers are obviously approximate. It should be noted that the press often quotes these numbers as the amount of lithium in an appliance; this is confusing as the numbers are actually stated in terms of LCE and not elemental lithium. The amount of LCE in batteries, or more correctly battery packs, for EVs has an even wider and changing range; a 70 kWh battery pack contains 63 kg of LCE.

Rather than talk about the lithium content, the battery manufacturing industry talks about production capacity in terms of Gigawatt hours (GWh). According to Benchmark Mineral Intelligence, the production capacity in 2015/2016 was 28 GWh. The forecast for 2017 is 103 GWh/

year and that for 2020 is 174 GWh/year. The forecast numbers are approximate as there are frequent press announcements of new “Gigafactories” worldwide.

When it comes to battery production facilities, here in the USA, and driven by the publicity surrounding Tesla, we tend to think of the joint Tesla & Panasonic Gigafactory #1 east of Reno, Nevada. The initial goal was that 35 GWh/year of batteries would be produced there. Tesla has also announced that the wall mounted Powertrains would be added to Gigafactory #1’s production. Ultimate capacities of 150 GWh/year have been mentioned.

However, as with many issues pertaining to the global mining industry, the role of China cannot be underestimated. Benchmark Mineral Intelligence estimates that, in 2016, 16.4 of the 28 GWh capacity was produced in China. By 2020, China alone is forecast to produce 108 (62%) of the forecast 174 GWh.

“Contemporary Amperex Technology Ltd (CATL) has plans to build the largest lithium-ion megafactory of all, in Ningde, – but the company is little known in North America. It’s already worth \$11.5 billion, and could be a dominant force globally in the battery sector if it successfully increases its lithium-ion production capacity six-fold to 50 GWh by the year 2020. Other Chinese manufacturers are on a similar trajectory. Panasonic, LG Chem, and Boston Power are building new megafactory plants in China, while companies such as Samsung and BYD are expanding existing ones.”

By 2020, mass production of LiBs will still be concentrated in just four countries: China, the USA, South Korea and Poland.

Membership Applications

New Regular and QP Member Applications:

The following individual(s) have submitted membership applications and or changes to their membership status. They have either received approval of the Membership Committee as candidates or are currently under review:

If any member of MMSA has good cause to believe that any of the applicant(s) should not be granted Regular membership or QP membership, as appropriate, you are requested to make known your objections, in writing, to **Betty Gibbs**, Executive Director, within 30 days from issue of this Newsletter. In the absence of any objections and after receiving approval of the various committees, the candidate members and those members requesting a change of status will be confirmed as Regular Members or QP Members, as provided by the ByLaws.

<u>Applicant</u>	<u>Endorsers</u>	<u>Applicant</u>	<u>Endorsers</u>
Clifton B Berg	Mike Blois Mark Jorgensen Matt Bender	Jorge A Lozano	John Sturgul Joseph Campbell Gary Simmerman (Supervisor)
John D Fognani	Barney Guarnera Bill Wilson Paul Jones	Xavier L Ochoa	Mick Gavrilovic Len Harris George Bee (Supervisor)

QP Applications

Jorge A Lozano

Xavier L Ochoa

Area of Special Expertise

Mining, Ore Reserves

Mining

<http://www.visualcapitalist.com/china-leading-charge-lithium-ion-megafactories/>)

In my previous article, I highlighted that the mining industry continues to innovate as it develops new processes to recover lithium as either lithium carbonate or lithium hydroxide monohydrate. In parallel, the LiB industry continues to be innovative.

One of the most important results of the innovation, and economies of scale, in the battery manufacturing process has been the decline in the battery costs. According to Bloomberg, the specific cost, in 2010, was \$1,000 /kWh. This dropped to \$600 /kWh in 2013 and \$269 /kWh in 2015. Tesla is striving for \$100 /kWh by 2020.

As I concluded in my previous newsletter, the innovations in both the mining industry and in the battery industry, have certainly helped the out-

look for lithium – the lightest of the metals.

MMSA News

MMSA Council Retreat Summary

October 21, 2017

A brief summary of the discussions at the Council Retreat was included in the October newsletter. Following are a few more topics that were discussed.

- A discussion started about increasing dues next year.
- Explore ideas for a community network.
- Become more active in social media.
- Develop webinars on topics of interest to members. (See below for information about existing webinars on ethics.)

More information is on the Members Only page of the Web site—meeting minutes, slides, information packet. If you have any comments or other ideas for the Council, contact the MMSA office.

Abandoned Mine Lands Summit at CSM

Several members of the Next Big Thing/AML Conference committee attended the Summit at the Colorado School of Mines on November 14. This is the second Summit held at the school.

The MMSA AML conference scheduled for April 26, 2018 will add to the information presented at the Summit. Details of the April 2018 program are still being determined.

The CSM Summit included a couple of talks about lists of abandoned

hardrock mine sites. Thousands of such sites exist, but the data is not complete and sometimes the locations are not accurate. One goal of the MMSA April conference is to identify several demo sites that can be used for leverage to get Good Samaritan legislation in place that protects those organizations who do the cleanup.

The committee members said that this conference was a distinct improvement over the 2016 Summit. The goal of the need for Good Samaritan legislation was strongly recognized. Industry involvement in the CSM summit was lacking, so MMSA needs include industry presence in the Spring.

The committee continues to work on the program and getting the right speakers for the sessions.

On-Line Ethics Courses

One of the CPD requirements for QPs is one hour of ethics per year. The hour can be spent studying ethics or taking a course. Ethics courses or sessions are presented at technical meetings. Several on-line courses are also available that can be viewed at any time.

David Abbott developed an ethics course that is available for free on two Web sites. One course was done for SME and can be found at:

<http://www.smepromo.com/ethics2016>

The same course was done for AIPG (American Institute of Professional Geologists). It is available on the AGI (American Geosciences Institute) Web site. The course consists of several sessions with questions on the content of each topic. It can be taken with or without continuing education credit. The course is free and a charge is made if you want a certificate.

Membership Update

The following changes in membership have taken place since the last newsletter, with the authority of the respective membership committees.

Regular Member Additions:

None

QP Members Confirmed:

None

Membership Deletions:

William M. Calhoun, Deceased
Donald J Baker, Resigned

MMSA presently has a total of **339** members, **5 in process**. Currently, **194** members are QP members

Additions, deletions and routine changes to the Society's data base and member biographies are accessible through the Members Only page in our web site, at www.mmsa.net This data base is the best source for information on any particular member.

<https://goli.americangeosciences.org/courses/course-v1:AIPG+AIPG002+2017/about>

Keeping track of CPD hours

By David Abbott—The Texas Board of Professional Geologists’ (TBPG) summer newsletter contained a note, “Continuing Education is Simple.” If is if you “keep your records of continuing education current, as you may be selected for audit. ... It’s a lot easier to keep your records current than to scramble to update them after you receive the audit notice!”

The easiest way to keep a current CPD record is to create and use a simple tabular record in OneNote™ or Evernote™. OneNote is part of Microsoft Office and Evernote is a free program. Both work on PCs and Macs, on your smart phone, your tablets, etc. The programs automatically synchronize the data between all your devices that you setup the program to work on, your home computer, your office computer, etc. As you complete a CPD activity, record it in a simple table with columns for date, hours, and activity description. If you have

this basic data, completing a CPD reporting form for any organization requiring CPD is easy.

The TBPG’s note also states, “Interestingly, many of our licensees don’t realize just how many things can count toward continuing education. We don’t require formal (and expensive courses). You can include things like professional society meetings that have a technical presentation, online courses and tutorials, teaching a course or short course, and we allow up to 5 hours of self-study per year.

“For your ethics, TBPG has an online ethics presentation on our website, and we count review/study of ANY rules or regulations to which you are subject as part of your profession. For example, if you need to review the regulations for underground storage tanks for your job, put that on your continuing education program activity log and count it as your 1 hour of ethics for the year!”

Although the Texas CPD requirements differ from MMSA’s, the TBPG’s note is right. Keep a current log as you do things and watch the CPD activity hours add up.

Obituary
William M. Calhoun

William was born on November 2, 1932 and passed away on Sunday, October 1, 2017.

William was a resident of Wallace, Idaho at the time of passing.

Bill graduated from Texas Western College (now University of Texas, El Paso) with a degree in Geology.

After graduating, he proudly served his country as a First Lieutenant in the Army.

The family suggests memorial donations in Bill’s memory be made to the Mining Heritage Exhibit, P.O. Box 469 Wallace, Idaho 83873 or to the Wallace District Mining Museum, 509 Bank Street Wallace, Idaho 83873.

Bill was an MMSA member since 1974.

At The House Committee on Natural Resources

The Committee on Natural Resources will hold an oversight hearing on November 29, 2017, at 10:00 am in 1324 Longworth HOB, regarding the National Environmental Policy Act (NEPA). Nearly five decades since its enactment, the hearing will examine recent

developments within NEPA’s regulatory framework, present certain case studies representative of current inefficiencies, and allow members to consider potential legislative improvements to enable the law to best serve its intended purpose.

<https://naturalresources.house.gov/calendar/eventsingle.aspx?EventID=403418>

QP seals are available from MMSA.

The seal comes as a self-inking rubber stamp and the stamp is about 1 high by 2.6 inches wide. The stamp has the MMSA logo, member name, and member number. The cost is \$35, including shipping. To order a QP seal, contact the MMSA office or order directly from the MMSA Web site (www.mmsa.net/payments). The QP seal is in the Products category.

2008 MMSA Centennial Medallions are available for the great price of \$40. The coin has 1 oz of silver and 24 carat gold plating.

