

Thank you for presenting your seminar on New Battery Technology and Fire Safety Concerns, and to the Georgian Bay Chapter for arranging this seminar. It is an important subject for P.Eng's to be aware of, and for it's implications for public safety, given that the Professional Engineers Act, R.R.O. Regulation 941, requires a professional engineer "to correct or report a situation that the practitioner believes may endanger the safety or the welfare of the public."

As a P.Eng., a former Chair of the Georgian Bay Chapter of PEO, and in my engineering career, this legal (and moral) responsibility of the Act has always been foremost. As a participant in the seminar, I want to apologize to you as speaker, to the Chapter organizers, and to the other seminar participants, if my frequent questions seemed to monopolize the floor at times. There was no intent to prevent others from having their say. As I identified to you during the dinner break, the subject of Battery Energy Storage Systems, is of concern to municipal leaders who had requested me to brief them as a P. Eng. on the subject in March 2023, 18 months ago. A copy of the presentation I delivered to them at the time is attached for your information. As I identified to you at the seminar, the BESS hazards identified in my presentation were as identified in recognized, reputable journals.

You ask in your note, "for any comments or recommendations regarding the seminar." My comments in this response are certainly not a formal "technical review" of your presentation, as defined by the PEO Guideline. My comments are based on personal notes taken during the seminar, so may be influenced from what I thought I heard, rather than what was actually said.

1) You introduced the subject, noting the Canadian Net-Zero Emissions Accountability Act enshrining Canada's commitment to achieve net-zero greenhouse gas emissions by 2050, as a driver for Battery Energy Storage Systems.

- to bring more realism into this goal's objective, it would be useful if your presentation would identify that the Environment Canada website identifies that to achieve this goal will require Canada to "Transition to 100% wind, water, and solar (WWS) for all purposes (electricity, transportation, heating/cooling, industry)" by 2050. (See slide attached from Environment Canada website.) As Professional Engineers with some awareness of what this objective would mean, I suggest it is somewhat irresponsible for us to gloss over this aspirational statement, as if it might be achievable. As I pointed out to you at the seminar, even for Ontario, as only part of Canada, this would mean replacing all of the energy supplied by 1,435 PetaJoules (PJ) of Petroleum products, 935 PJ of Natural Gas, 137 PJ of Biofuels, 127 PJ of Other sources (e.g. coal, etc), as well as the 60% of the 514 PJ supplied by nuclear to the Ontario electrical system, with wind, water, and solar in the next 25 years.

2) Your presentation went on to show that batteries of BESS have 6 applications,

- smoothing renewable supplies of solar and wind
- load shifting
- frequency regulation
- UPS backup power supplies
- voltage support
- and finally energy arbitrage (buying cheap electricity to sell later at a profit)

In fact, in particular for the first identified objective, of smoothing renewables, examination of the actual performance of Ontario wind generators in particular as seen in 3 years of actual IESO data from 2021 to 2023 (attached) you find that the need to shift wind is not so much daily as seasonally. We need the supply on hot sticky summer days (like recently) when wind has a negligible supply, and on cold calm crisp winter nights when again wind (and solar) are minimal. The main advantage BESS will provide is as you say "energy arbitrage" and the main result of this will be to increase the cost to consumers, not to add security.

3) In your discussion of BESS hazards, while you mentioned the risk of older Lithium Ion cells (either LiNMC LiNCA or LiFePO4 cells) "swelling" indicating failure, you failed to identify that this is generally not something that batteries experience immediately when new, but after a number of charge-discharge cycles, or periods of sustained high capacity storage. Thus, in your identification that the safety of Lithium batteries is assured by a charge-discharge-charge-discharge test, you failed to show that safety was assured. This was the point I was trying to make by my question at the seminar that this very limited test should not be considered as assuring battery long term safety. The BESS systems we are installing today are expected to have a lifetime of years, of charging and discharging at high current, or sustained sitting at high charge. These are precisely the conditions that are implicated in cathode/anode partition penetration by dendrites or damage.

4) In your discussion about Battery Management Systems, your discussion about cell balancing was unclear. I heard, (perhaps my error) that you were discussing the importance of cells being balanced by mass on their racks. I did not hear that the goal of a BMS is to ensure cell voltage levels are "balanced". This may have been my error, but perhaps you would check your delivery notes, to ensure that the subject of "balancing" is not misinterpreted by your listeners.

In conclusion, my somewhat cursory review of your presentation left me wondering if listeners adequately understood the hazards, and that they are not addressed adequately by the current codes and standards. Given the risk which I identified in installing major systems, such as the 40 acre, 400 MW, 1600 MWH storage system in the rural municipality of Arran Elderslie, or the proposal of installing a BESS on the border of Owen Sound, under 1 km from the Grey County Offices, the largest public school in Grey and Bruce, of the Regional Hospital, perhaps you may wish to revisit your presentation.

William (Bill) Palmer P. Eng.