FINAL

Commission to Advance Lithium-Ion Battery Safety in Maryland Mtg (HB468-Ch 950)

Thursday, December 5 · 10:00am – 12:00pm

Time zone: America/New York

Google Meet joining info

Video call link: https://meet.google.com/onr-vzdi-zux

Or dial: (US) +1 413-749-4505 PIN: 903 082 512#

More phone numbers: https://tel.meet/onr-vzdi-zux?pin=8698687664184

The meeting was called to order by Commission Chairman Emil Nusbaum at 10:07 a.m.

Present in person were Commission Members: Chairman Emil Nusbaum, Marc Boolish, Ivan Browning, Vincent Baker, Michael Cox, DeAndre Wilson, Kitty McIlroy, and Justin Short. Members Attending Virtually: Taiwo Alo, David Black, Haley Kotzker, Christopher Neidhart, Chris Pilzer, Nicholas Rodricks, Ginny Rogers and Robert Whittlesey. Absent Commission Members: Shatorah Robertson, Geoffrey Donahue, Garrett Fitzgerald. Members of the public were in attendance. Staff in attendance: Ken Bush MSP and Penny Doty MSP.

Roll call was completed by the Commission staff. Staff confirmed there was a majority present.

Chairman Nusbaum reviewed the meeting agenda and the minutes from the last meeting held on November 7, 2024 and the November 22, 2024 Virtual Meeting. The minutes as presented were approved by all the attending Commission members for finalization with no objections raised. Chair Nusbaum reported that the Interim Report was emailed, with hard copies mailed out to the Legislative Contacts as required.

Chairman Nusbaum introduced James (Jim) Milke, Ph.D, FSFPE, Professor Emeritus, University of Maryland Senior Principal Engineer, Fire and Risk Alliance to the Commission. Dr. Milke provided the Commission with an "Overview of Lithium-Ion Battery Hazards and Protection Strategies" Presentation. The Presentation included the following highlights.

!. Outline.
   A. Overview of lithium-ion batteries (LIB): parts, types, sizes and use
   B. Hazards of LIB and thermal runaway
   C. Fire incidents involving LIB: causes, consequences
   D. Fire detection and suppression options for LIB fires
   E. Recycling and Damaged, Defective or Recalled Batteries

II. Battery Form Factor
   A. Cylindrical Cell
   B. Prismatic Cell
   C. Pouch Cell

III. LIBs from Cell to System

A. Cell
B. Module
C. Unit
D. Container

IV. Module
A. Battery Cell
B. Liquid Cooling Structure
C. Passive Cooling Structure
D. Cell Module Controller
E. Busbar
F. Support Structure
G. Battery Terminal

V. Battery Energy Storage Systems (BESS)

VI. Cell Chemistry
A. LCO – Lithium Cobalt Oxide – Small portable electronics (phones, laptops, cameras
B. LMO – Lithium Manganese Oxide – Portable power tools, medical instruments, some hybrid or electric vehicles
C. LTO – Lithium Titanate Oxide – EVS, charging stations, uninterrupted power supplies, wind and solar energy storage, solar street lights, telecommunication systems, aerospace and military equipment
D. LFP - Lithium Iron Phosphate
E. NMC – Lithium Nickel Manganese Cobalt – Power tools and powertrains for electric bikes, scooters and EVs.
F. NCA – Lithium Nickel Cobalt Aluminum - EVs, other products that require high loads with long battery life.

VII. Thermal Runaway
A. Hazards –
1. Smoke, Fire, Explosion, Internal Pressure Rise, Toxic Gas Production, Flammable Gas Production, Vapor Cloud
B. Initiation by Abuse – Overheat, Crush, Penetration, Overcharge, Internal Short, External Short, Electrolyte leakage.

VIII. Causes of Thermal Runaway
A. Increased frequency – Battery Abuse, Uncertified Batteries, Modifications, Mismatch Parts

IX. Video of Gas Release from Damaged Module, Video of burning Module placed in Bucket of water

X. Emissions During Thermal Runaway
A. Carbon Dioxide, Carbon Monoxide, Hydrogen, Hydrocarbons (methane, ethan, ethylene, acetylene, propene, propane, ….), Hydrogen Fluoride, Fluoroethane, Hydrogen Chloride, Hydrogen Cyanide, Nitrous Oxides, Sulfur Dioxide

XI. Soot Emissions
A. Primarily, heavy metal-oxides – Nickel, Manganese, Cobalt
B. Others – Lithium, Fluorides, Chlorides, Polyaromatic Hydrocarbons (PAH)

XII. ESS Incidents – 2,262 Fires in 2023 (increase of 303% since 2018) – 2018 – 2023: 773 Injures and 132 Fatalities

XIII. Fire Incidents w/ Micro-Mobility Vehicles, NY City – 2019 – 2023 – Alarming Increasing for Investigations, Injuries, Deaths and Structural
XIV. Incidents at UMD, College Park – Case Studies – E-Micro-mobility devices
XV. Micro-mobility Devices – Experiment Video w/ E-scooter in living Room – UL
XVI. Incidents w/ EV – Video –
    A. Chevrolet Volt Caught Fire Two Weeks After Crash
    B. Eight-four cases of re-ignition
XVII. Detection
    A. Gases – Carbon Dioxide, Hydrogen, Volatile Organic Compounds
    B. Particles – Air Sampling Detector
XVIII. Ideal Battery Extinguishment Agent
    A. High Thermal Conductivity and Capacity and Low Electrical Conductivity
    B. Application of Water
        1. Water has good heat remove capability, but is electrically conductive
        2. Potential for shorting neighboring cells – may initiate thermal runaway in another cell
        3. Potential of HF generation peaks over short periods of time – poses health risk to emergency responders
XIV. Suppression Strategies
    A. Stopping thermal runaway requires that suppression agent interacts w/ affected cell
    B. Suppression system operation in vicinity of ignited battery can prevent fire spread to other combustibles in the area.
XX. Suppression of EVs
    A. Type of Vehicle – Mock-up of PHEV/4.4kWh –
        1. Quantity of Water – 275,1060
        2. Quenching Time – 72,586
        3. Reignition – 10 Minutes After Start
    B. Type of Vehicle – Mock-up of EREV, 16 kWh
        1. Quantity of Water – 1074, 1165, 2640
        2. Quenching Time – 9:32, 14:02, 21:22
        3. Re-ignition – 10 Minutes After Start
XXI. BESS Information: Standards
    A. Built Environment – ICC IF, ICC IRC, ICC IBC; NFPA 5000; NFPA 1
    B. Installation/Application – NFPA 855, NFPA 70, UL 9540 A, IEEE C2, IEEE 1635/ASHRAE 21, IEEE P1578, DNVGL Gridstor, FM Global 5-33, NECA 416 & 416
    C. Energy Storage Systems – UL 9540, ASME TES-1, NFPA 791
    D. System Components – UL 1973, UL 1974, UL 810A, UL1741, CSA 22.2 No. 340-201, IEEE 1547, IEEE 1679 Series
XXII. BESS Information Standards - II
    A. Cell Certified to IEC 62619 (UL 1642)
    B. Module Certified to UL 1973
    C. Rack Certified to UL 1973
    D. BMS Certified to IEC 61508
XXIII. BESS Layers of Protection
    A. Containment Region – Smoke Detection, LFL Gas Detection, Exhaust and Deflagration Venting, Fire Suppression, PCM/Intumescent Materials, Colling/Heat Transfer Plates, Separation Distance Specification, Non- Propagation Design.
    B. Preventative Region – Cell Quality, Environmental System Controls, Battery Management System, Off-gas Detection, Temperature Monitoring

XXIV. Explosion Control – IP66 Battery Bay
   A. Roof Vents, IP20 Thermal Roof, Overpressure Vents, Sparkler Assembly
XXV. NY State Activity
   A. Gov Hochul Inter-Agency Fire Safety Working Group on Emergency Response
      1, Division of Homeland Security and Emergency Services
      2. Office of Fire Prevention and Control
      3. NY State Energy Research and Development Authority
      4. NY State Dept of Environmental Conservation
      5. Dept of Public Service
      6. Dept of State
   B. Developments
      1. Feb 2024: Initial Recommendations
      2. July 202: Draft fire code amendments for BESS installations
XXVI. Procedures for DDR (Damaged, Defective or Recalled) Batteries (US DOT)
   A. Indications of DDR Batteries –
      1. Acute hazard, such as gas, fire, or noticeable leaking electrolyte
      2. LiBs showing signs of physical or mechanical damage,
XXVII. Removal of DDR Batteries
   A. Vehicles towed to location, separated from other vehicles by at least 50 ft.
   B. Individual batteries: handle as hazardous waste
   C. FDNY Procedures
      1, The batteries or mobility device should be moved to the following location in order of preference until it can be appropriately over packed/mitigated by Haz mat Company 1 or a Haz Mat Tech Unit: bathroom tube or fire apartment, with all cells fully submerged; Sink large enough that all cells can be full submerged in water; Garbage pail or bucket large enough that all cells are capable of being fully submerged in water
XXVIII. Public Education Messaging – C.H.A.R.G.E.
   A. Choose Certified Products
   B. Handle with Care
   C. Always Stay Alert for Warning Signs
   D. Recycle Devices and batteries Properly
   E. Get Out quickly if There is a Fire
   F. Educate Others on Safe Practices
XXVIV. Recommended Actions
   A. Adopt Current Standards – they are “catching up” to a rapidly changing hazard
   B. Regulations on D- mobility Charging
   C. Support for Emergency Responders: Exposure to heavy Metals, Acidic Gases
   D. Public Education needs to be a high priority – provide support to Fire Departments to do that function

After the presentation, Dr. Milke opened the floor for questions and further discussions among the Commission members.

The Subcommittee leaders provided the Commission with updates and plans for future meetings.

The Commission members discussed the current battery pick-up program in Montgomery County and the need for other counties to push the initiative as well as to fulfill the need to expand the service to rural communities.

The Commission discussed and recommended invite extensions to identified focus groups/guest speakers to present at future Commission meetings. The Commission also discussed various upcoming/future demonstrations related to the Commission's topics of interest. More information will be provided at a later date.

The Commission discussed adoption of policy regarding inclement weather. The Commission agreed that regularly scheduled Commission Meetings would be held virtually with no in-person meeting in the event Prince George's County Schools and/or University of Maryland at College Park are closed due to inclement weather. Of course, Chairman Nusbaum advised the Commission members to always utilize their own judgment when determining hazards related to inclement weather and personal meeting participation format.

Penny Doty reminded Commission members that the Subcommittee documents and discussions are confidential until presented to the Commission at an Open Meeting forum. This means that the Subcommittee shared drive cannot be shared with the Commission members. Commission members are encouraged to join one or more Subcommittees to enhance participation. Each of the Subcommittee meetings can only include the rostered members due to quorum restrictions. Please contact the Emil Nusbaum Commission Chair, Penny Doty or the Subcommittee Leaders if interested in joining one or more Subcommittees.

The next in person Commission meeting was scheduled for Thursday, January 9th at 10:00 a.m. at MFRI in Classroom I.

Chair Emil Nusbaum asked if there was any additional business the group members wished to address, and upon hearing none, the meeting was adjourned at 12:43 p.m.

These meeting minutes are respectfully submitted by Penny L. Doty.