# **Upcoming Changes to NFPA 855**

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### Agenda

- > Introductions
  - > What is ATIS PEG?
  - > Meet the Speakers
- > Background: The Fire Codes and Battery Regulation
- > NFPA 855-2020
- > Key Changes in NFPA 855-2023 for Telecom
- > Upcoming Changes in NFPA 855-2026 for Telecom
- > Evolution of NFPA 855
- > Q&A



#### Ernie Gallo - Code and Safety Expert - NEBScore

Alliance for Telecommunications Industry Solutions (ATIS) ATIS Board Member ATIS Protection Engineers Group (PEG) Advisory Board Member ATIS STEP: Sustainability in Telecom: Energy and Protection Committee

#### **National Fire Protection Association (NFPA)**

NFPA 1 Fire Code, 70 National Electrical Code (NEC) 70E -Standard for Electrical Safety in the Workplace - NFPA 780 Standard for the Installation of Lightning Protection -NFPA 855 Standard for the Installation of Energy Storage Systems

#### **Institute of Electrical and Electronics Engineers (IEEE)**

IEEE C2 National Electrical Safety Code – Committee IEEE Wire Line Subcommittee IEEE Low Voltage Data, Communications and Signaling Circuit Surge Protective Devices IEEE Fiber Optics Subcommittee



# Introduction to ATIS PEG atis PEG ENGINEERS GROUP

- The <u>Alliance for Telecommunications Industry Solutions (ATIS)</u> is a standards development organization that advances ICT industry transformation.
- > ATIS' various committees and initiatives are member-driven and consensus-based.
  - > Learn more about <u>ATIS Initiatives</u> <u>STEP Committee</u>
- > ATIS produces the annual <u>Protection Engineers Group (PEG) Conference</u> and events. Attendees of PEG events do not need to be ATIS Members.

The annual ATIS PEG Conference brings together the leading experts in the fields of power, engineering, and telcos each year to network and share the cutting-edge developments in the field.



# Who is This Bald, Fat Dude?

- > Trng Dir for Services Subsidiary of a Large Lead-Acid & Li-ion Mfr
  - > Started Out of High School with Electric Utility at Generating Plant
  - > Then, 26 Years with ITC Company as Power Maintenance Engineer
- > Degreed Electrical Engineer and Master/Journeyman Electrician
  - > Working on PE
    - > Not as Important for Most Electrical Engineers Except Consulting
- > Former Chair of IEEE PES ESSB
  - > IEEE1635/ASHRAE21 (Battery Ventilation / Thermal Mgmt) co-Chair, IEEE1657 (Batt Tech Trng) Chair, IEEE2962 (Li-ion IO&M) Vice-Chair, etc.
- > Principal Member of NFPA 855 (BESS Installation, which Feeds Fire Codes)
  - > Task Group Chair or co-Chair for 4 Task Groups



- > Chair of Battcon (Annual Battery User Conference) Tech Cmte
- Former Vice-Chair of ATIS-STEP and Primary First Edition Author of 5 ATIS Standards on Power, Batteries, Grounding, and Electrical Protection





#### **Rich Kluge - NEBS & Fire Code Expert - NEBScore**

#### **Principal NEBS Consultant for NEBScore**

Started Out of College as Project and Process Engineer in Plastics Industry Since worked 33 Years with Bellcore – Telcordia – Ericsson – NEBScore

#### **Degreed Mechanical Engineer and Professional Engineer**

Work experience mostly in thermal, seismic and physical protection

#### Managed many telecom standards projects

GR-63 & GR-1089, NEBS Physical and Electrical Equipment Protection Standards GR-3160, Data Center and Data Center Equipment Standard GR-1275, Installation Quality for Telecom and Data Center Facilities GR-232 (VLA), GR-4228 (VRLA), GR-3150 (Li-Ion), GR-3176 (NaNiCI)...

Principal Member of NFPA 855, as well as NFPA 75, 76, 110/111, 1, 72 +



#### How the Fire Codes Work and Why They're So Confusing

- > "Home Rule" in the U.S. (10<sup>th</sup> Amendment)
- > 2 Model Fire Codes (IFC and NFPA 1)
  - > Reissued Every 3 Years





- > Local Jurisdictions (States, Counties, Municipalities) Can Adopt Model Codes in Whole or Part and Modify, or Write Their Own
  - > Sometimes They are Many Years Behind Adopting the Latest
    - > e.g., some Counties in Texas Still on 2005 Codes
- > NFPA 855 Feeds Model Fire Code Battery Requirements
  - > But it is Relatively New, so Only in Newer Model Codes
- > A&E (Architecture & Engineering) Firms and AHJs (Fire Marshals) Are Learning the Code Changes as They Go and Often Misinterpret Them





Figure 1 – Statewide Fire Code Adoptions



PEG PROTECTION ENGINEERS GROUP

## **History of Battery Regulation in the Fire Codes**

- > UFC (Western States Only) 1997, Article 64
  - > Lead-Acid Spill Containment Driven by LA Grand Fire
    - > Started as TIA in 1995 to 1994 Edition of the UFC
  - > Lead-Acid Ventilation Driven by Sacramento Explosion and Other Thermal Walkaway Events
- > IFC (was Articles 608/609 now in Chapter 12) and NFPA 1 (Chapter 52) 2000 and beyond editions
  - > 2018 Edition of IFC Was First to Comprehensively Cover Li-ion and Other Technologies Besides Lead-Acid and Ni-Cd
  - > First Edition of NFPA 855 in 2020
    - > NFPA 1 Adopted in 2021+ and IFC (2023 ed.) in 2024+











#### Key Telecom Traditional Battery Technology Exemptions in NFPA 855-2020

- > Lead-Acid (including VRLA), Ni-Cd and NiZn < 70 kWh Exempt
  - >  $\leq$  1,458 Ah (Total of all Parallel Strings) for Nominal -48 VDC
  - > -48 VDC Lead-Acid/Ni-Cd Exempt from Listing & Explosion Control
  - > UL 1778 Listed UPS w/Lead-Acid Exempt from Other Listings
    - > Lead-Acid/Ni-Cd in UL 1778 Listed UPS Exempt from Explosion Control
- > Lead-Acid and Ni-Cd Bldgs < 1,500 ft<sup>2</sup> Exempt From Fire/Smoke Detection
  - > Other Telecom Lead-Acid Facilities Comply with NFPA 76 Detection
  - > If Only -48 VDC Lead-Acid or Ni-Cd Batteries, NEBS-Compliant Eqpt Bldgs Don't Need a Fire Suppression System
    - > <1,500 ft<sup>2</sup> Bldgs Don't Need a Fire Water Supply if Only -48 VDC Batteries
- > VRLA Not Required to Have Spill Containment or Spill Kits (Neutralizer)
- > -48 VDC Lead-Acid / Ni-Cd Can Use Industry Install/Removal Practices







#### **Telecom Exemptions for Newer Battery Technologies** in NFPA 855-2020

- > Li-ion & NaNiCl < 20 kWh Exempt
  - >  $\leq$  390 Ah (Total of all Parallel Strings) for Nominal -48 VDC
- > Li-ion & NaNiCl Exempt from:
  - > Spill Control & Neutralization (Spill Kits)
  - > Normal Ventilation (if Unoccupied)
  - > Flame Arrestors







#### Key Telecom Regulations in NFPA 855-2020 That Apply to All Battery Types

- > Signage for Battery Rooms/Areas
- > Maintenance Documents on-Site
- > SDS on-Site
- > Training for Maintenance Personnel







#### Key Traditional Battery Telecom Regulations in NFPA 855-2020

- Vented Lead-Acid and Ni-Cd > 1,000 gals Total Require Spill Control
  - >  $\approx$  8,770 Ah Total of Paralleled Strings
- Calculations (see IEEE 1635 / ASHRAE 21) Needed to Ensure Gassing from Lead-Acid (Including VRLA) and Ni-Cd Won't Exceed 1% Hydrogen with Existing Ventilation Design
  - > On-Site Neutralizer (Spill Kits) for Flooded Lead-Acid and Ni-Cd
  - > VRLA Needs a Method to Detect and Control Thermal Runaway (Walkaway)
    - > Typically Done with Temperature-Compensated Charging
  - > All Lead-Acid (including VRLA) and Ni-Cd Must Have Flame Arrestors



#### Key Newer Battery Telecom Regulations in NFPA 855-2020

- > Li-ion and NaNiCl Over 20 kWh Must Comply with the Following:
  - > A Site-Specific Emergency Operations Plan
  - > An HMA if Site has Both Li-ion and Lead-Acid or Ni-Cd in Same Room
  - > UL 9540A Test Results
  - > 3' Minimum Spacing of These Battery Types from Everything Else and from Each Other's 50 kWh Max Bays/Cabinets/Racks/Stands
    - > AHJ Can Waive Based on UL 9540A Test Result Report from FPE
    - > Telecom -48V Lead-Acid and Ni-Cd are also exempted
  - > Modules Listed to UL 1973 and System Listed to UL 9540
  - > Can't Go in a Basement Electrical Room
  - > Commissioning and Decommissioning (Before Removal) Plans and Results
  - > BMS to Prevent Over/Under Voltage, Charging Outside °F Range, etc.
  - > Deflagration Ventilation and Explosion Control per NFPA 68 & 69







# More Key Newer Battery Telecom Regulations in NFPA 855-2020

- > Li-ion and NaNiCI Limited to Max 600 kWh
  - > Can Exceed with AHJ-Approved HMA



- > Li-ion and NaNiCl Over 50 kWh Must Comply with the Following:
  - > High Flow (0.3 gpm) Sprinklers (about 3x typical NFPA 13 design)
- > AHJ Can Force Retroactivity for Previously Installed Sites







#### Key Changes in NFPA 855-2023 for Telecom

- > NaNiCl from FZSoNick (now Horien) Exemption Increase from 20 to 70 kWh
- > New kWh Calculation for W/Cell Ratings Benefits Lead-Acid (includes VRLA)
  - > 1,166 W/cell (Total Lead-Acid Strings @ 15 min Rate) for 480 VDC Bus UPS
    - > 1 String/Cabinet for Nominal 480 VDC Bus UPS of ZincFive NiZn
- > Lead-Acid Listed to UL 1973 Don't Require 9540A Testing, nor 9540 Listing if Other Components (e.g., Chargers/Inverters) Appropriately Listed
- > Lead-Acid Cabinets/Stands/Racks Limited to 250 kWh without 3' Spacing
  - >  $\leq$  5,208 Ah @ -48 VDC
    - May Seem to Eliminate New 2 String MiniTank Stands (48 x 4000 Ah batteries) But Note Telecom Exemption!
  - > ≤ 4,166 W/cell for Nominal 480 VDC UPS String(s) [all VRLA Parallel Strings]
- > Installations on Roofs (e.g., for Wireless) > 75' Require AHJ Permission
  - > More Likely to be Granted for Lead-Acid or Ni-Cd
- > Lead-Acid Batteries in UPS Not Required to Have Fire Suppression System
- > NFPA 68 or 69 Compliance (Not Both) for Li-ion and NaNiCl
- > Li-ion Storage Rules of Chapter 14 Apply to New Batteries (Not Just Used)



#### **NITMAM Process for NFPA 855-2026**

- > 855-2026 To Be Published Late June December 2025, Depending on Outcome of NITMAMs at mid-June NFPA Conference Technical mtg, and Possible Subsequent NFPA 855 Committee Votes Based on Any "Successful" NITMAMs
  - > NITMAMs Concerns:
    - > Additional Listing for EV Batteries to Have Propagation Testing if Used for V2X
    - > 9540A and LSFT Language
    - > Add Other Potential Fire Suppression Method Standards
    - > Whether NFPA 68 Compliance Should Be Added Back in Addition to NFPA 69 for Li-ion Systems





#### Forthcoming Changes for NFPA 855-2026 For Telecom

- > Exemptions for Lead-Acid and Ni-Cd Mostly Harmonized, and NiZn Added
  - > NiCd and Flooded Lead-Acid Exempted from UL 1973 Requirement and Still Not Required to Have UL 9540A or 9540 System Testing if Ancillary Components Listed





>

- 9540A Testing May Not Be Adequate (Depending on What's Done by the Test Lab) as a True Large-Scale Fire Test (LSFT), so Annex G.11 Added as an Example
  - > 9540A Likely to Get More Revisions to Make it More Amenable to the NFPA 855 Committee?



Maximum Energy Table Removed for All Battery Types

Hazard Mitigation Analysis Now Mandatory for All Non-Lead Acid and Ni-Cd Types.

Emergency Response Plan Needed in Addition to Emergency Action Plan





#### **NFPA 855 Evolution in Retrospect**

- > Initial Emphasis on Fire and the Need for Listing to UL 9540.
- > Quick Recognition That Thermal Runaway Propagation UL 9540A was needed.
- > Oops! Stopping the Fire Increases Explosion Risk Add NFPA 68 and NFPA 69 and Explosion Testing.
- > Oops! Still Fires Add Large-Scale Fire Testing on Top of Other Tests.
- > Broad with Respect to Chemistries and ESS Technologies, But 90% of Focus is Lithium-Ion Batteries.
- > Somewhat Difficult to Compare Editions Due to Large-Scale Reorganization.



## 2015 Edition of IFC – Battery Topics

- > Permits
- > Safety Caps
- > 1 hr or 2 hr Fire Rated Separation
- > Thermal Runaway Control for VRLA
- > Spill Control and Neutralization
- > Supervised Ventilation
- > Signage
- > Seismic Bracing
- > Smoke Detection

## 2018 Edition of IFC – Additional Topics

- > Hazard Mitigation Analysis
- > Vehicle Impact Protection
- > Testing Maintenance Repair
- > Location Restrictions 75 ft up 30 ft down
- > Electrical Disconnects
- > Separation for Outdoor Installations
- > 50 kWh Size Limitations
- > Security
- > Maximum Allowable Quantities
- > Listing of Battery, Chargers, Inverters
- > Energy Management System
- > Fire Suppression
- > Gas Detection



## 2023 Edition of NFPA 855 – Additional Topics

- > Retrofits
- > Reused Equipment
- > Installation
- > Means of Egress
- > Fire Command Center
- > Access Roads
- > Annunciation
- > Water Supply
- > System Interconnection

- > Commissioning
- > Decommissioning
- > Operations and Maintenance
- > Training
- > Emergency Operations Plan
- > Fire and Explosion Testing
- > Dedicated and Non-Dedicated Use Buildings
- > Roof Top Installations
- > Parking Garages



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# **Questions?**

