WHAT'S GOING ON IN THE IEEE BATTERY STANDARDS GROUP?

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ABSTRACT

Battery users worldwide benefit from IEEE battery standards. While other standards organizations produce battery documents that concentrate on product specification and qualification, the IEEE documents are far more user-oriented. The aim of these standards is to help the user in all aspects concerning stationary batteries, from sizing, through installation design and installation, maintenance and testing, to replacement. This paper gives the Battcon audience an overview of these documents and highlights some of the newer projects being pursued.

THE COMMITTEE

The people working on these standards collectively make up the Stationary Battery Committee (StaBatt) of the IEEE Power Engineering Society (PES). StaBatt consists of about 60 volunteers, mostly from utilities, telecom operators, battery manufacturers, equipment manufacturers, service companies, consultants and governmental and quasi-governmental organizations. From the standpoint of its organization and technical activities, StaBatt reports to the PES Technical Council, and in its standards activities it reports to the IEEE Standards Association (IEEE-SA). Most of the participants are members of IEEE-SA and PES, but this is not required to become involved in standards work.

StaBatt sponsors 11 standards and six standards projects. A full list of these is given in the bibliography at the end of this paper, and in the body they will be referred to by their number and an informal description of their contents.

IEEE STANDARDS

Although all of these documents are described collectively as standards, they actually fall into three categories: standards (in which the predominant tone is 'shall'); recommended practices ('should'); and guides ('may'). StaBatt's mainstream approved documents include only one standard (IEEE 535 on nuclear qualification), seven recommended practices and three guides. The newer projects are more heavily oriented towards guides.

Each project begins with a Project Authorization Request (PAR), which must be approved by the New Standards Committee of the IEEE-SA Standards Board (SASB) before substantive work can proceed. A working group is assembled and produces a series of drafts, moving progressively towards the goal of a finished document. When a draft is deemed by the working group to be ready it moves through the IEEE-SA balloting process, which ensures a balanced approach in which all comments are properly considered. The final draft must be approved by the Review Committee of the SASB, which functions as a watchdog to ensure that the process has been followed correctly.

Once approved and published, these documents have a five-year review cycle. By the end of this five-year period a document must be withdrawn, reaffirmed without changes, or a PAR must be approved for its revision.

BATTERY DOCUMENTS

StaBatt's core documents can be grouped by function or by chemistry/technology, with some documents covering more than one function or chemistry/technology. There are guides to battery selection (IEEE 1184 for UPS and IEEE 1189 for VRLA), and recommended practices for sizing (IEEE 485 for lead-acid and IEEE 1115 for nickel-cadmium). IEEE 484 and 450 cover recommendations for vented lead-acid battery installation and maintenance/testing, respectively, and are mirrored by IEEE 1187 and 1188 for VRLA. For nickel-cadmium these functions are combined in one document, IEEE 1106.

In addition to the new projects outlined below, the committee is currently working on updates to the following documents: IEEE 485, 535, 1106, 1184, 1188 and 1189.

NEW PROJECTS

IEEE 1375, guide for battery protection, was originally approved in 1998. This document provides an indication of the trend of new projects being sponsored by StaBatt. These new documents are predominantly guides and cover certain areas in much more depth than could be achieved in one of the existing recommended practices. The subjects include battery monitoring (P1491), spill containment (P1578), ventilation (P1635), personnel qualifications (P1657) and battery cycling (project number not yet allocated). These new projects are described in greater detail below.

Battery Monitoring

IEEE P1491, a guide for battery monitoring, is being developed to help those who are looking for guidance on the selection and use of fixed stationary battery monitoring equipment. The document has been in development for several years. By the end of the January 2004 meeting of the group, the document was reviewed, and revised up to page 36 of 49. Written comments, changes, and revisions by working group members (present or not) were implemented by the end of February. Par 1491 Final Draft was sent out for ballot mid-March, 2004 to the entire SCC29 Group. At the next meeting in Portland, all tabulated votes and comments will be reviewed. The working group chair is Bart Cotton, and the vice-chair is Zbig Noworolski.

Battery Spill Containment and Ventilation

StaBatt is working on two new documents to help with the present misinterpretation of Fire Codes. The four competing model Fire Codes all require spill containment and ventilation (many other Codes and standards, including the NEC, also require ventilation) in one form or another. The problem is that the wording is sparse (leaving it open to interpretation by Fire Marshals, Building Inspectors, and Electrical Inspectors), and varies from Code to Code. In order to better guide users, manufacturers, and authorities having jurisdiction (the aforementioned inspectors, each known as the AHJ) on how to properly do (and calculate in the case of ventilation) spill containment and ventilation, the StaBatt committee is creating P1578 on spill containment and P1635 on ventilation. In addition, while other IEEE StaBatt standards specify calculation methods for Hydrogen evolution from batteries, they are coarse (only cover worst case operating mode) and can lead to costly oversizing of ventilation systems. ASHRAE (the American Society for Heating, Refrigeration, and Air-conditioning Engineers) came to StaBatt and asked us to jointly develop a ventilation standard with them to better guide their engineers on how to design HVAC (Heating, Ventilating and Air-Conditioning) systems for battery rooms/areas. These are Guides, and the AHJ still has the final say over what the applicable Code in a given jurisdiction means; but we hope that these Guides will help them better understand the issues, so that they can make informed interpretations and judgments, rather than judgments based on hyperbole and marketing.

The spill containment document (1578) is the closest to publication. First and foremost, it debunks the myth that VRLA batteries need spill containment. It covers multiple methods of providing spill containment (room/area, individual rack, drainage to water/chemical treatment, etc.). It also addresses the issue of passive versus active neutralizing or absorbing pillows. The Model Codes address spill containment for batteries sitting on a rack doing nothing. P1578 also addresses the more likely spill scenario of installation or removal of flooded batteries. In the Appendix, a Model Code section on batteries is given to guide existing and future Code committees on the IEEE's view of the requirements that should be included in Codes to properly cover safety for batteries. This should be a very useful document.

Because ASHRAE and the IEEE have differing standards processes, each has its own committee working on the ventilation standard. There is cross-pollination of membership between the two committees and we're sharing the same document (having assigned different sections to each committee). It is still up in the air as to whether the document will share sponsorship and numbering. These issues have held up this document more than the spill containment document. However, it is beginning to take final shape, and already contains a lot of useful information. For example, it covers the expected gas evolutions under different operating modes (boost/equalize, cycling, float, etc.) It also gives guidance on how to calculate the electrolyzing current (that portion which produces Hydrogen gas) and coloumbic current (the portion that actually recharges a battery) from the total charge current. Also addressed are the much lower gassing rates of properly operating VRLAs.

Battery Technician Qualification/Training

Shifting gears to the subject of training, many companies contract out their battery installation and/or maintenance. They really have no good way of verifying whether the technicians of the companies they hire are properly trained on DC battery installation and maintenance (and its associated safety precautions), other than the "word" of those companies. There are various battery training programs out there, but they widely vary in length and content. For DC battery technicians there is nothing like the electrician apprenticeship program. Oftentimes, it does no good (other than the important safety aspect) to hire just electricians either, as most electricians are very good at AC systems, but many have little experience on DC systems. For these reasons, StaBatt is tackling the subject of attempting to somewhat standardize the training subjects for a DC battery installation or maintenance technician. The new document has just been started, and has been assigned project number P1657. The IEEE will not be getting into the business of certifying technicians, but the document will provide guidance to any organization who wishes to train battery technicians on the subjects that should be covered in a proper training program. It may even include varying levels of technicians (beginning, intermediate, expert; or some other form of classification). While this will not guarantee excellent technicians, at least a hiring organization can ask whether a tech has been trained on the appropriate subjects. There is no doubt that the average technician who has been trained on the appropriate subject matter will be more effective and commit fewer errors than a technician who hasn't been trained, or one who's been improperly trained, or even one who's trained too little for the job they're hired to do ("a little bit of knowledge can be a dangerous thing"). This project will likely take about 2 years to complete.

Stationary Portable Batteries?

An interesting sidebar to StaBatt's main standards activities is its sponsorship of P1625, covering batteries for portable computing. This document had already passed through the balloting process at the time of writing this paper and is expected to be 'on the street' by the time Battcon rolls around. A separate working group comprising some of the big names in the computer and portable battery industries developed this standard on a fast track to meet a need for standardization in their field. The first issue of the document deals exclusively with lithium ion and lithium ion polymer batteries and covers all aspects of design and manufacturing to meet stringent quality and safety requirements.

At first glance it seems that this document has nothing to do with the StaBatt's normal activities. While this is correct with respect to the committee's historical scope, it is expected that StaBatt will become increasingly involved with new battery technologies. Thus P1625 will help set the scene for the future. PES recognized this link and agreed to sponsor the document.

Battery Cycling and Emerging Technologies

The Emerging Electricity Storage Applications and Technologies Subcommittee (EESATS) is responsible for monitoring the status of and to promote awareness of emerging electricity storage technologies and applications. StaBatt formed the subcommittee to increase awareness of emerging applications such as distributed generation and transmission line stabilization that depend on stored electric energy, and emerging storage technologies such as the Sodium Sulfur Battery, the Zinc Bromine Flow Battery and several Lithium Ion battery designs currently in development as well as other electricity storage technologies.

The term "Stationary Battery" tends to conjure up many interpretations among power engineers, depending on one's perspectives on battery energy storage. A stationary battery is normally operated in one of two basic modes: 1) standby, and 2) cycling applications including primary power source batteries, i.e. off-grid hybrid power sources, or Distributed Energy Resources (DER) applications. Many standards developed for standby applications do not apply to cycling stationary applications, and vice versa, but many engineers are totally unaware of the not-so-subtle differences between standby battery operation and maintenance (O&M) and cycling battery O&M requirements. It is important to differentiate between these two applications and increase awareness of why and how these two O&M approaches must be managed differently.

In July 2003, the StaBatt sponsored a panel session at the PES summer meeting held in Toronto, Canada. The session was titled "Batteries for Stationary Standby and Stationary Cycling Applications". The panel addressed issues associated with the potential for the misapplication of stationary standby applications standards to stationary cycling applications. The panel presented six papers that covered the following topics as they related to the differences between stationary standby vs. stationary cycling applications. These papers were presented at the panel session:

Part 1: Standby vs. Cycling – Definitions and Concepts
Part 2: Selection Criteria
Part 3: Operating Issues
Part 4: Charge Management
Part 5: Maintenance and Testing
Part 6: Alternative Electricity Storage Technologies

As a follow-up to the formal presentations, the EESATS has proposed the development of a recommended practice titled "Guide for Application and Management of Stationary Batteries Used in Cycling Service". The proposed scope for the guide is "to provide information on the differences between stationary standby and stationary cycling applications and appropriate battery management strategies in cycling operations. While the primary emphasis is on lead-acid batteries, information is also provided on alternative and emerging storage technologies". At the StaBatt winter meeting held in January 2004 in Albuquerque, NM, the Stationary Battery Committee approved the formation of a working group to pursue the formal development of the guide. A PAR is currently in process.

Planning is currently underway to address the development of standards for emerging stationary battery technologies such as sodium sulfur, zinc-bromine, and lithium ion.

SUMMARY AND CALL FOR VOLUNTEERS

IEEE battery standards play a vital role for battery users worldwide and are particularly important in an era of downsizing, when specialized knowledge is increasingly being lost through early retirements and layoffs. StaBatt is expanding its activities into exciting new areas and this will be of additional benefit to the stationary battery community. The new work is creating a problem, however, in that the existing members are being stretched across more and more working groups.
The committee urgently needs additional volunteers to help develop these documents. There are no membership requirements to get started, and we invite anyone with an interest in this process simply to turn up for one of our meetings and to get involved. More information can be found on the StaBatt website at http://www.ewh.ieee.org/cmte/PES-SBC/

BIBLIOGRAPHY

1. ICBO, "*Uniform Fire Code*," www.icbo.org, 1997
2. ICC, "*International Fire Code*," www.intlcode.org, 2003 (*forthcoming*)
3. IEEE Std 450-2002, "*Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications*," www.ieee.org.
4. IEEE Std 484-2002, "*Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications*," www.ieee.org.
5. IEEE Std 485-1997 (Reaff. 2003), "*Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications*," www.ieee.org.
6. IEEE Std 535-1986 (Reaff. 1994), "*Standard for Qualification of Class 1E Lead Storage Batteries for Nuclear Power Generating Stations*," www.ieee.org.
7. IEEE Std 1106-1995, "*Recommended Practice for Installation, Maintenance, Testing, and Replacement of Vented Nickel-Cadmium Stationary Batteries*," www.ieee.org
8. IEEE Std 1115-2000, "*Recommended Practice for Sizing Nickel-Cadmium Batteries for Stationary Applications*," www.ieee.org.
9. IEEE Std 1184-1994, "*Guide for Batteries for Uninterruptible Power Systems,*" www.ieee.org.
10. IEEE Std 1187-2002, "*Recommended Practice for Installation Design and Installation of Valve-Regulated Lead-Acid Storage Batteries for Stationary Applications*," www.ieee.org.
11. IEEE Std 1188-1996, "*Recommended Practice for Maintenance, Testing, and Replacement of Valve-Regulated Lead-Acid (VRLA) Batteries for Stationary Applications*," www.ieee.org.
12. IEEE Std 1189-1996, "*Guide for Selection of Valve-Regulated Lead-Acid (VRLA) Batteries for Stationary Applications*," www.ieee.org.
13. IEEE Std 1375-1998 (Reaff. 2003), "*Guide for Protection of Stationary Battery Systems*," www.ieee.org.
14. IEEE P1491, "*Draft Guide for Selection and Use of Battery Monitoring Equipment in Stationary Applications*," (*presently in balloting*)
15. IEEE P1578, "*Draft Guide for Battery Spill Containment*," (*presently in draft*).
16. IEEE/ASHRAE P1635, "*Draft Guide for the Ventilation and Thermal Management of Stationary Battery Installations*," (*presently in draft*).
17. IEEE P1657, "*Draft Guide for Personnel Qualifications for Installation, Maintenance, and Operation of Stationary Batteries*," (*presently in draft*).
18. McCluer, Steve, "*Battery Acid Spill Containment — Big Issue or Big Yawn?*," Battcon 2002.
19. NFPA 1, "*Uniform Fire Code*," www.nfpa.org, 2003
20. Van Sciver, McCluer, Ashton, and Marrero, "*Future Power Shock: Battery Experts Separate Fact From Fiction*," Power Quality Magazine, pgs. 42-45 and 40-43, from September/October and November 2001 editions, respectively.
21. WFCA, "*Uniform Fire Code*," www.wfca.com, 2000.