



ANSI WORKSHOP
Standards and Codes for
Electric Drive Vehicles



American National Standards Institute

UL Standards Activity

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EV standards development

- Many parties developing EV/LEV product standards including IEC, ISO, NFPA, SAE, UL
- Focus of these standards reflect different aspects, geographies, etc.
- UL EV standards date back to 1990s, with many recent developments & publications



Crucial role of safety standards

- **Rapidly evolving EV technology and global supply base demands standardization relative to infrastructure, designs & safety**
- **A safe and secure infrastructure is key to deployment and acceptance of EVs**
- **UL actively involved with stakeholders to develop standards and test methods to promote safe EV use & deployment**



Safety standard objectives

- **Address safety for reasonable product use & misuse using Hazard-based Safety Engineering (HBSE) principles**
- **Compatibility with applicable model installation codes and regulations (e.g. NEC) is essential**
- **Compatibility with other applicable standards a goal**



EV equipment safety strategies

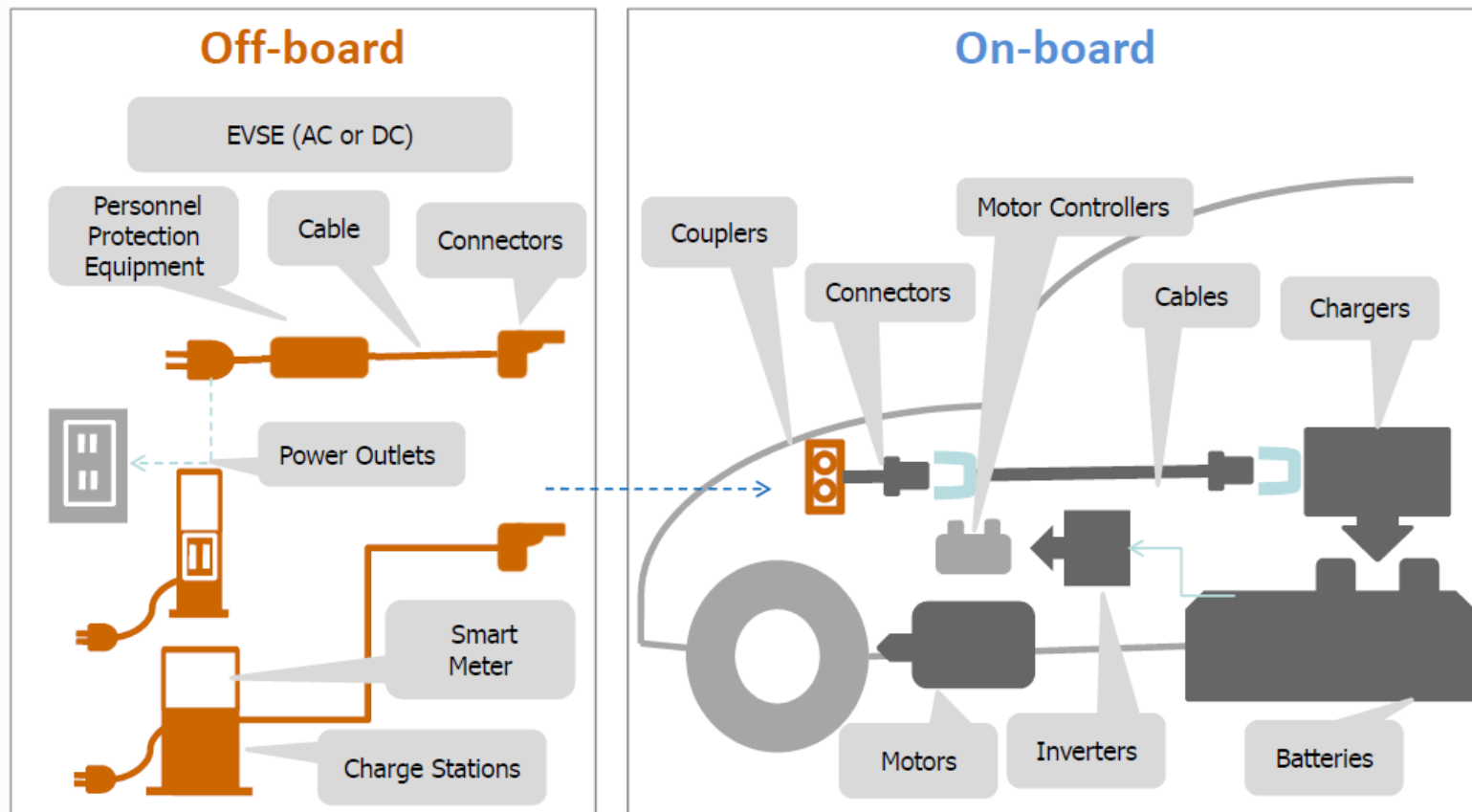
- **Product safety standards focus on minimizing risks of electric shock, fire, and injury**

- **Protection from abuse:**
e.g. consumer access,
vehicle exposure, misuse



- **Protection from environment: weather, temperature, exposure to solvents, etc.**

EV equipment addressed by UL standards



UL safety standards for EV equipment

Products	Standards	Scope
Electric Vehicle Supply Equipment	Sub 2594	Safety of EVSE products including cord sets, charge stations, and power outlets supplying power to an on board charger
Personnel Protection System	UL 2231-1 UL 2231-2	Safety of Personnel Protection Equipment (PPE) as required by the National Electrical Code to protect against electric shock
Off Board Cable	UL 62	Safety of Type EV cables in accordance with the National Electrical Code
Plug/Coupler	UL 2251	Safety of EV connector and inlet (coupler) for connecting power to an electric vehicle (referenced by SAE J1772)
On/Off Board Charger	UL 2202	Safety of on-board or off-board products supplying charging current to a battery
Batteries	UL 2580* Sub 2271	Safety of batteries and battery packs of Li-ion or other technologies for EV and LEV, respectively
Cables & connectors	Sub 2733 Sub 2734	Safety of on-board cables and connectors
Motor	UL 1004-1	Safety of electric motors, including those for vehicle traction forces
On-board converter/inverter	Sub 458A	Safety of on-board converters & inverters to modify voltage levels
Charging Station Meters	Sub 2735	Safety of utility smart meters
Wireless Charging Equipment	Sub 2750*	Safety of wireless EV charging equipment and technologies
		* Under development



UL standards development initiatives

- **Actively developing new safety requirements – basically all publications have been revised in last year or are being revised/developed now**
- **Sustained movement to consensus standards and ANSI National Standards**
- **Continued work on a global level to support safety of EV equipment**



Issues going forward

- **Completion of efforts to comprehensively address safety requirements for EV related products**
- **Holistic alignment and coordination of global system standards**
- **Supporting new technologies and innovations for the EV market through new standards development**



Comprehensively address safety

- **Many component standards exist, but need to continue to work to make sure the right content is defined for all safety-related components**
- **Codes and standards must address key safety issues for the public**
- **Comprehensively address solar integration, smart grid connectivity, local energy storage, etc.**



Holistic system coordination

- **Coordination of requirements to address “handshakes” among standards, and between standards and codes/regulations through balanced committees**
- **Responsible consideration of practical use, emerging issues, and closed-loop maintenance based on field experience**



Supporting innovation

Support EV technologies & products by:

- **Continuing engagement with industry and stakeholders**
- **Anticipating safety implications of evolving practical use**
- **Establishing baseline safety requirements to support safe, sustained deployment**



Conclusion

- **Much work has been done in EV product standards development**
- **Standards development is being diligently pursued by the safety community**
- **Collaboration with key stakeholders will result in the best set of cohesive EV standards & codes supporting safe deployment**



Thank you!

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