REGULATORY OUTLOOK FOR ELECTRIC VEHICLES

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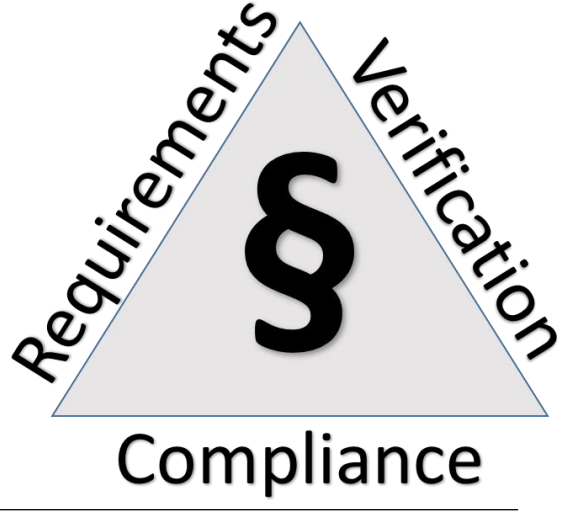
UN ECE VEHICLE REGULATIONS

- Harmonization of regulatory requirements on all markets to facilitate international trade
- Working Party of experts on technical requirement of vehicles – WP.29
- Draft regulations prepared by Informal Working Group (IWG) of international experts
  - Collaborative effort of technical experts from ”Contracting Parties” and stakeholders
- Electric vehicle requirements developed by
  - IWG Electric Vehicle Safety (EVS)
  - IWG Electric Vehicles and the Environment (EVE)

ELECTRIC VEHICLE SAFETY (EVS)

- Phase 1 concluded 2018 => Global Technical Regulation (GTR) 20
- Adopted by WP.29 March 2018
- Implementation into national/regional legislation in progress
  - EU and Japan: revision of R100 and related regs (R94, R95, ...)
  - China: GB on Electric Vehicle Safety Requirements and GB on Li ion batteries for EV
  - North America

- Phase 2: Ongoing (estimated duration 2018—2022)
  - Research an studies of non-resolved topics from phase 1
  - Focus on
    - Thermal propagation in Li ion batteries
    - Effects of water exposure
    - Measurement and management of gases in case of battery failure



MANAGING RISKS

- Electrical risks
  - Preventing unintentional contact with hazardous voltage
  - Isolation resistance
- Rechargeable electric energy storage system (REESS) malfunction and abuse conditions (Li ion battery)
  - Thermal risks
  - Chemical exposure risks

GTR 20 – NEWS COMPARED TO UN R100.02

- Safety requirements
  - Post crash protection against electric shock
  - Protection against water effects
  - Thermal propagation protection of occupants
  - Management of gases that can be released in case of Li ion battery failure
  - REESS low temperature protection
- New pass/fail criterion
  - Venting
- Warning requirements
  - Loss of BMS control
  - Thermal event
  - Low energy

REESS ABUSE CONDITIONS

Type of trigger	Condition	Risk management	Verification method
Electrical	Overvoltage, Undervoltage, Overcurrent, External short circuit	Battery management system (BMS); Protective devices on cell and battery level	Standardized tests on component and vehicle level
Mechanical	Deformation by physical abuse (crash/crush)	Placement of REESS; Abuse tolerant enclosure designs	Standardized tests on component and vehicle level
Thermal	External heat sources	Placement of REESS; BMS and thermal management and insulation	Standardized cell, battery pack and vehicle level test
Manufacturing defects	Internal short circuit => cell thermal runaway => propagation	Production quality control; REESS design	Engineering judgement on system design – ”documented approach”