REGULATORY OUTLOOK FOR ELECTRIC VEHICLES

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