



**SUSTAINABLE
INLAND TRANSPORT**

INLAND TRANSPORT COMMITTEE



UNECE

UNECE activities towards sustainable and energy efficient transport

UN legal instruments and vehicle regulations on electric and hydrogen vehicles

Walter Nissler
Chief of Section

World Forum For Harmonization of Vehicle Regulations, WP.29

- UNECE Sustainable Transport Division: secretariat to WP.29 for more than 50 years
- WP.29 is:
 - the unique worldwide regulatory forum for the automotive sector
 - administrating three Multilateral UN Agreements



Construction regulations
1958 Agreement – Type Approval Regulations with mutual recognition of the type approvals
1998 Agreement – Global Technical Regulations



In Use PTI regulations
1997 Agreement – Adoption of Uniform Conditions for Periodical Technical Inspections of Wheeled Vehicles and the Reciprocal Recognition of Such Inspection



What is WP.29 doing?



Emissions of pollutants and CO₂



General safety



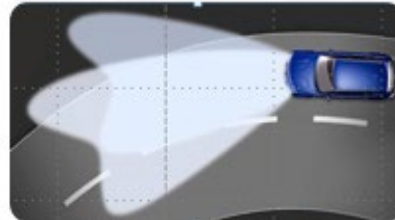
Passive safety



Noise and tyres



Automated/autonomous and connected vehicles



Lighting and light signalling

WP.29 and SDGs



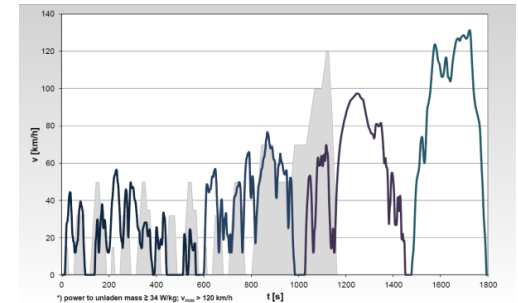
UN Regulatory Framework & SUSTAINABLE DEVELOPMENT GOALS



Regulatory activities road vehicles



- Regulatory framework for deployment of safe electric and hydrogen vehicles, by the World Forum for Harmonization of Vehicle Regulations (WP.29),
 - UN Regulation No. 100 and UN GTR No. 20 on electric vehicle safety,
 - UN Regulation No. 134 and UN GTR No. 13 on Hydrogen and fuel cell vehicles safety;
- Regulatory framework for emission reduction and fuel efficiency by WP.29
 - measuring CO₂ and pollutant emissions from road vehicles via worldwide harmonized test cycles for motorcycles, cars and vans (LDVs), and trucks, buses and non-road mobile machines HDVs
 - UN GTRs Nos. 2 (PTW), 4 (HDV) and 15 (LDV)
 - UN Regulations Nos. 53 (PTW), 49 (HDV), and 83 and 154 (LDV)
- Regulatory framework on engine efficiency and durability (incl electric vehicles):
 - CO₂ emissions: Regulation No. 101 on fuel consumption and CO₂ emissions
 - Battery durability: UN GTR No. 22 on vehicle battery durability
- (under development) the Life-cycle Assessment (LCA) regulatory framework to measure the life-cycle emission of carbon of vehicles, including during manufacturing, use and end-of-life phases of the vehicle;



Electric Vehicle Safety

UN Regulation No. 100

UN GTR No. 20



Better safety for all users

- Performance based and technology neutral.
- Not design specific requirements that might prevent future technologies
- Address potential safety risks of EVs either of vehicles in use or after a crash event
- Electrical shocks associated with the high voltage circuits of EVs
- Potential hazards associated with lithium-ion batteries and/or other
- Rechargeable Electrical Energy Storage Systems (REESS) (in particular, containing flammable electrolyte)



Motivation

- Harmonise (avoid diversification of) the technical requirements of China and emerging markets with internationally agreed ones (UN-R or GTR)

	Electrical safety		REESS safety
	In-use	Post crash	
EU	R100	R12, R94, R95	R100
Japan	R100	R12, R94, R95	R100
US	None	FMVSS305	None
China	(GB/T18384-3)	(New GB/T)	(New GB/T)
S. Korea	KMVSS	KMVSS	KMVSS
(others)	???	???	???

- EU and Japan already apply relevant UN-Regulations and therefore **less urgent demand to amend existing requirements**



UN REGULATIONS & UN GTR content

- Requirements for Electric Vehicle Safety
 - Electric shock protection (in use and post crash)
 - Electrolyte spillage after a crash;
 - Fire protection
 - Functional requirements

- Requirements for RESS Safety (in use and post crash)
 - Thermal shock and cycling
 - Mechanical shock/integrity/vibration
 - Fire resistance
 - External short circuit/overcurrent/overcharge/over-discharge protection
 - Over-temperature protection
 - Thermal propagation
 - Water exposure resistance
 - Gas management

EVS UN Reg & UN GTR Phase 2

After the GTR was established, Phase 2 started in 2019 to:

Remaining items to consider:

1. Test procedure for Thermal Propagation
2. Test procedure for Vibration test
3. Test procedure for Water immersion
4. Flammability, toxicity, and corrosiveness of vented gases

Estimated completion of the technical work by 2023

Challenges of current development

Thermal propagation

- While testing and evaluating the thermal propagation, we are seeing signs that the gases emanating from the affected battery cell or pack, could potentially be toxic, lethal and/or flammable.
- Industry making strides in advancing prognosticating technologies which would allow for early detection and through pro-active BMS neutralization of the threatening thermal propagation runaway.
- While testing and evaluating the thermal propagation, we are seeing signs that the gases emanating from the affected battery cell or pack, could potentially be toxic, lethal and/or flammable.
- Continue to evaluate the effects of overcurrent, overcharge and undercharge on the battery

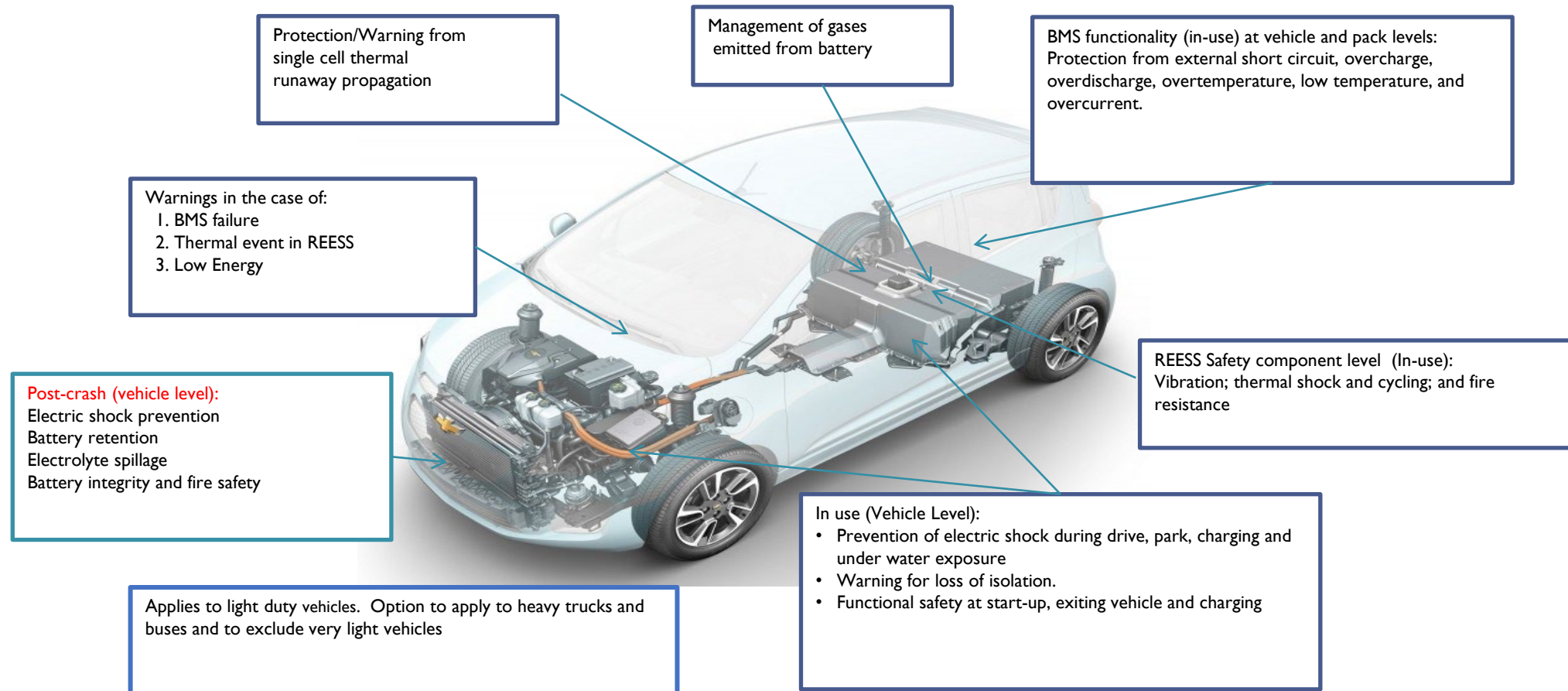
Heavy vehicles

- ❑ Adaptations of PC/LCV requirements
- ❑ Applicability of some of the tests and requirements on heavy vehicles in current draft had been challenging

REESS warning

- Defining the **uniformly applicable threshold** (for giving warning before safety critical situation happens) is a challenge:
 - Materials and designs of REESS are diverse
 - Robustness of the REESS against failure has competitive nature and it is difficult to be standardized
 - Threshold is difficult to be uniformly determined as it is depending to the vehicle system

Current UN GTR Requirements



Hydrogen Vehicle Safety

UN Regulation No. 134

UN GTR No. 13



Background on the development of UN GTR on HFCV

- ❑ Regulatory pressure to lower CO₂ and pollutant emissions is helping to drive an increasing market penetration HFCV
- ❑ Many governments support the development and deployment of HFCV by financing research
- ❑ The production capacity for hydrogen vehicles, at a scale not seen in the past



Regulatory convergence

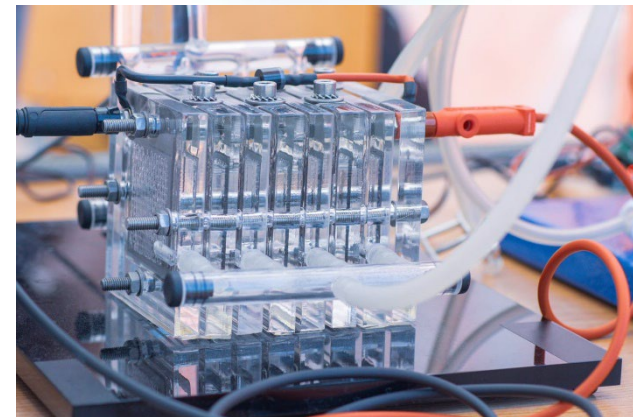


- ❑ Convergence between regulatory obligations can result in economies of scale and cost reductions for manufacturers
- ❑ New technologies can be made available to a high number of vehicles at lower costs & higher quality



Better safety for all users

- ❑ Performance based and technology neutral.
- ❑ Not design specific requirements that might prevent future technologies
- ❑ Address potential safety risks of HFCV either of vehicles in use or after a crash event
- ❑ Potential scope revision to address additional vehicle classes
- ❑ Requirements for material compatibility and hydrogen embrittlement
- ❑ Requirements for the fuelling receptacle





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Thank you!

walter.nissler@un.org

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