



INLAND TRANSPORT COMMITTEE



Activities on Vehicle electrification at the World Forum for Harmonization of Vehicle Regulations (WP.29)

Francois Cuenot, UNECE
SC.1
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Harmonized regulation for Electrified vehicles

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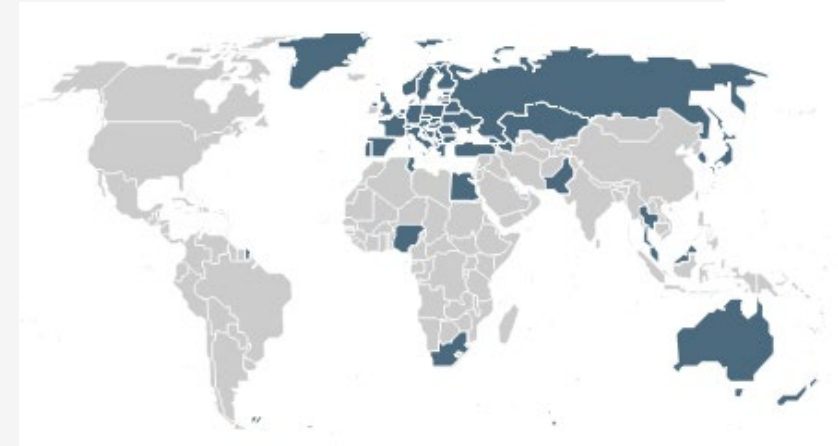
- What is WP.29 : the 3 global agreements on harmonized vehicle regulations
 - 1958 Agreement and UN Regulations
 - 1998 Agreement and UN GTRs
 - 1997 Agreement and UN Rules on periodic technical inspections
- Activities on EVs
 - Safety
 - Environment
- Conclusions and Next steps

the World Forum for the harmonization of vehicle regulations

WP.29



- The unique worldwide regulatory forum for the automotive sector
- Administrating three Multilateral UN Agreements :
- 1. The 1958 Agreement -> UN Regulations
 - 54 contracting parties (4 in Africa)
 - Last country joining : Pakistan in 2020
 - Reciprocal recognition of Type Approval
 - **Approved once and accepted everywhere(CPs)**
 - Elimination of barriers to trade
 - Administrative provision + E marking



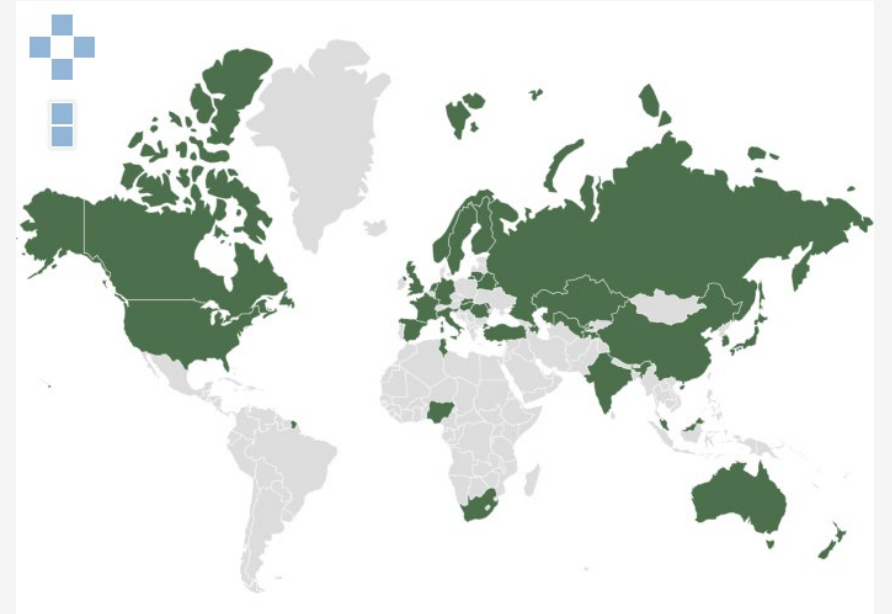
the World Forum for the harmonization of vehicle regulations

WP.29



■ 2. The 1998 Agreement -> UN Global Technical Regulations (GTRs)

- 38 contracting parties (3 in Africa)
- Most major automotive markets
- Commit themselves to implement/transpose a UN GTR into national legislation, when voting in favour
- Need a system/agency for market surveillance and enforcement of production compliance



■ 3. The 1997 Agreement -> UN Rules

- Legal framework for Periodic Technical Inspection (PTI) of vehicles in use
- Reciprocal recognition of certificates of such inspections for cross-border use of vehicles
- UN Rule 4 provides “Uniform provisions for periodical technical inspections of motor vehicles equipped with electric or hybrid propulsion system(s) with regard to their roadworthiness”

UN Regulations on electrified vehicle Safety considerations



- UN Regulation No. 100 / UN GTR No. 20 on Electric Vehicle Safety (EVS) for cars, vans and trucks
- UN Regulation No. 136 for electric two-/three-wheelers safety
- UN Regulations No. 12, 94, 95, 137 and 153 on post-crash safety for cars and vans
 - 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)
 - Fire resistance tests and requirements

	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)	???	???	???

Example of UN Regulation No. 100



3	Protection against direct contacts of parts under voltage
4A	Isolation resistance measurement method for vehicle based tests
4B	Isolation resistance measurement method for component based tests of a REESS
6	Part 1 - Essential characteristics of road vehicles or systems
	Part 2 - Essential characteristics of REESS
	Part 3 - Essential characteristics of road vehicles or systems with chassis connected to electrical circuits
7	Determination of hydrogen emissions during the charge procedures of the REESS
8	REESS test procedures
	Appendix - Procedure for conducting a standard cycle
8A	Vibration test
8B	Thermal shock and cycling test
8C	Mechanical Drop Test for removable REESS
8D	Mechanical shock
8E	Fire resistance
	Appendix - Dimension and technical data of firebricks
8F	External short circuit protection
8G	Overcharge protection
8H	Over-discharge protection
8I	Over-temperature protection
9A	Withstand voltage test
9B	Water resistance test

- Entered into force in 2016
- Adopted by all contracting parties to the 1958 Agreement
- Many tests on both the vehicles and its battery
- Similar to those of cars and vans
- All UN texts standalone and free of charge

<https://unece.org/transport/vehicle-regulations-wp29/standards/addenda-1958-agreement-regulations-121-140?accordion=16>

UN Regulations No. 100 - Examples



- protection of persons against access to hazardous parts
 - Jointed test finger

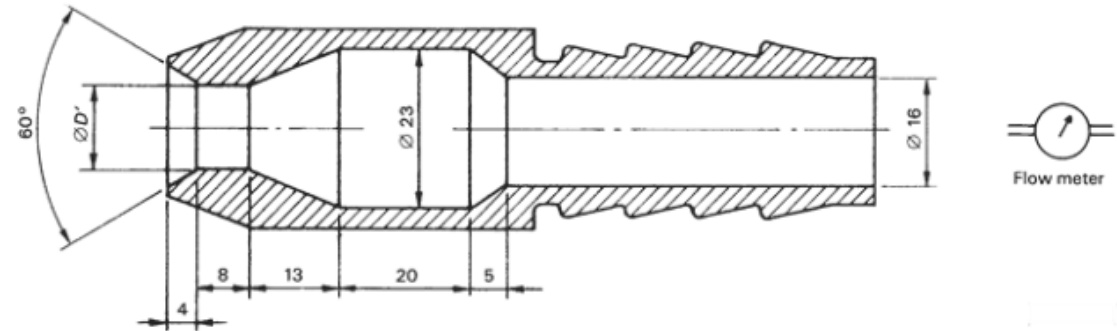
First numeral	Addit. letter	Access probe (Dimensions in mm)	Test force
2	B	<p>Jointed test finger</p> <p>Stop face (Ø 50 x 20)</p> <p>Ø 12</p> <p>See Fig. 1 for full dimensions</p> <p>Insulating material</p> <p>Jointed test finger (Metal)</p> <p>80</p>	10 N ± 10%
4, 5, 6	D	<p>Test wire 1.0 mm diameter, 100 mm long</p> <p>Sphere 35 ± 0.2</p> <p>Approx. 100</p> <p>100 ± 0.2</p> <p>Ø 10</p> <p>Handle (Insulating material)</p> <p>Stop face (Insulating material)</p> <p>Rigid test wire (Metal)</p> <p>Edges free from burrs</p> <p>Ø 1 + 0.05 / 0</p>	1 N ± 10%

UN Regulations No. 100 - Examples

- Water resistance test
 - Nozzle design and test specifications

- (a) Spraying with a stream of fresh water the enclosure from all practicable directions with a standard test nozzle as shown in Figure 1.

Figure 1
Test device to verify protection against water jets (hose nozzle)



$\phi D' = 6.3 \text{ mm}$ unit: mm

The conditions to be observed are as follows:

- Internal diameter of the nozzle: 6.3 mm;
 - Delivery rate: 12.5 l/min \pm 5 per cent;
 - Water pressure: to be adjusted to achieve the specified delivery rate;
 - Core of the substantial stream: circle of approximately 40 mm diameter at 2.5 m distance from nozzle;
 - Test duration per square metre of enclosure surface area likely to be sprayed: 1 min;
 - Minimum test duration: 3 min;
 - Distance from nozzle to enclosure surface: between 2.5 m and 3 m.
- (b) Subsequently, apply 500 V DC between all high voltage inputs and the vehicle's exposed conductive parts/electrical chassis if present to measure the isolation resistance.

UN Regulations on electrified vehicle Environmental considerations



- Range of EVs covered in UN GTR No. 15 and UN Regulation No.154 on WLTP
 - UN GTR No. 21 Determination of electrified vehicle power (needed for WLTP or else)
- UN GTR No. 22 Battery durability requirements
 - Canada, China, Japan, Korea, UK, US, EU adopted proposal for harmonized minimum performance requirements

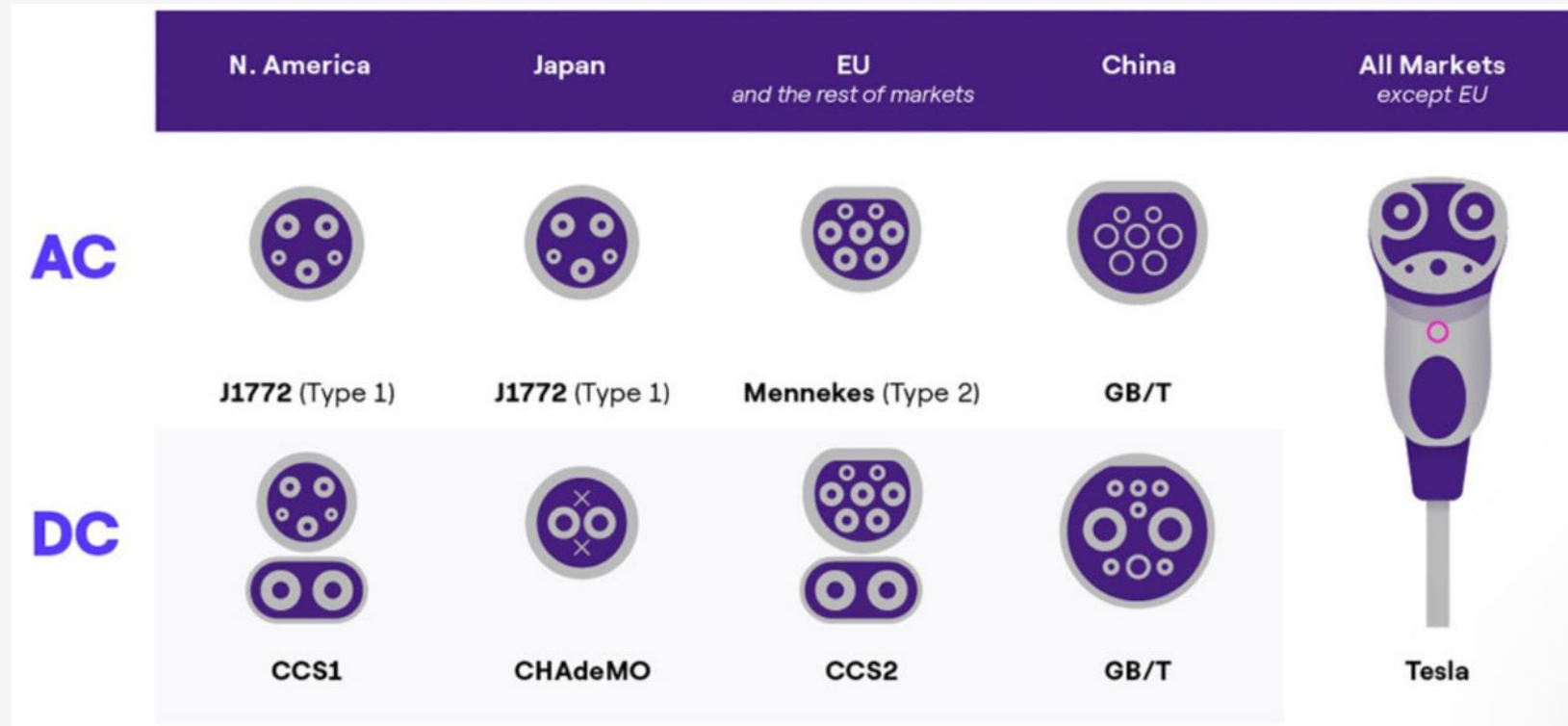
<i>Vehicle age/km for categories 1-1 and 1-2 in the scope of this GTR</i>	<i>OVC-HEV</i>	<i>PEV</i>
From start of life to 5 years or 100,000 km, whichever comes first	80 per cent	80 per cent
Vehicles more than 5 years or 100,000 km, and up to whichever comes first of 8 years or 160,000 km	70 per cent	70 per cent

- Light duty vehicles only at the moment; Vans (monitored) and trucks to be included soon

Harmonization gaps to further incentivize EV deployment



- Communication between EV and its (recharging) infrastructure
 - Hardware not harmonized, light duty



Harmonization gaps to further incentivize EV deployment



- Communication between EV and its (recharging) infrastructure
 - Bilateral agreement for Heavy Duty between EU/US to adopt MCS, Megawatt Charger system

<https://www.whitehouse.gov/briefing-room/statements-releases/2023/05/31/u-s-eu-joint-statement-of-the-trade-and-technology-council-2/>

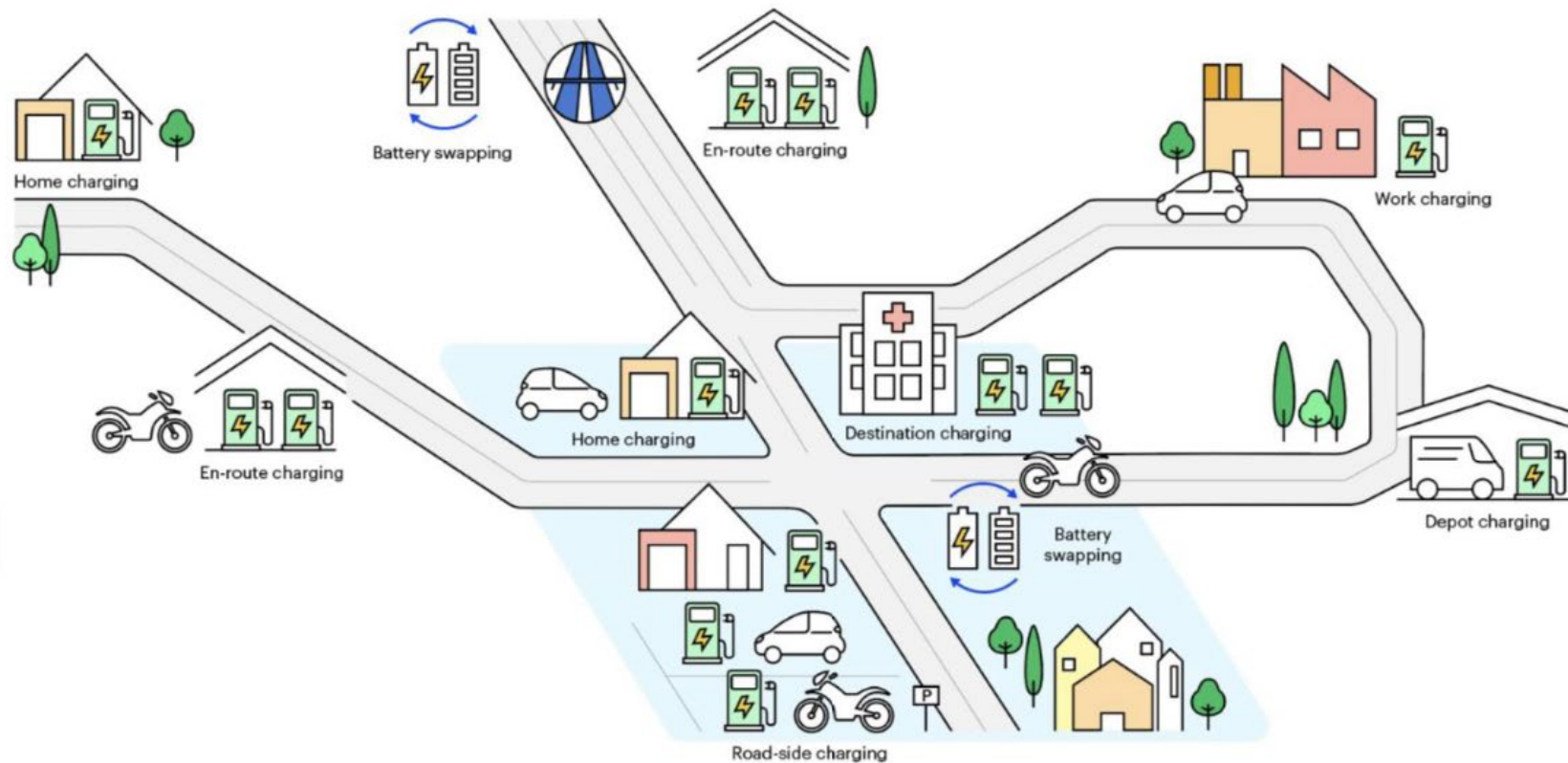


Charging infrastructure needs



- Depot charging key for transport/fleet operators

Charging infrastructure solutions



V2X role to cross benefit vehicle and the grid



Sustainable power generation + stationary battery energy storage + electrifying everything (esp. transport) are the 3 pillars of a sustainable energy future.



Cooperation between Utilities, Industry players, Operators and DSO/TSOs is key to integrate the 4 pillars.



Electricity demand in our economy will grow 3x. Technologies can provide flexibility and better anticipate between demand and supply.



We need a clear roadmap to enable the electricity growth. We need processes, -business models and operations improvements too.



V2X is key to solve local and unplanned grid issues (on top of constraint based tech and supply driven technologies)



V2X unlocks a flexible, free floating fleet of mobile batteries, with enough spare capacity not always required for traveling.



V2X unlocks a flexible, free floating fleet of mobile batteries, with enough spare capacity not always required for traveling.

Conclusions and next steps



- Regulatory aspects for EVs and their batteries are well covered globally at the vehicle level; high investment from industry to deploy EV technology; regulatory framework also quickly improving
- Role of energy provider / grid operator key to successful deployment
- Adoption by large fleet operators to be better coordinated ? Role of SC.1 in experience sharing from operators?



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Thank you!