JRC questions to SIGTP-02-22

A. Eddarir, N. Lebedeva

3rd SIG TP meeting, March 12-14, 2024

Aachen, Germany

Smoke Assessment

➢Premises

- Assessment of smoke from the battery directly entering the passenger compartment during egress* time.
  (re-entering smoke and smoke from the environment are out of scope)
- Assessment to respect integration of battery into vehicle
  (Smoke assessment to be subject of UN R 100 Part 1)

Is the smoke assessment related to whether the battery pack is inside or outside the passenger compartment ?

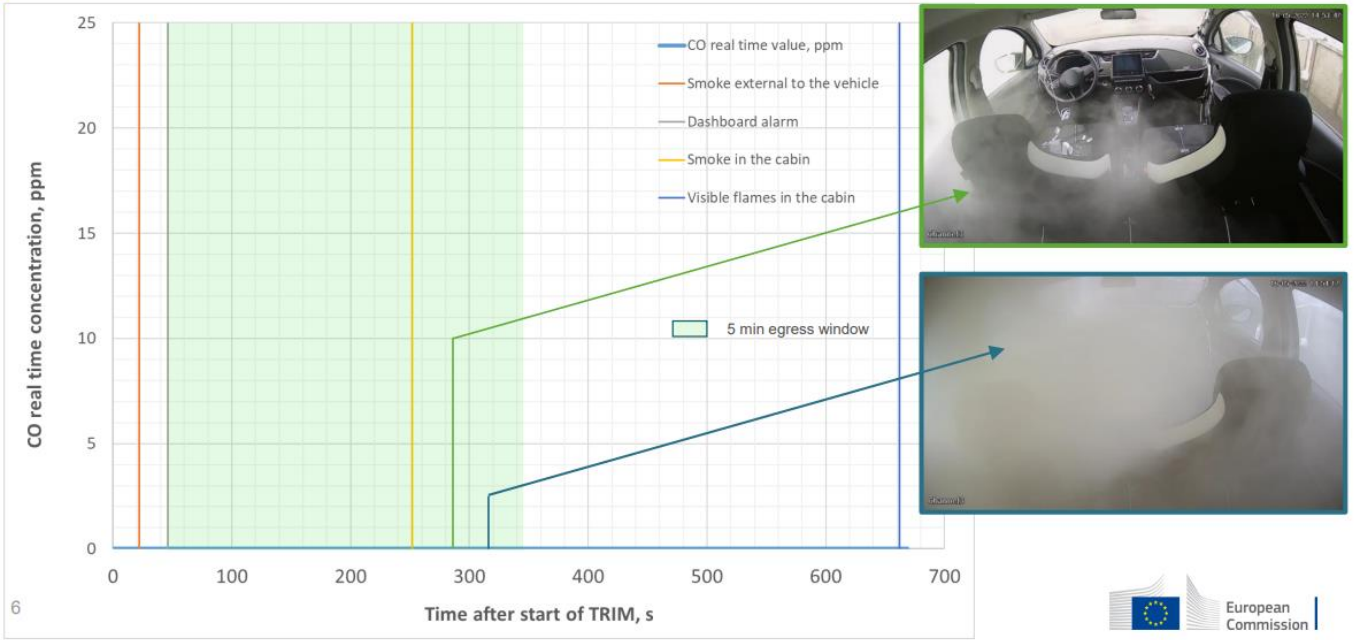
How are “inside the passenger compartment” and “outside the passenger compartment” defined?

Smoke Assessment

- Neither the presence of smoke nor the visual perception of smoke are fail-criteria.
  (Critical substances like CO are invisible)

- Smoke may occur within the stipulated time window of 5 minutes.
- In the case of Car A (see EVS25-E2TG-0400 [EC]), carbon monoxide (CO) may have remained undetectable for some time, >600 s. However, smoke has ingressed within this time, leading to decreased visibility within the cabin

Cabin air quality monitoring - Car A



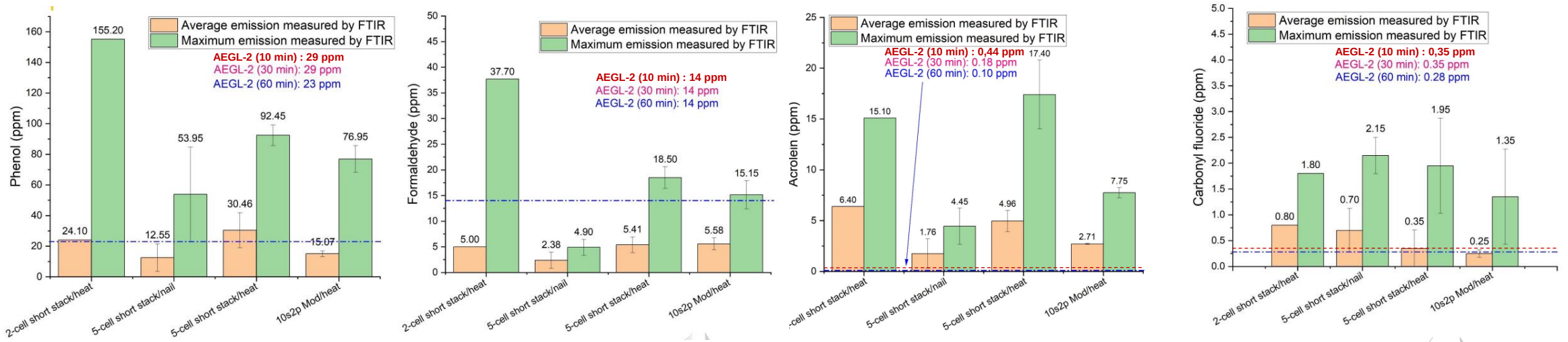
European Commission

Smoke Assessment

- Hazards coming from smoke are
  - CO-Concentration (impediment of consciousness, capability to leave the vehicle self-controlled).
  - H_2-Concentration (potential risk of fire or explosion).
  - Other hazards (e.g. opacity) can be controlled or neglected prior to egress.

Thermal runaway (TR) and propagation experiments on 2-cell, 5-cell short stacks and 10s2p modules
Hazards coming from **other smoke components such as**: **phenol, formaldehyde, acrolein and carbonyl fluoride** are almost always above AEGL-2 (10 min) exposure limits, where irreversible effects to human health are expected.

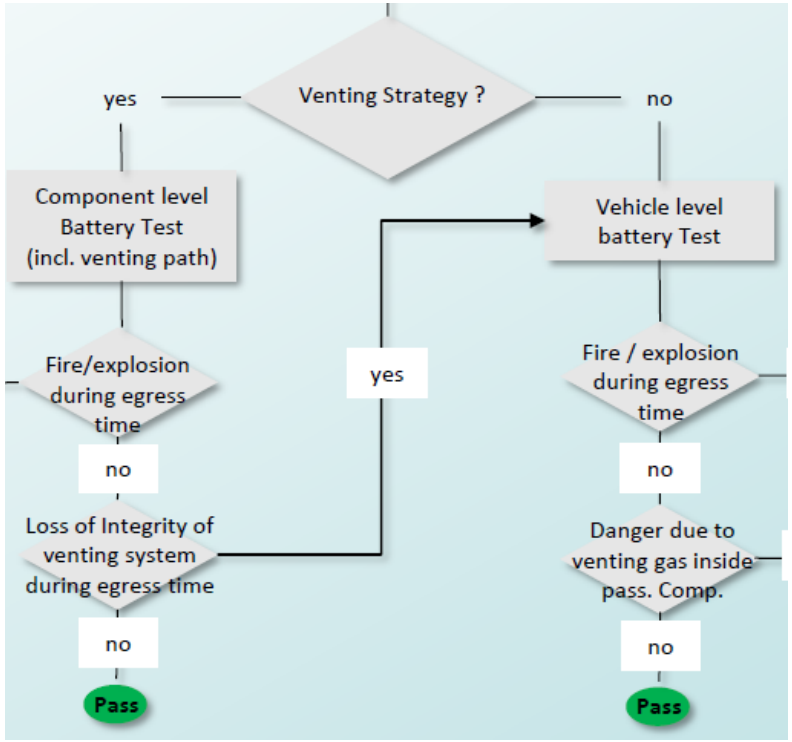
Reminder, AEGL-2 level indicates: "*irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape*"



European Commission

EVS24-E1TP-0401 [EC]

Smoke Assessment Procedure



"Loss of integrity of venting system during egress time"
What is meant here? Is venting considered a "loss of integrity"?

How is *"danger due to venting gas inside pass.comp."* evaluated?

Test criteria:

-Fire

-Explosion

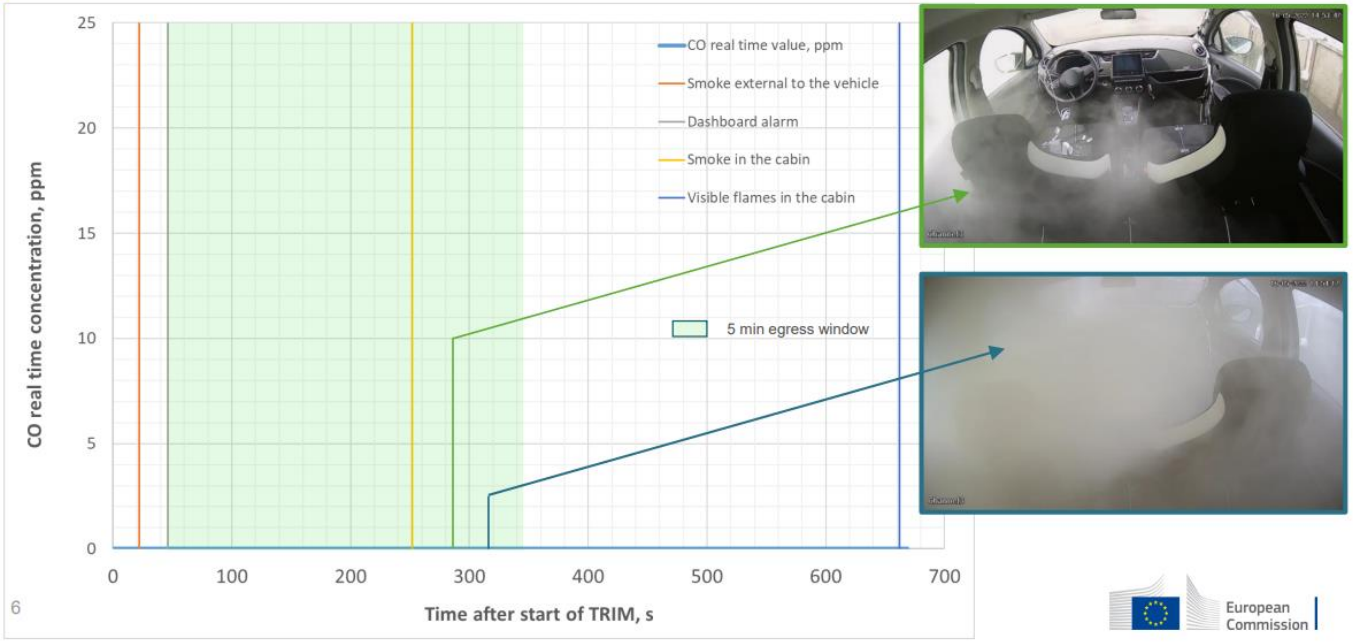
-Smoke

As previously mentioned, smoke assessment serves as a critical pass-fail criterion, as demonstrated in the previous study EVS25-E2TG-0400 [EC], smoke evaluation can occur within the stipulated time of 5 min, in Car A described in EVS25-E2TG-0400 [EC] visible smoke observed inside the cabin at 293 seconds.

Test Criterion CO

- CO-Measurement is simple and precise.

Cabin air quality monitoring - Car A



Detection of carbon monoxide (CO) within the cabin occurred after 650 seconds.
And partial loss of visibility occurred at 240 seconds.

JRC's view is that visual inspection is more dependable indicator of smoke in the cabin.

EVS25-E2TG-0400 [EC]

European Commission

Test Criterion CO

Pass-Fail Criterion

- Accumulated CO-Concentration over egress time < AEGL-2-10min accumulated exposure Value (AEGL-2-10min. = 420 ppm * 10 min = 252.000 ppms)

CO is not the only hazardous compound (see slide 4)
Toxicity of vented gas is not the only risk – loss of visibility (see slide 3), flammability, corrosiveness are important hazards to consider

Measurement of CO in a complex mixture of vented gases may not always be straightforward (see slide 6)

JRC's view is that visual inspection is more dependable indicator of smoke in the cabin.

Thank you

European Commission