TASK FORCE DIRECT VISION: PROGRESS & STATUS PHASE 2

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VRU-Proxi-24-04

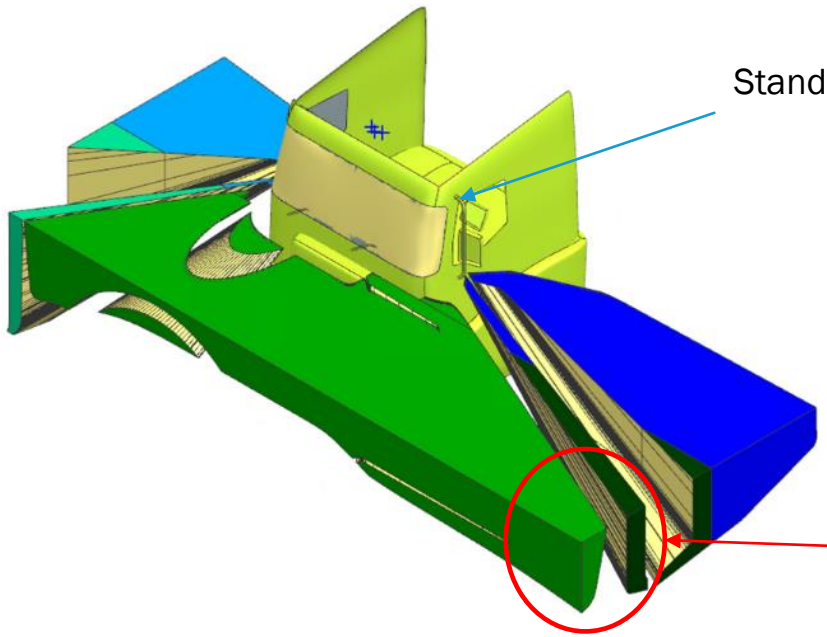
OBJECTIVES

- From Terms of Reference
  - Amending the alternative testing method for innovative vehicle designs (e.g. aerodynamic narrow A-pillar designs) by replacing paragraph 5.3. (April 2023 or earlier if possible)
  - For vehicles with competing objectives (e.g. improved direct vision versus high capacity transport, high efficiency, new powertrain technology, impact on freight industry) with direct vision challenges an alternative approach could be considered. It shall be limited to Level 3 for N3 category of vehicles and shall be based on quantified data. (October 2023 or earlier if possible)

DESIGN NEUTRALITY – WHAT IS THE PROBLEM?

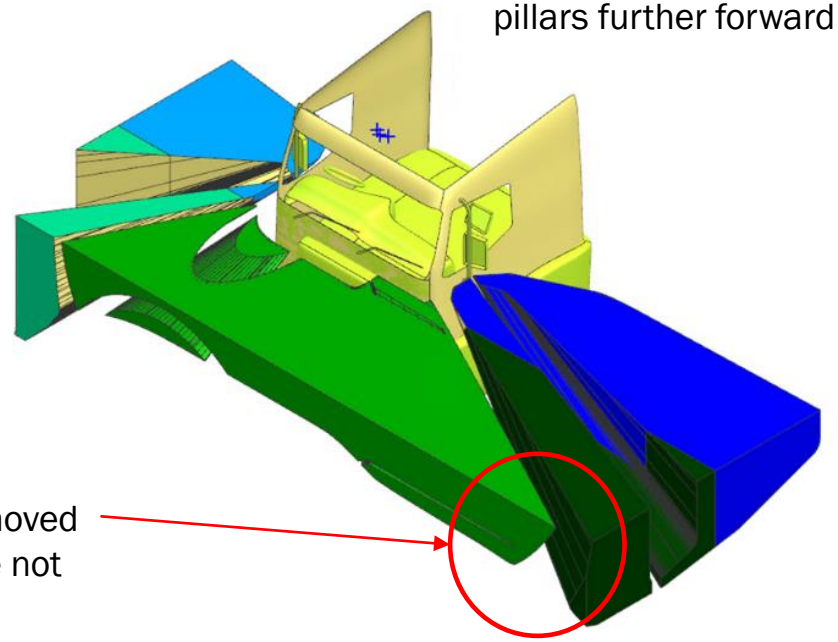
- Method development to date based on past/current cab design
- Future truck design may vary: narrower distance between A pillars a particular feature of aerodynamic concepts
- Current method defines front, nearside and drivers side view based on A-pillar and sets a limit value to each side
- Making the A pillars closer together laterally will make the view out of the front window smaller and the view out of the side windows bigger. A vehicle that passes the regulation with a standard cab configuration, could fail on frontal limit if A pillars are moved closer together and nothing else changes

DESIGN NEUTRALITY – QUANTIFYING THE PROBLEM



Standard Generic cab

Identical except A-pillars further forward



No change in Cab height

Blind spots (no colour) have moved further around to front but are not obviously bigger

- Modelling exercise based on the ‘generic’ cab defined in current regulation as an example method that can be used to validate virtual tests
- Moving A pillars forward moves them further from driver eye and reduces angle of obstruction slightly – blind spot gets slightly smaller
- VRUs could appear in either blind spot location – no evidence can quantify that one location is more probably than the other
- Net change is expected to be a slight improvement in direct vision

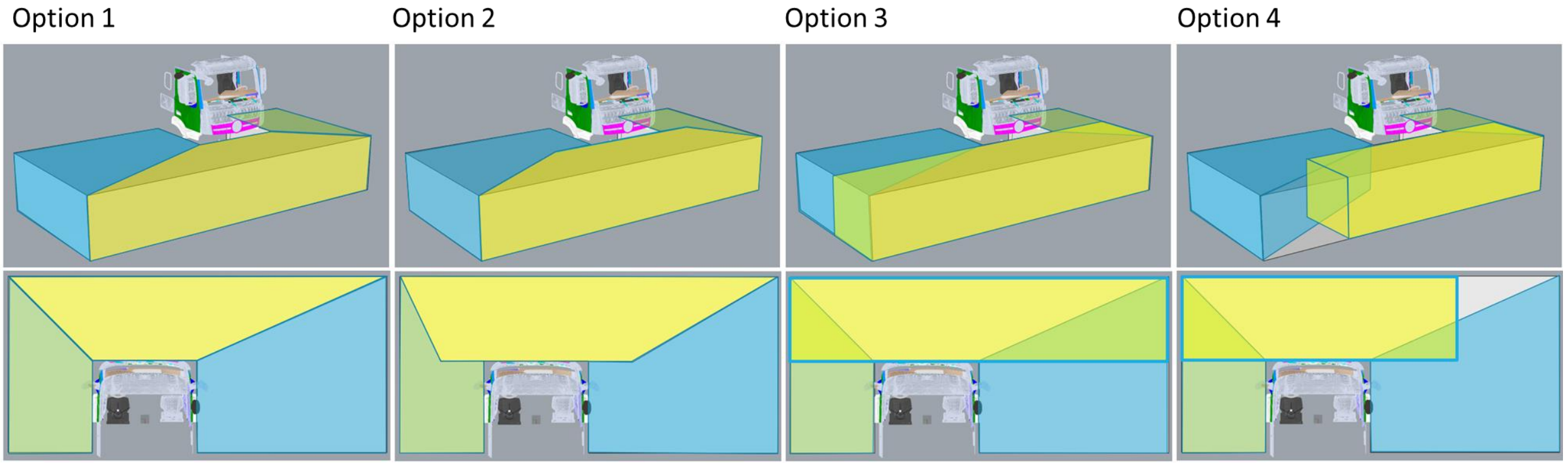
DESIGN NEUTRALITY – QUANTIFYING THE PROBLEM

- Combined total volume assessment (all sides) in current regulation produces small improvement in score with A pillars forward (6%)
  - Consistent with qualitative expectation on safety
  - Good design neutrality
- Assessment to each side shows much larger changes in opposing directions (Front view with A pillars forward scores 32% worse than baseline)
  - Inconsistent with qualitative expectation on safety
  - Poor design neutrality, a design change that is marginally better for safety could cause a vehicle to fail regulatory criteria

	Combined volume (m^3) current regulation (>11.2)
Baseline	11.27
Forward (x) 100mm	11.63
Forward (x) 170mm	11.91
Relative index to baseline (Baseline =1)	
Forward (x) 100mm	1.03
Forward (x) 170mm	1.06

	Volume in current regulation (m^3)		
	Nearside: Min 3.4	Front: Min 1.8	Offside: Min 2.8
Baseline	3.25	4.47	3.56
Forward (x) 100mm	4.19	3.5	3.93
Forward (x) 170mm	4.77	3.03	4.11
Relative index to baseline (Baseline =1)			
Forward (x) 100mm	1.29	0.78	1.10
Forward (x) 170mm	1.47	0.68	1.15

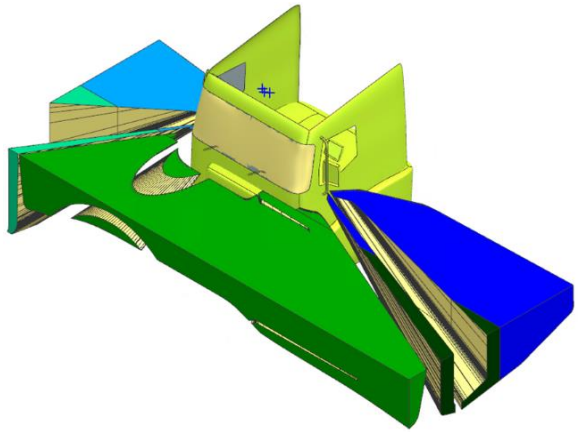
DESIGN NEUTRALITY – WHAT SOLUTIONS ARE PROPOSED?

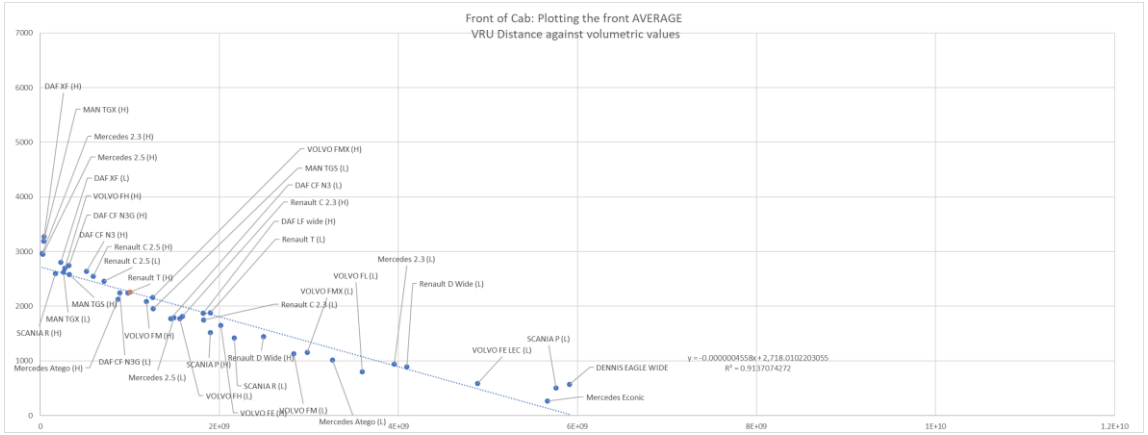


Vision to the front
Vision to the passenger side
Vision to the driver's side

- All options involve defining at least the front view as a section of assessment volume. Deemed visible whichever area of the cab (windscreen, side window, lower door window etc) they are seen through
  - Options 1 & 2 have 3 discrete views all defined independently of vehicle configuration
  - Options 3 & 4 have independently defined front zone but side zones remain tied to A-pillar position

DESIGN NEUTRALITY – WHAT ANALYSES ARE REQUIRED?





- Analysis of sensitivity of score to design changes not affecting safety based on generic cab
  - Baseline – shown previously as quantification of problem plus two variants of moving A pillars inboard
  - Alternative method 1 – completed by ACEA
  - Alternative method 2-4 to be completed by Loughborough

- Each approach will represent a different proportion of the assessment volume for the view to each side
  - Need to define new limit values that give ‘equivalent’ level of stringency to phase 1 Regulation (the same existing cab designs at the same mounting positions should pass/fail)
  - Loughborough re-calculating the correlation between VRU distance and volume for each candidate method
  - See separate presentation (Loughborough) for progress

- Seeking best compromise between good design neutrality and equivalence of level of stringency

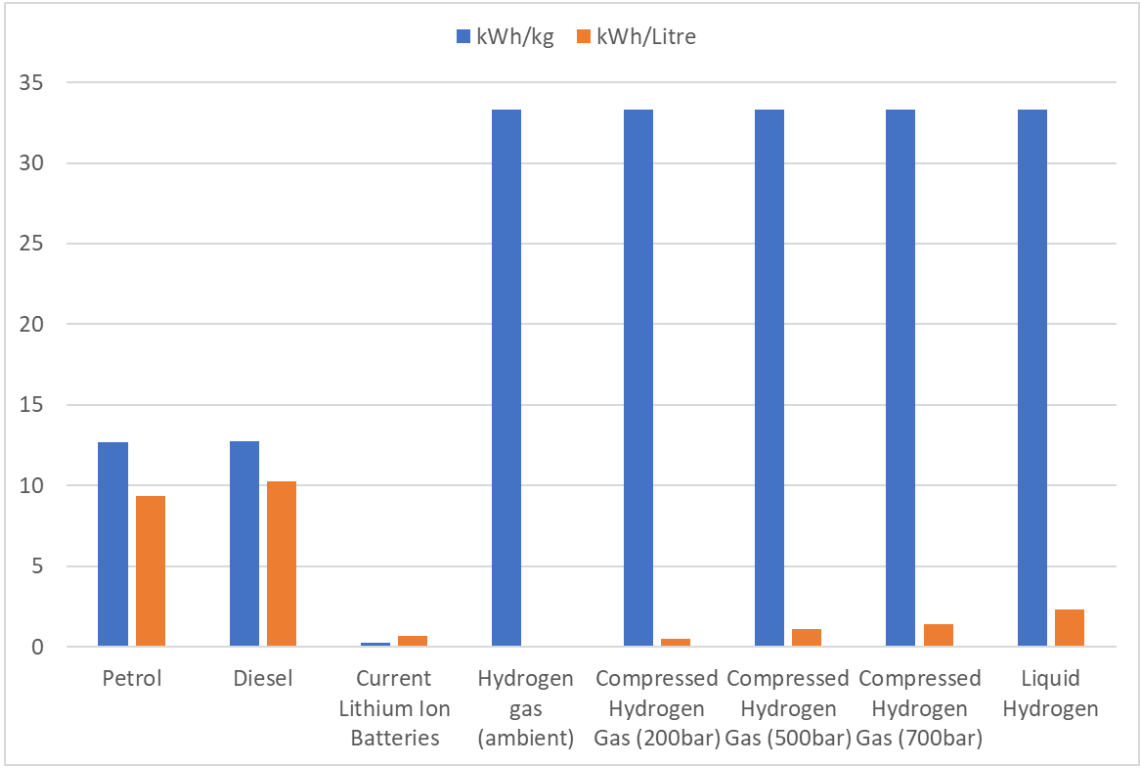
ALTERNATIVE APPROACH FOR COMPETING OBJECTIVES

- High Capacity Transport Concept (Lead: Sweden)
  - Aim: Increased energy efficiency (e.g. kwh/tonneKm), reduced CO2, reduced HGV traffic. This is beyond 25.25m, 60 tonne EMS. Already in place at 34m/70+ tonnes in SE and FI but investigation underway in multiple countries (e.g. DK, NL, ES, NO) and may include higher still weights
  - Problem: Relies on powerful motor vehicles with specific features. Indications are it may not be possible for vehicles with these features to pass the separate frontal limit. Not long after Direct vision in 2029 these may also need to be zero emission
  - Possible solution: Relaxation of frontal limit

- Source: Nordic HCT conference presentation showing vehicles trialled in Finland

ALTERNATIVE APPROACH FOR COMPETING OBJECTIVES

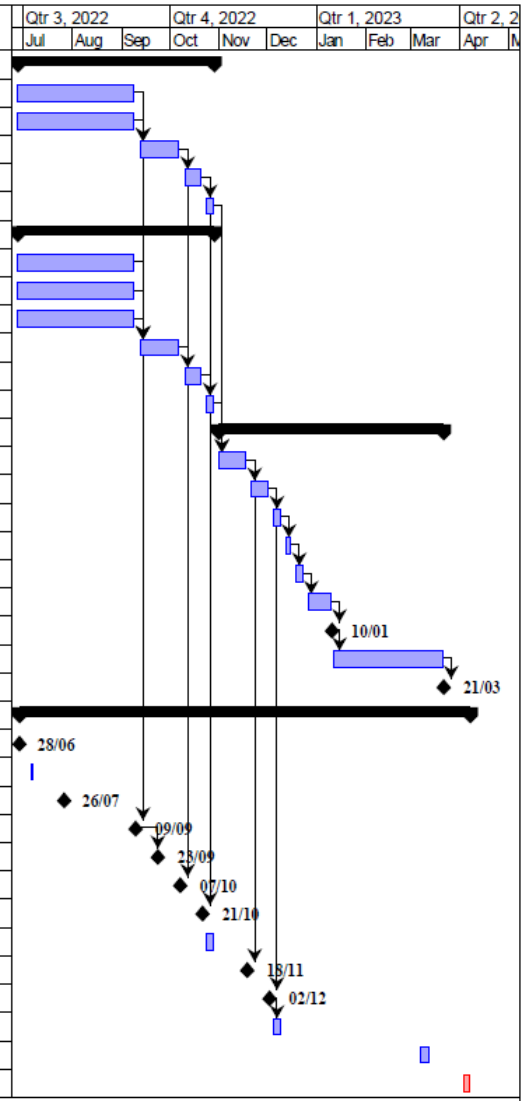
- Zero Emission Vehicles (Lead: TBC)
  - Aim: Decarbonisation of freight, legal compliance with possible sales bans on combustion engines
  - Problem: Energy per unit of mass or per unit of volume is much lower for batteries or hydrogen than for diesel. Although electric motors more efficient than ICE, more “fuel” storage space is needed for ZEV. With limits on available length and width, tends to push cab up in conflict with direct vision requirement
  - Possible solution: Relaxation of frontal limit



- Source: https://www.acea.auto/fact/differences-between-diesel-and-petrol/
- https://www.acea.auto/fact/differences-between-diesel-and-petrol/
- https://rmi.org/run-on-less-with-hydrogen-fuel-cells/
- https://www.idealhy.eu/index.php?page=lh2_outline#:~:text=Pressurised%20hydrogen%20contains%20about%200.5,kWh%2Flitre%20at%20700%20bar.&text=The%20best%20way%20of%20transporting,the%20amount%20of%20energy%20involved.

WORK PLAN AND TIMING

	Name	Duration	Start	Finish
1	**Design neutral method**	**90 days**	**27/06/22 08:00**	**28/10/22 17:00**
2	Complete analysis VRU distance correlation	55 days	27/06/22 08:00	09/09/22 17:00
3	Complete sensitivity analysis (Generic Cab)	55 days	27/06/22 08:00	09/09/22 17:00
4	Discussion and generation of alternative evidence	20 days	12/09/22 08:00	07/10/22 17:00
5	Develop TF Options paper	10 days	10/10/22 08:00	21/10/22 17:00
6	Decision at VRU proxi	5 days	24/10/22 08:00	28/10/22 17:00
7	**Alternative for competing objectives**	**90 days**	**27/06/22 08:00**	**28/10/22 17:00**
8	Produce Evidence base for HCT	55 days	27/06/22 08:00	09/09/22 17:00
9	Produce Evidence base for ZEV	55 days	27/06/22 08:00	09/09/22 17:00
10	Consideration of German proposal	55 days	27/06/22 08:00	09/09/22 17:00
11	Discussion and generation of counter evidence	20 days	12/09/22 08:00	07/10/22 17:00
12	Develop TF options	10 days	10/10/22 08:00	21/10/22 17:00
13	Decision at VRU Proxi	5 days	24/10/22 08:00	28/10/22 17:00
14	**Regulatory drafting**	**102 days**	**31/10/22 08:00**	**21/03/23 17:00**
15	Initial draft amendment document	15 days	31/10/22 08:00	18/11/22 17:00
16	Circulation among TF for review	10 days	21/11/22 08:00	02/12/22 17:00
17	Presentation at VRU Proxi	5 days	05/12/22 08:00	09/12/22 17:00
18	Finalise drafting	5 days	12/12/22 08:00	16/12/22 17:00
19	Final review by VRU Proxi CPs	5 days	19/12/22 08:00	23/12/22 17:00
20	Submission process	12 days	26/12/22 08:00	10/01/23 17:00
21	Formal document submission for April GRSG	0 days	10/01/23 17:00	10/01/23 17:00
22	Preparation of informal documents	50 days	11/01/23 08:00	21/03/23 17:00
23	Submit informal documents	0 days	21/03/23 17:00	21/03/23 17:00
24	**Meetings**	**204 days?**	**28/06/22 08:00**	**07/04/23 17:00**
25	Task force	0 days	28/06/22 08:00	28/06/22 08:00
26	VRU Proxi 24	2 days	06/07/22 08:00	07/07/22 17:00
27	Task force	0 days	26/07/22 08:00	26/07/22 08:00
28	Task force (approximate)	0 days	09/09/22 17:00	09/09/22 17:00
29	Task force (approximate)	0 days	23/09/22 17:00	23/09/22 17:00
30	Task force (approximate)	0 days	07/10/22 17:00	07/10/22 17:00
31	Task force (approximate)	0 days	21/10/22 17:00	21/10/22 17:00
32	VRU Proxi (approximate)	5 days?	24/10/22 08:00	28/10/22 17:00
33	Task force (approximate)	0 days	18/11/22 17:00	18/11/22 17:00
34	Task force (approximate)	0 days	02/12/22 17:00	02/12/22 17:00
35	VRU Proxi (approximate)	5 days	05/12/22 08:00	09/12/22 17:00
36	VRU Proxi (approximate)	5 days	06/03/23 09:00	13/03/23 09:00
37	GRSG	5 days	03/04/23 08:00	07/04/23 17:00



VRU Proxi Task force Direct vision

SUMMARY

- Task force is agreed on the need for design neutrality and on the planned analyses
- There may be a trade off for different methods between sensitivity to design changes and the robustness with which we can prove equivalence. May not be a perfect answer, CPs may need to choose between options
- Consideration of the possibility of alternatives for competing objectives has commenced but limited progress so far.