



Project Alpha Phase II

2024-05-08



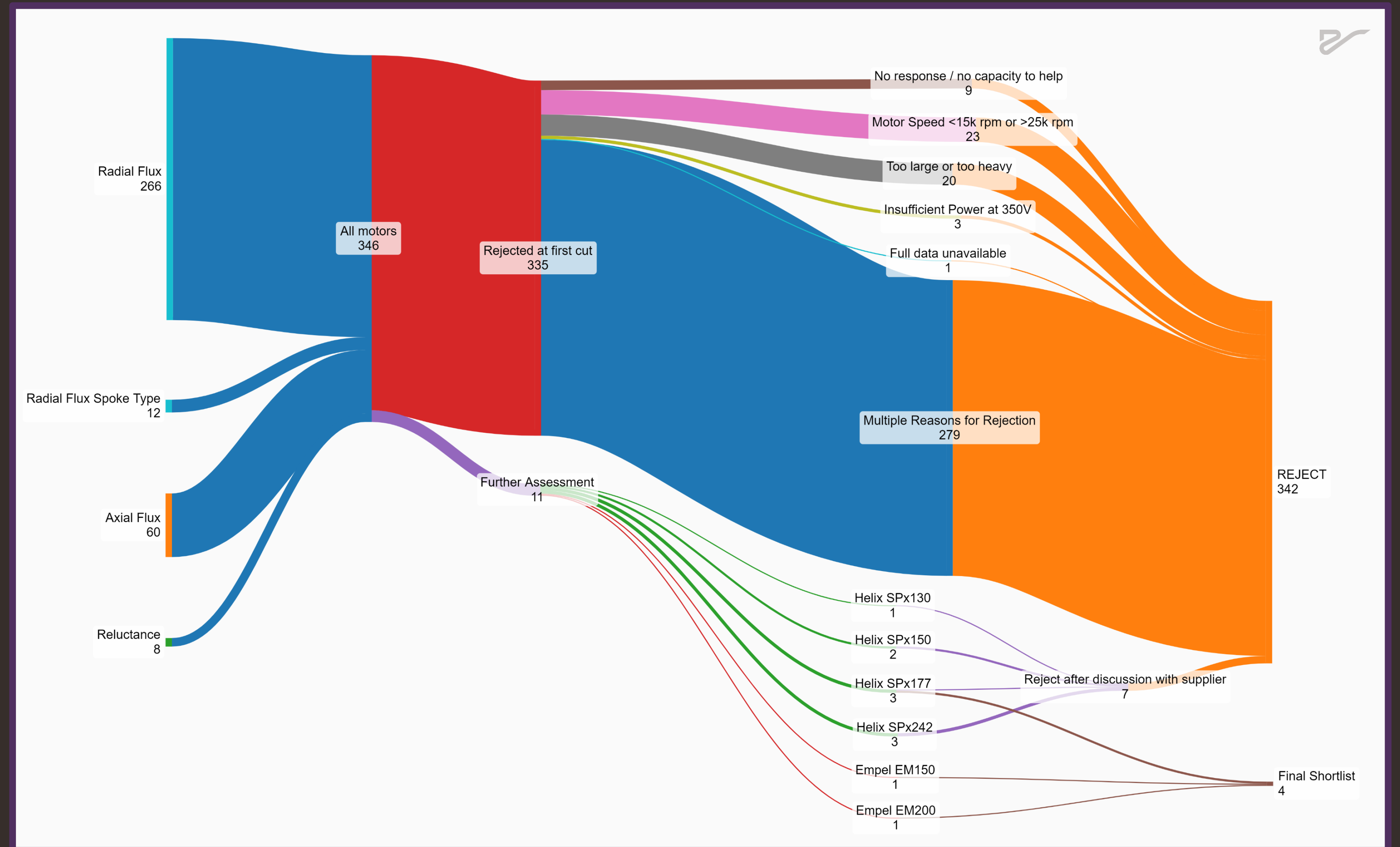
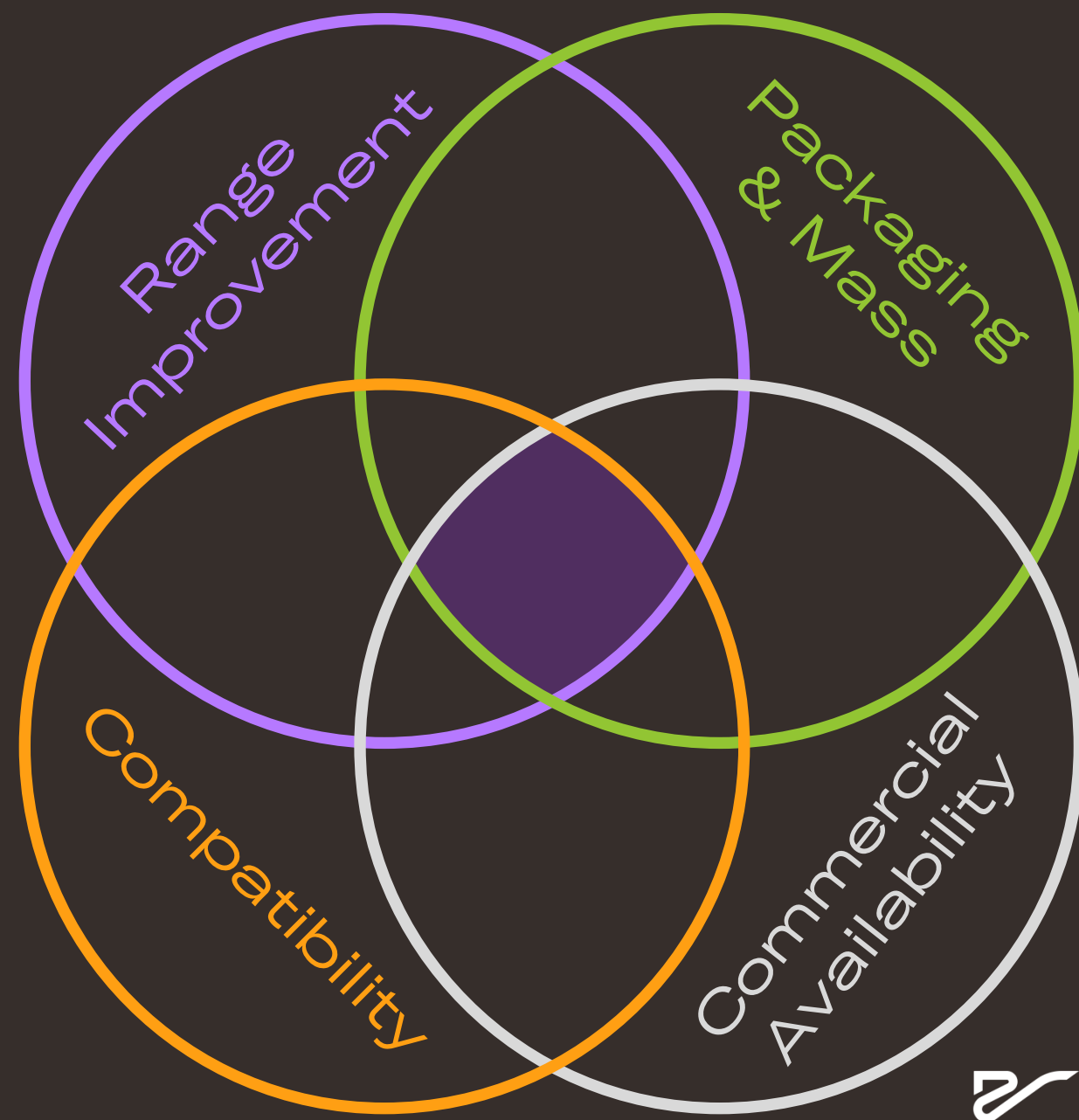
Agenda

- E-Motor Landscape Overview
- E-Motor Shortlist & 2-Motor Combinations
- E-Motor Selection Recommendation



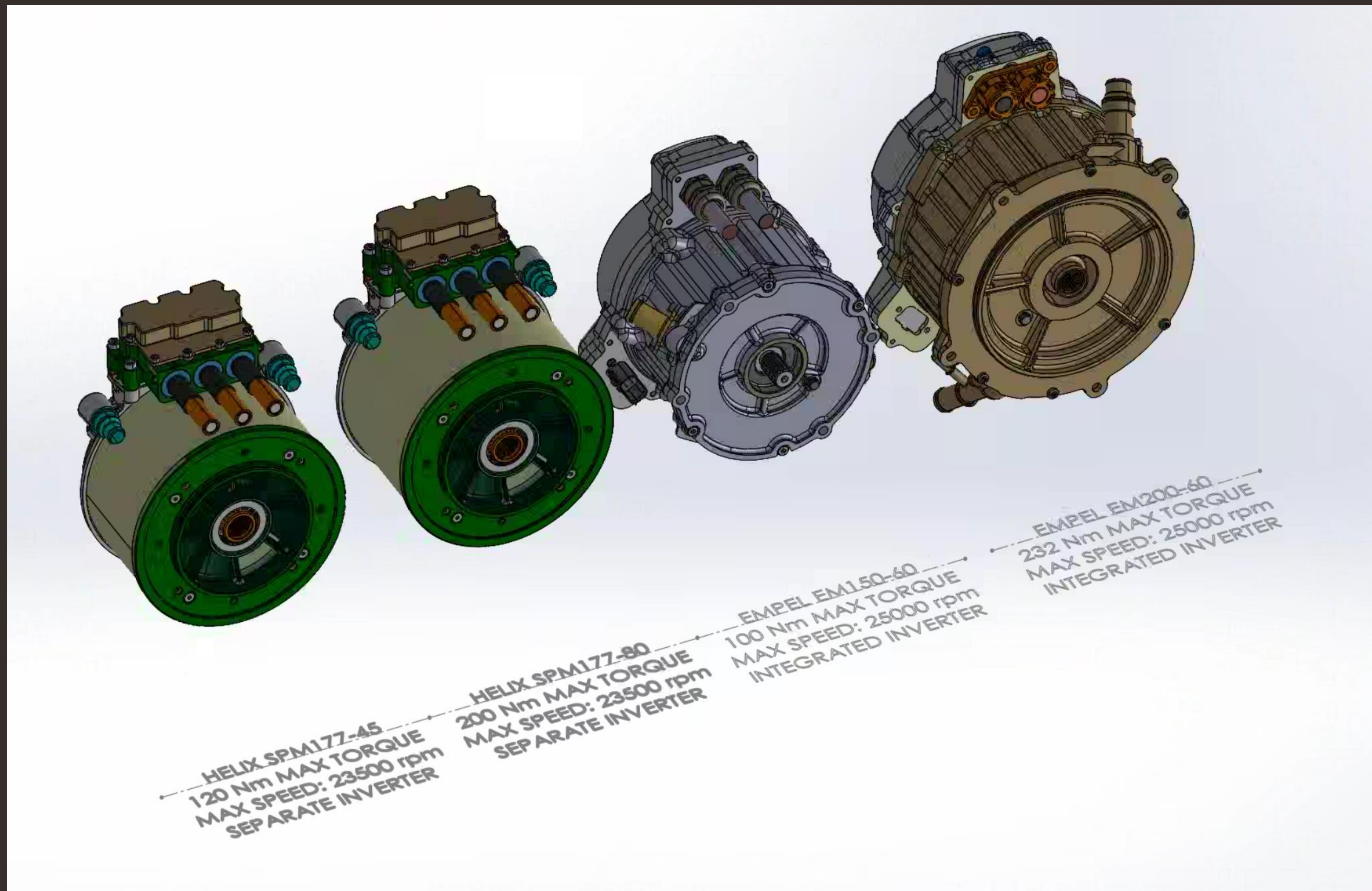
E-Motor Landscape

- 346 motors assessed
- 4 shortlisted for demonstrator





E-Motor Shortlist



E-Motor Shortlist*
EMPEL EM200x60 (<i>motor A</i>)
EMPEL EM150x60 (<i>motor B</i>)
Helix SPX177_45 (<i>motor C</i>)
Helix SPX177_80 (<i>motor D</i>)

* ATE Systems replied that they do not have capacity to support



2-Motor Combination Assessment

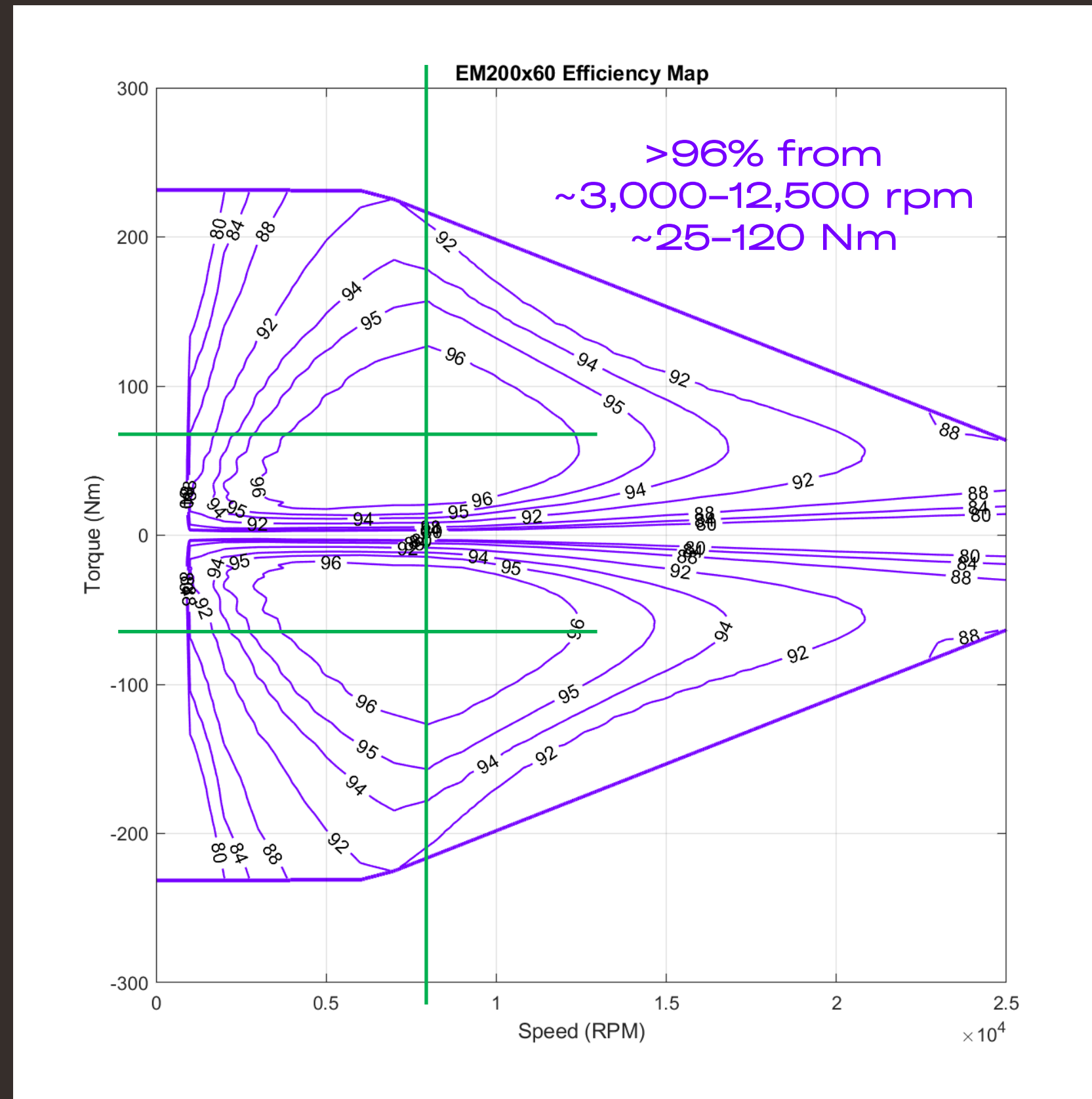
E-Motor Combination	Simulated Range Improvement Relative to Predicted* Tesla Model 3 Efficiency		Observations	
	WLTP with losses**	City Cycle with losses**	Data Confidence	Commercial Cost
EM200x60 (motor A) EM150x60 (motor B)	5 - 7%	16 - 24%	High	££
EM200x60 (motor A) SPX177_45 (motor C)	6 - 9%	18 - 27%	Low	£££
EM200x60 (motor A) SPX177_80 (motor D)	5 - 7%	16 - 24%	Medium	£££
EM150x60 (motor B) SPX177_80 (motor D)	3 - 5%	6 - 10%	Medium	£££

* prediction based on motors characterized in Phase I and mapped to Tesla speed & torque range

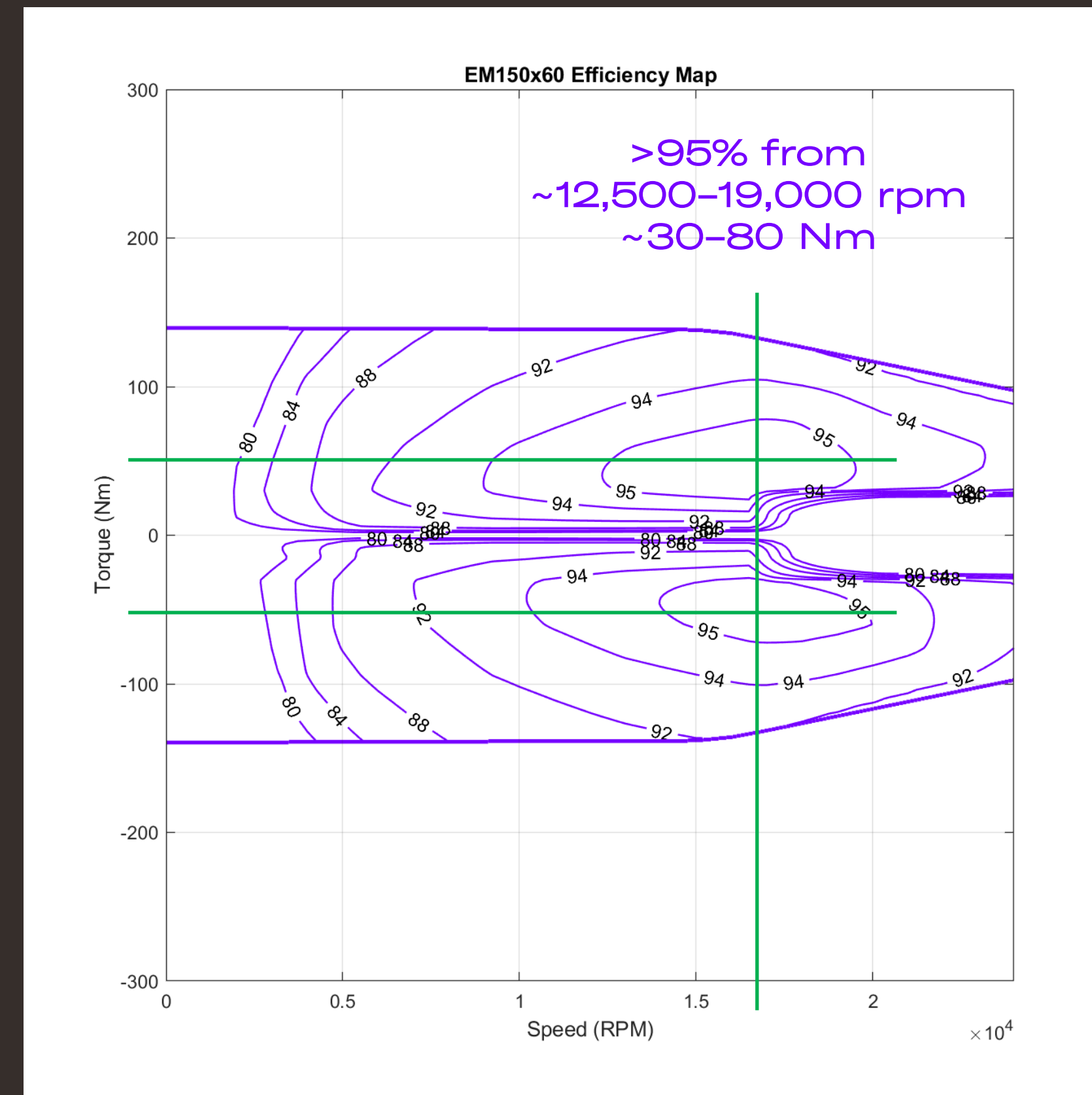
** expected losses are thermal as well as mechanical due to transmission gearing & lubrication



Recommended E-Motor Efficiencies



Higher torque, lower speed optimised



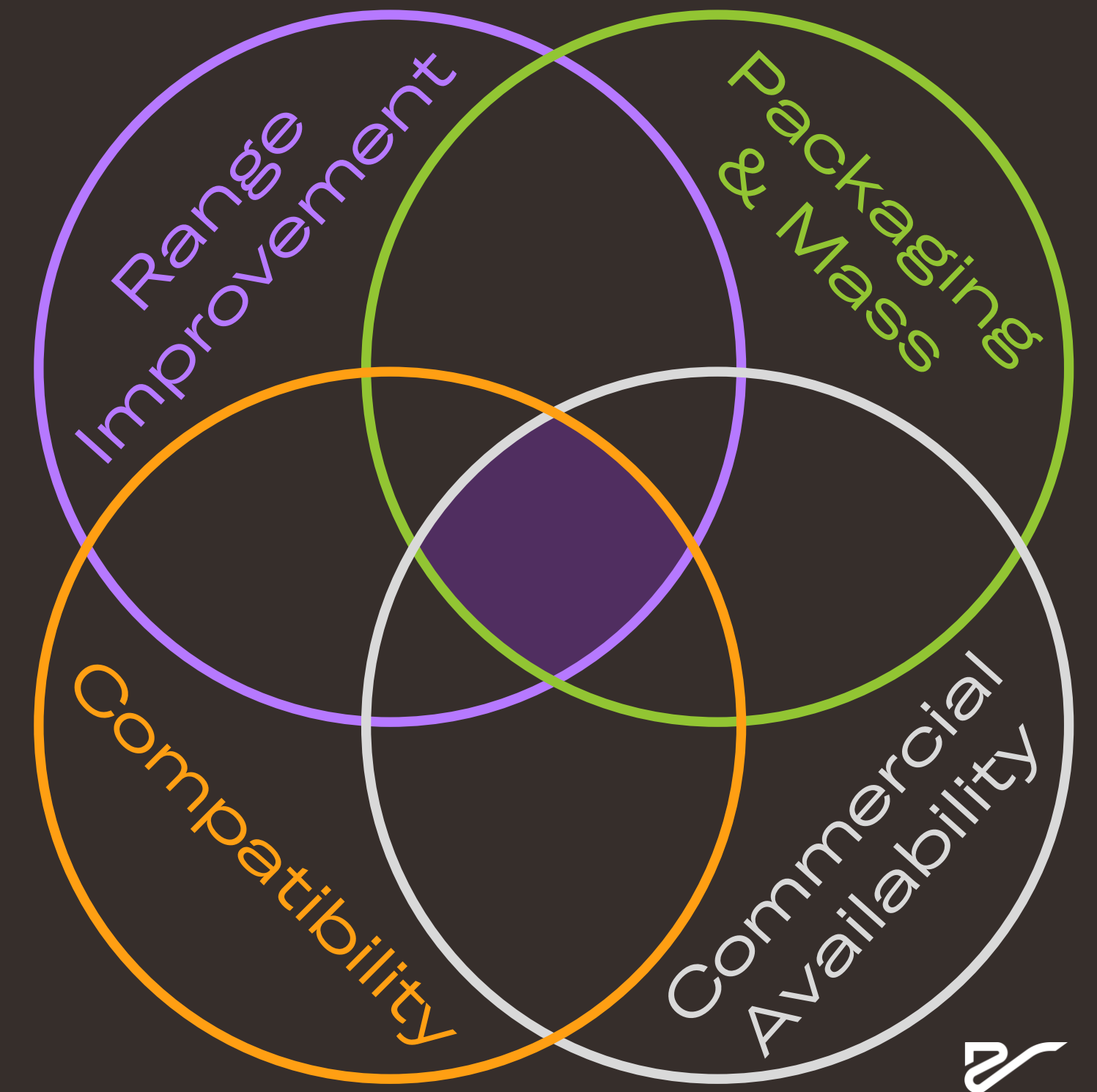
Lower torque, higher speed optimised



E-Motor Recommendation

Of the extremely limited motors that meet all technical requirements, recommend the two EMPEL motors:

- ✓ Simulated range gains in line with prior predictions
- ✓ Peak motor efficiencies target different speed & torque ranges within duty cycles
- ✓ Meet all technical requirements
- ✓ Highest confidence in efficiency data
- ✓ Using one supplier minimizes integration risks
- ✓ Commercially viable





Next Steps

- Vehicle-Level Benchmarking
- Concept Design and Packaging Due Diligence
- Benchmark Tesla IDU