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EXTERNALLY EXCITED SYNCHRONOUS MACHINE (EESM) AS MAIN AND AUXILIARY DRIVE

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WHY EESM MACHINES

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**HOW TO INTEGRATE EESM AS
MAIN DRIVE**

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EESM AS AUXILIARY DRIVE

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**WILL EESM SUCCEED
PERMANENT MAGNET - SM**

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WHY EXTERNALLY EXCITED SYNCHRONOUS MACHINES

SUSTAINABILITY AND COST

Global Warming Potential (GWP)



Neodymium Price



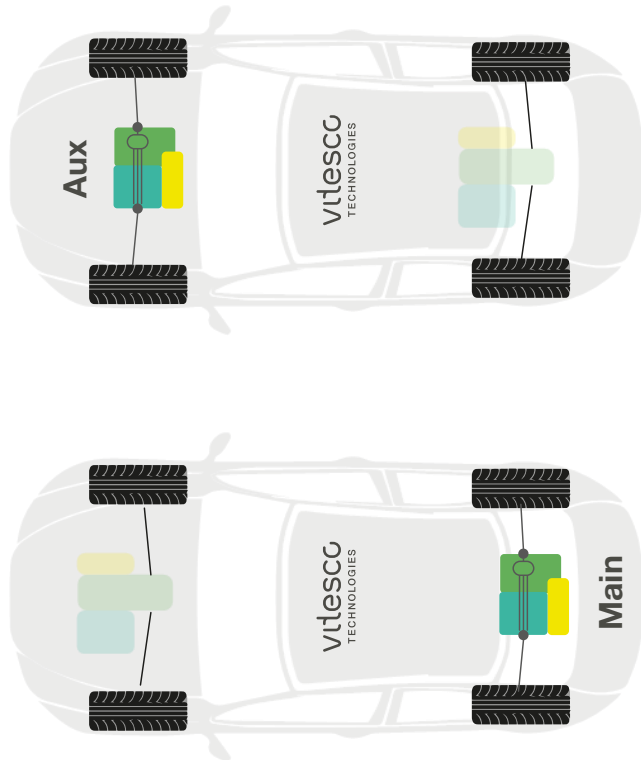
Key Takeaways

- Magnet free rotor
- Lower GWP
- Plannable purchasing

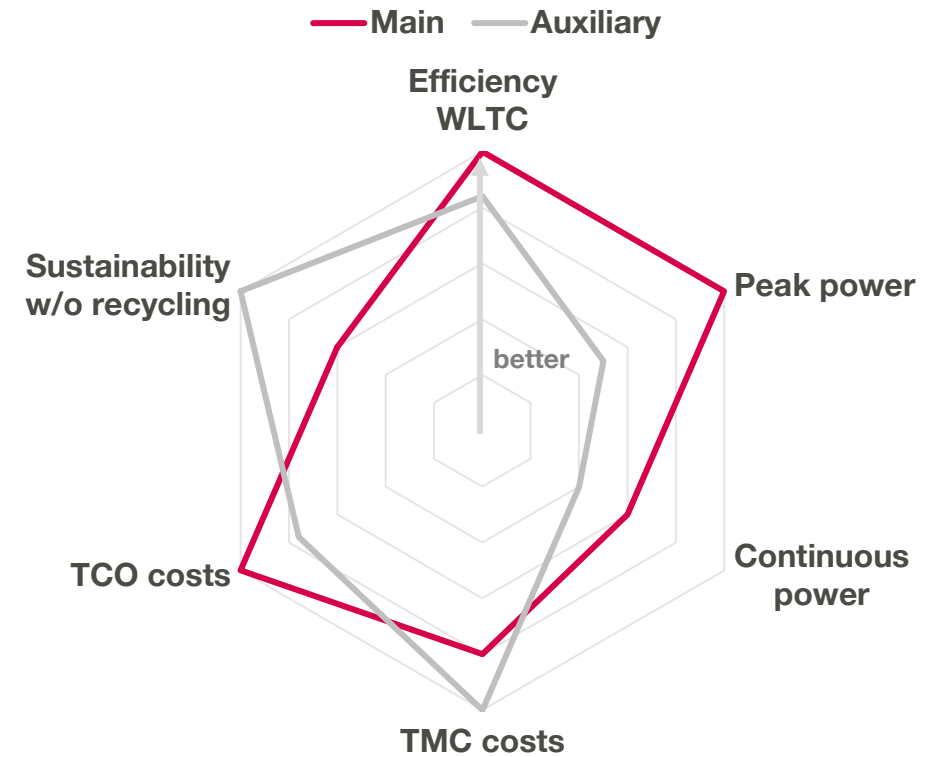
WHY EXTERNALLY EXCITED SYNCHRONOUS MACHINES

NEW DIMENSIONS FOR SYSTEM DESIGN

Drive Concepts



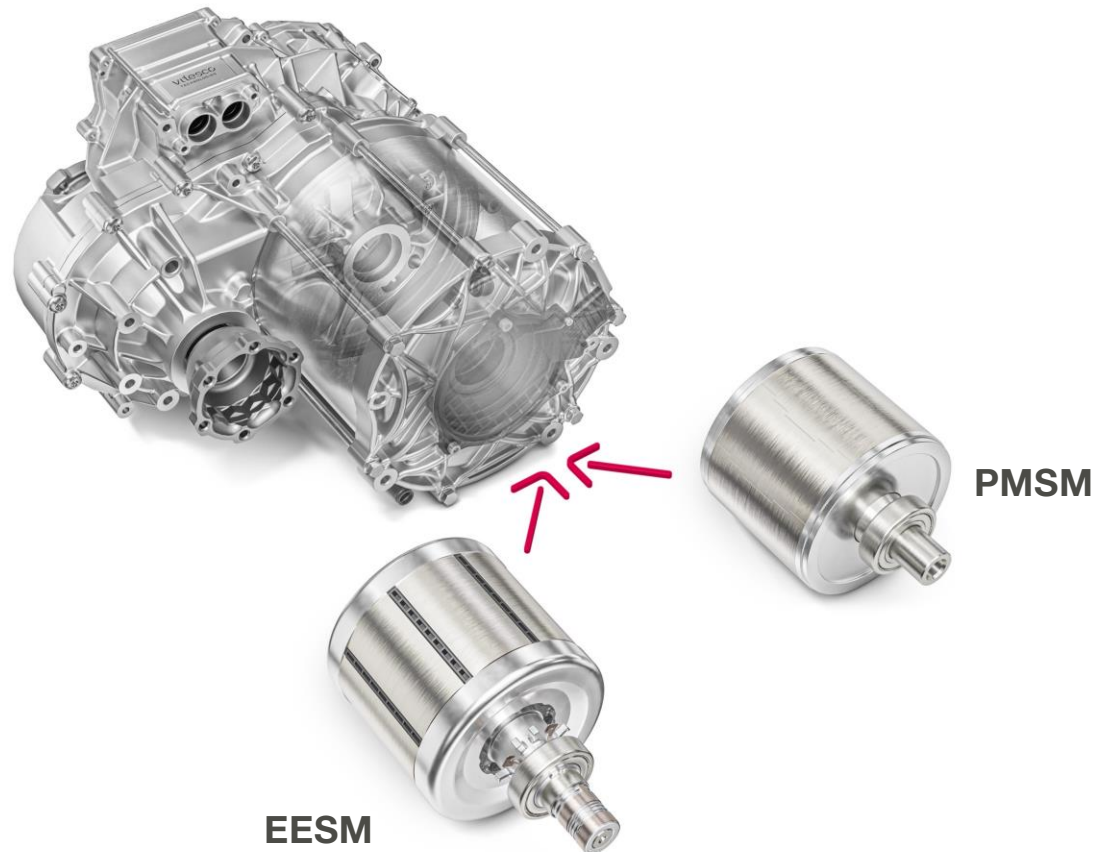
Main versus Auxiliary Drive



HOW TO INTEGRATE EESM AS MAIN DRIVE

PLATFORM INTEGRATION

“Plug and Play”



Platform Harmonization



Compact design



Seamless integration

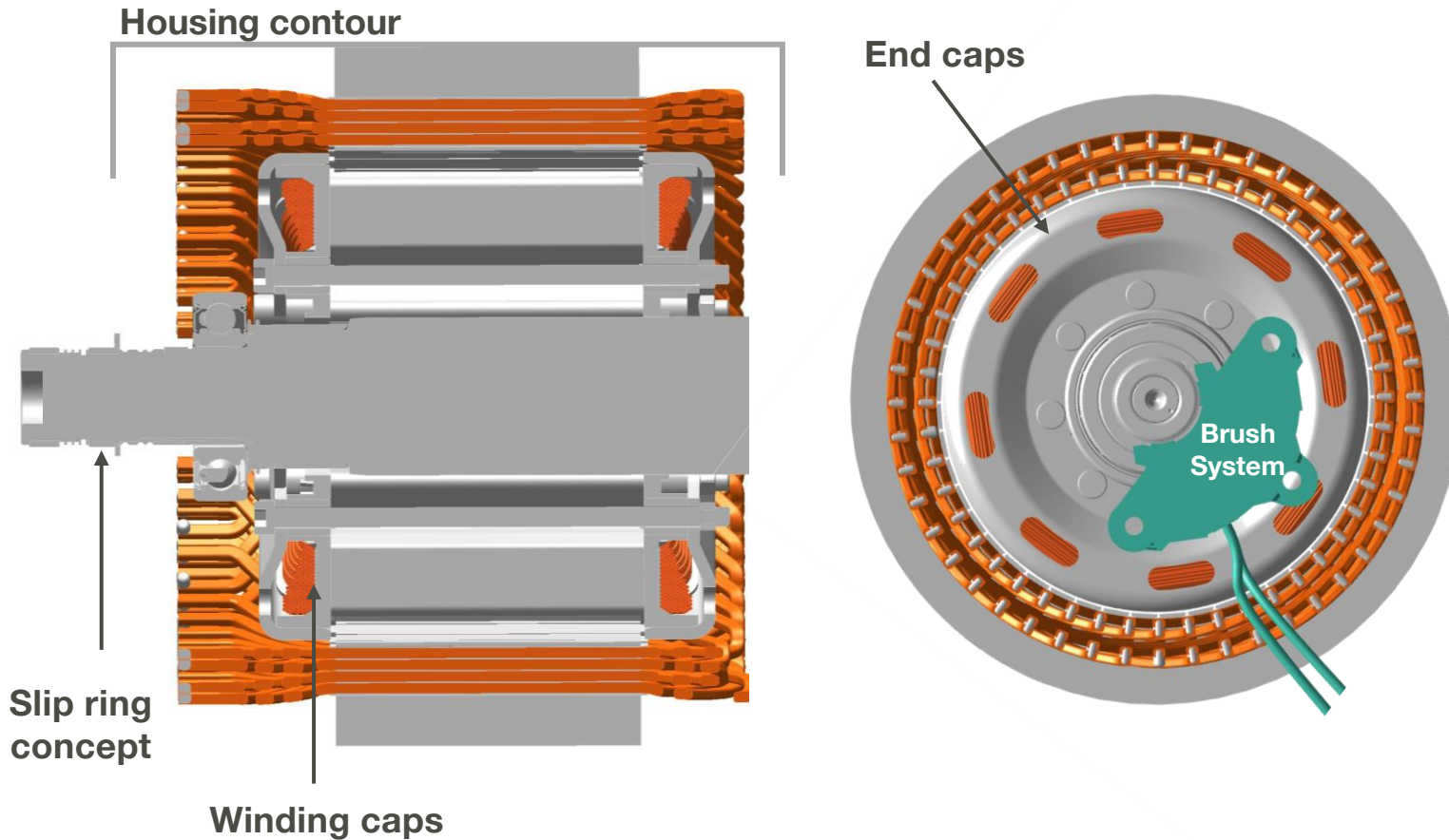


Scalability in given platform

HOW TO INTEGRATE EESM AS MAIN DRIVE

INSTALLATION SPACE

Harmonized Bearing Position



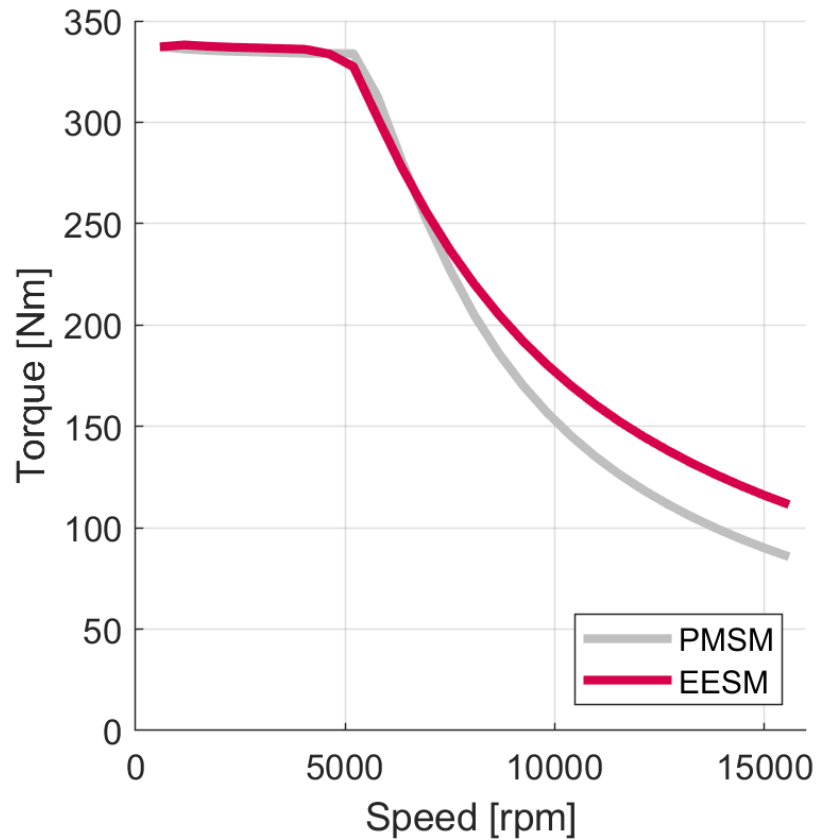
Solved Challenges

-  Winding caps
-  End caps
-  Slip ring concept

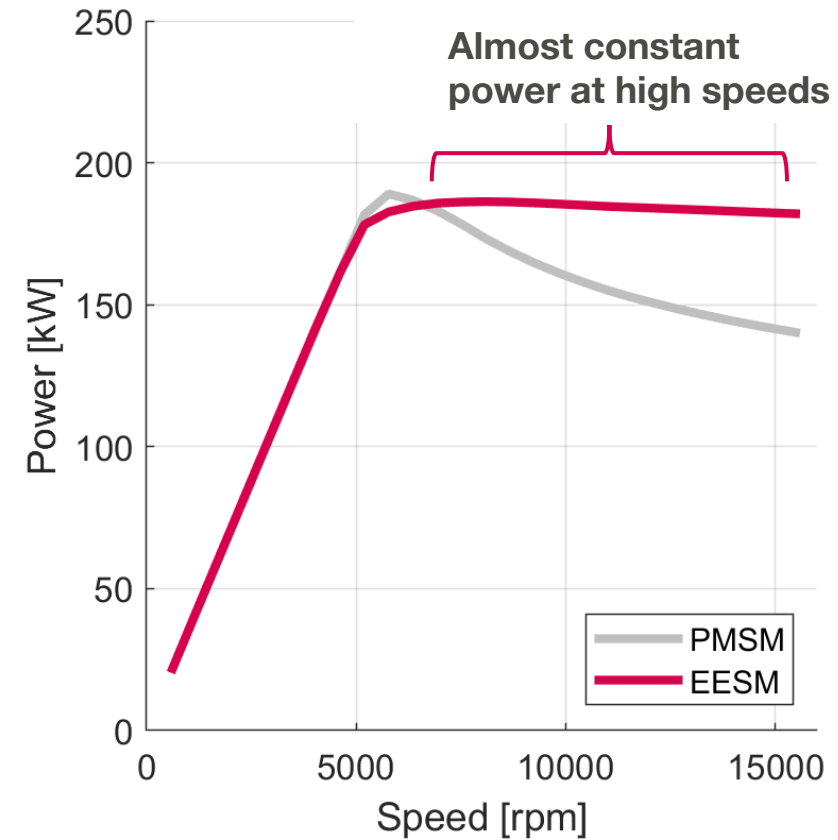
HOW TO INTEGRATE EESM AS MAIN DRIVE

PEAK PERFORMANCE FOR D SEGMENT CAR - SIMULATION

Torque Comparison PMSM vs EESM



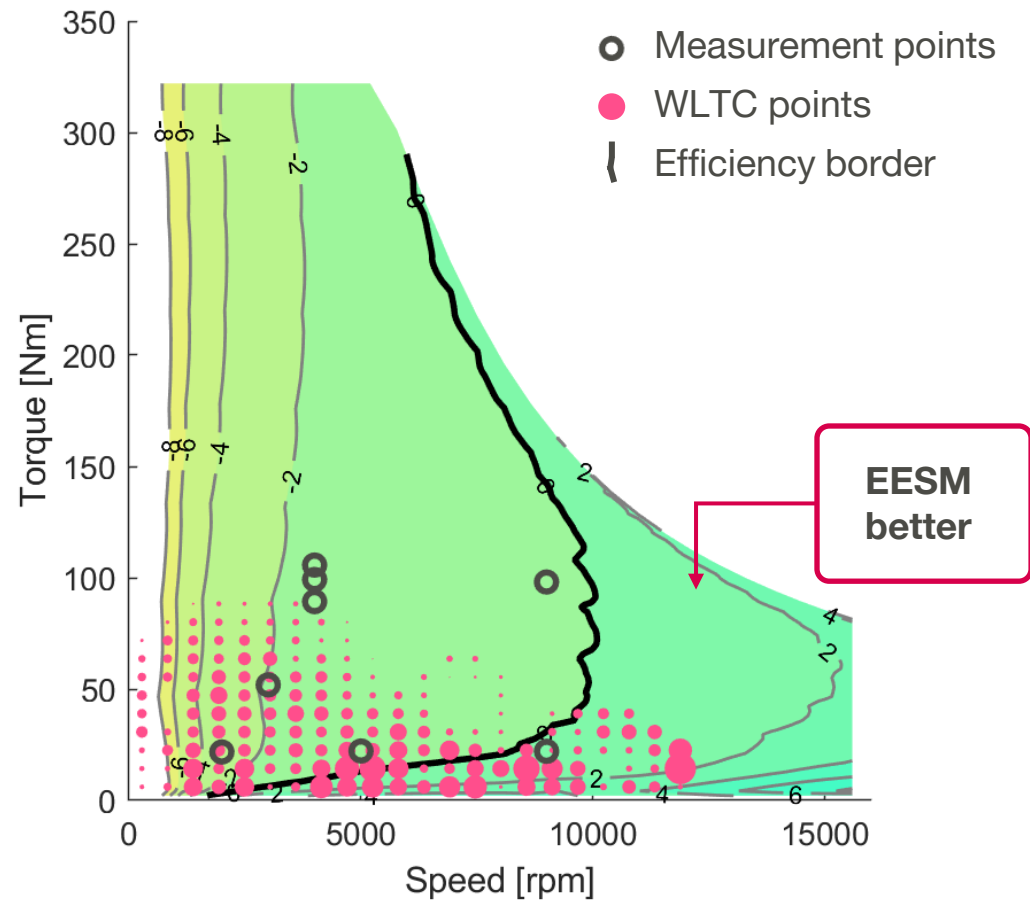
Power Comparison PMSM vs EESM



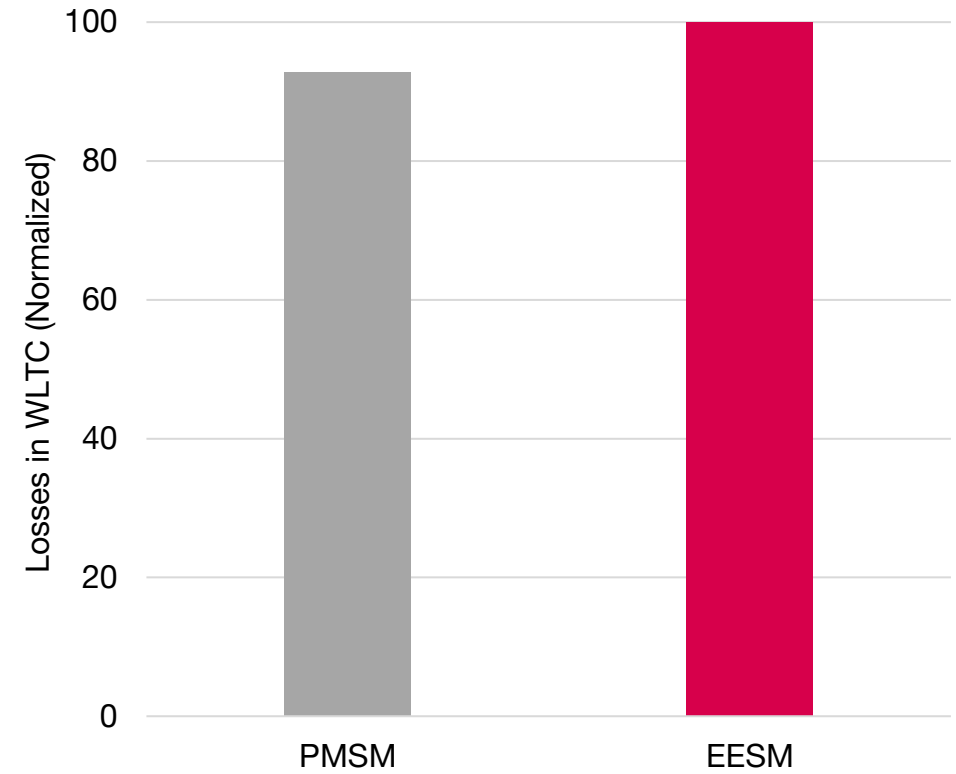
HOW TO INTEGRATE EESM AS MAIN DRIVE

EFFICIENCY FOR D SEGMENT CAR – SIMULATION AND MEASUREMENT

Difference Efficiency Plot in Percent – System Level



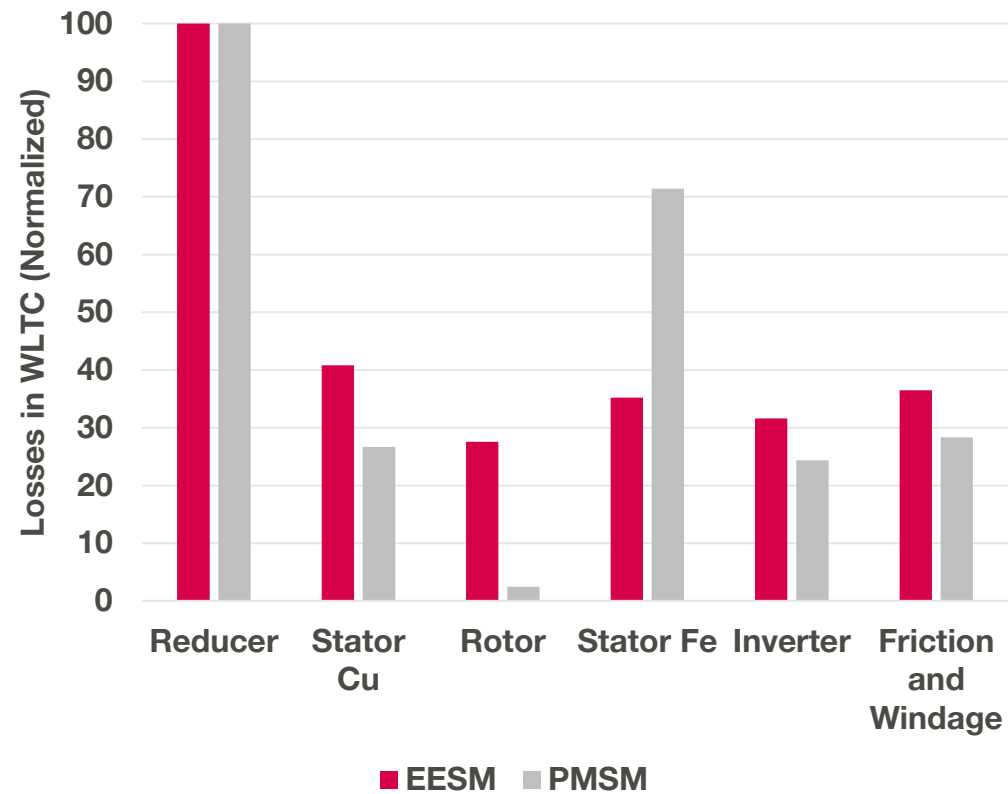
Loss Comparison – System Level



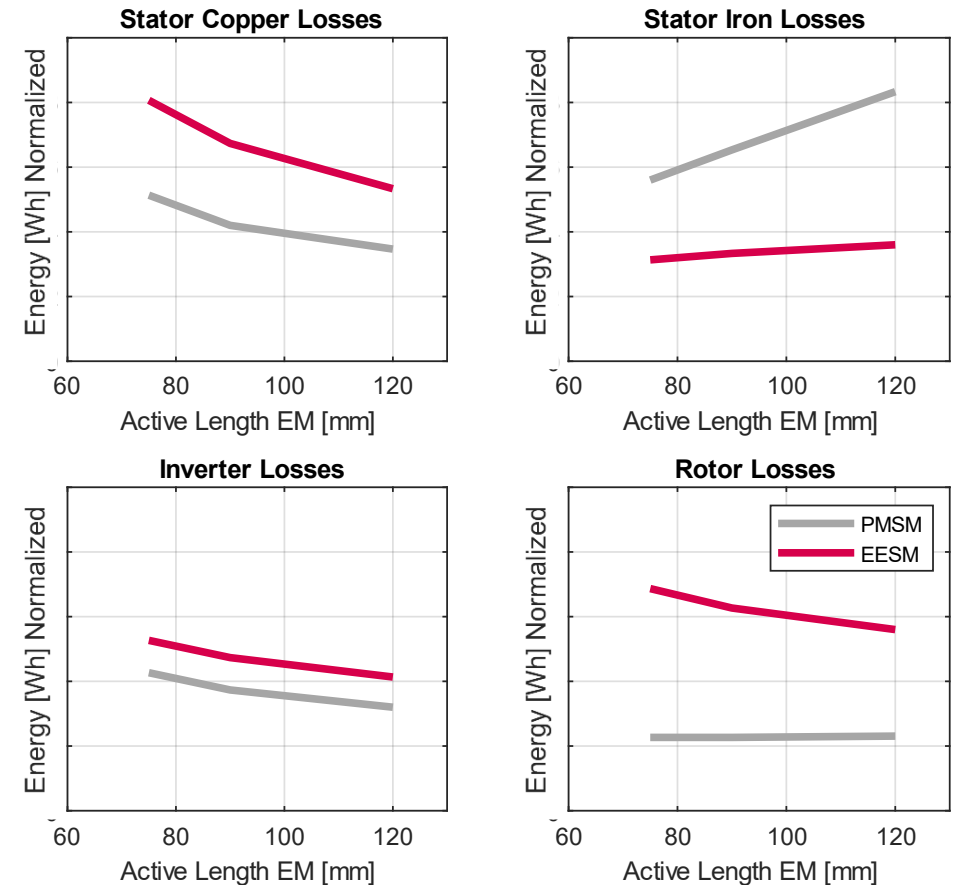
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SCALING

Detailed Loss Separation



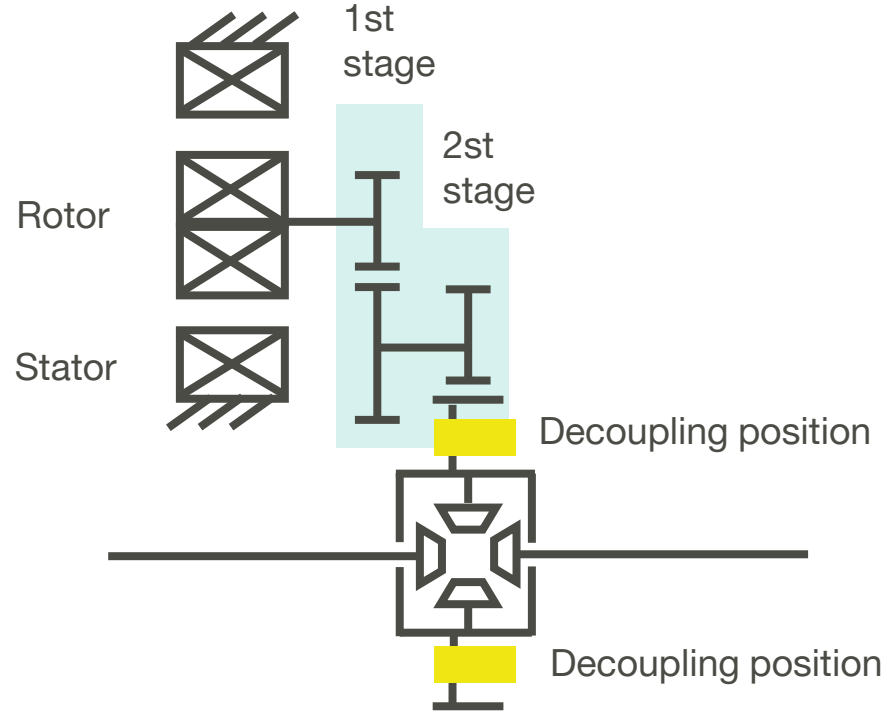
Losses in WLTC



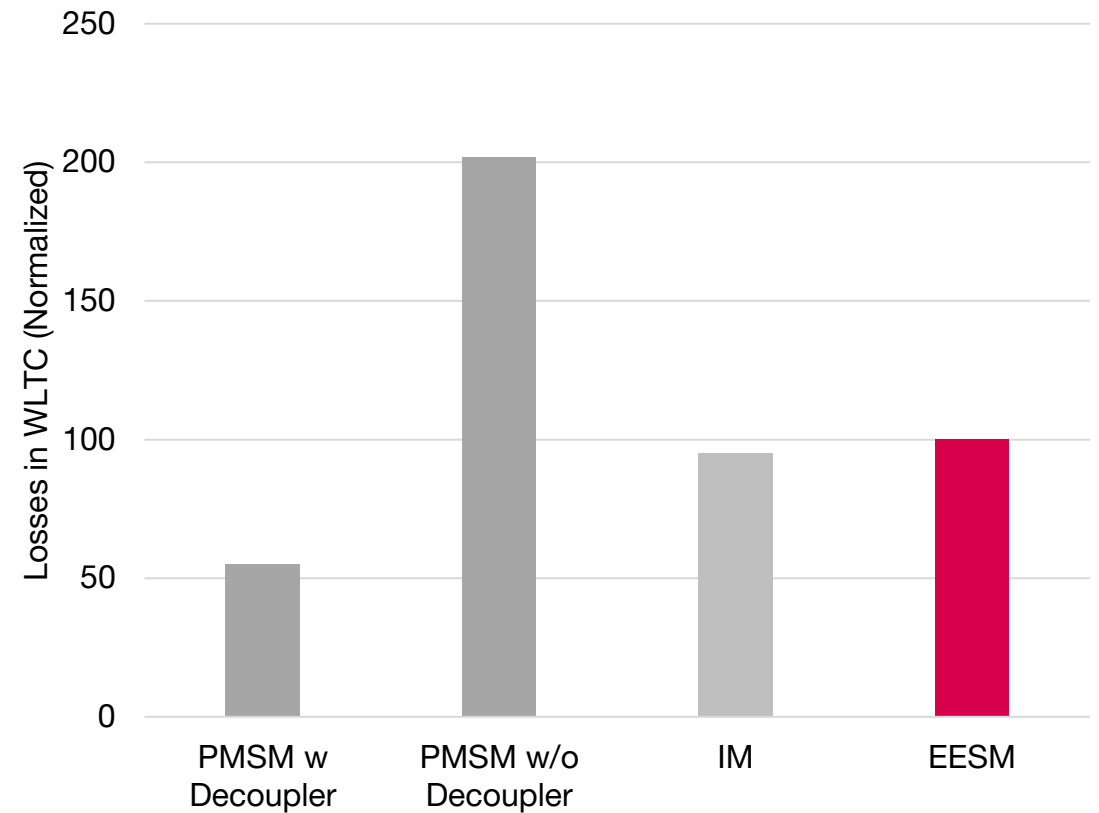
EESM AS AUXILIARY DRIVE

DRAG LOSSES

Decoupling Device



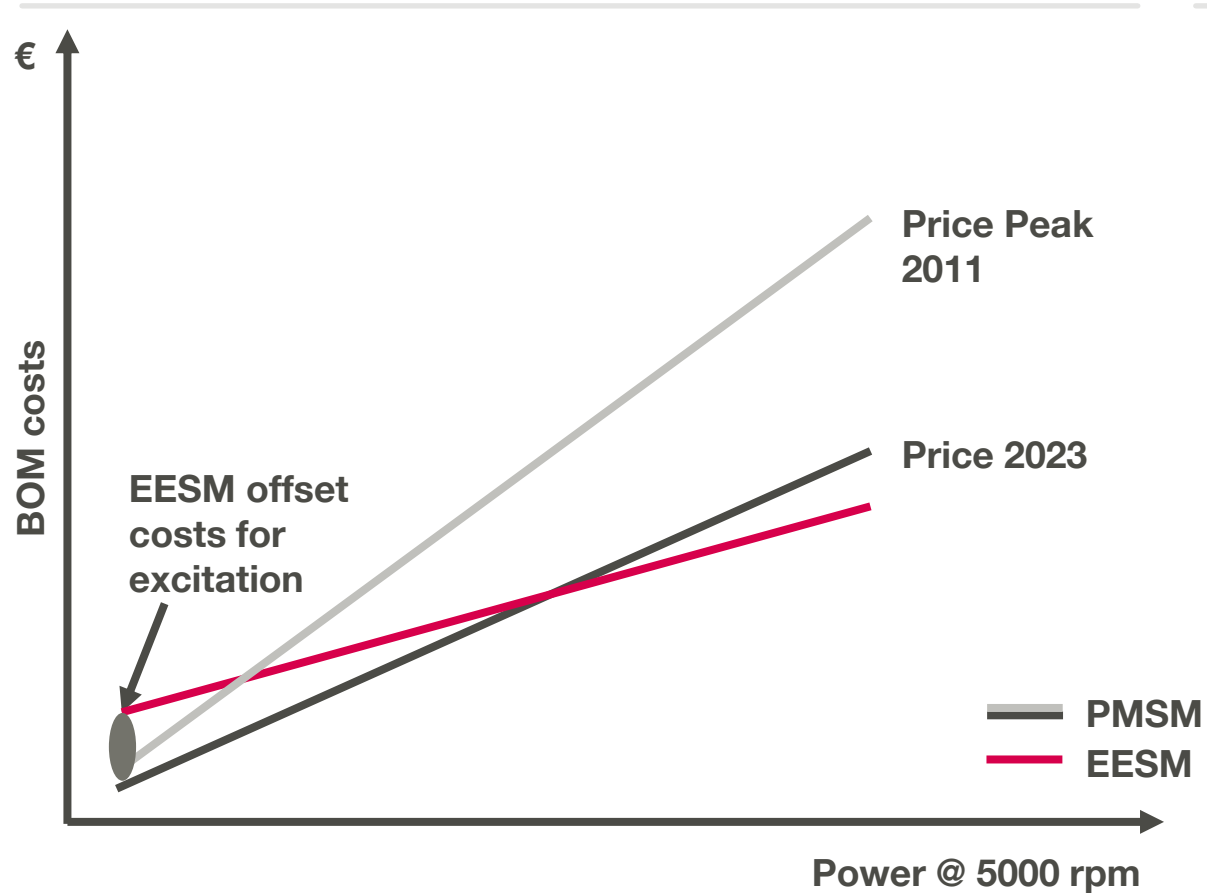
Drag Losses in WLTC



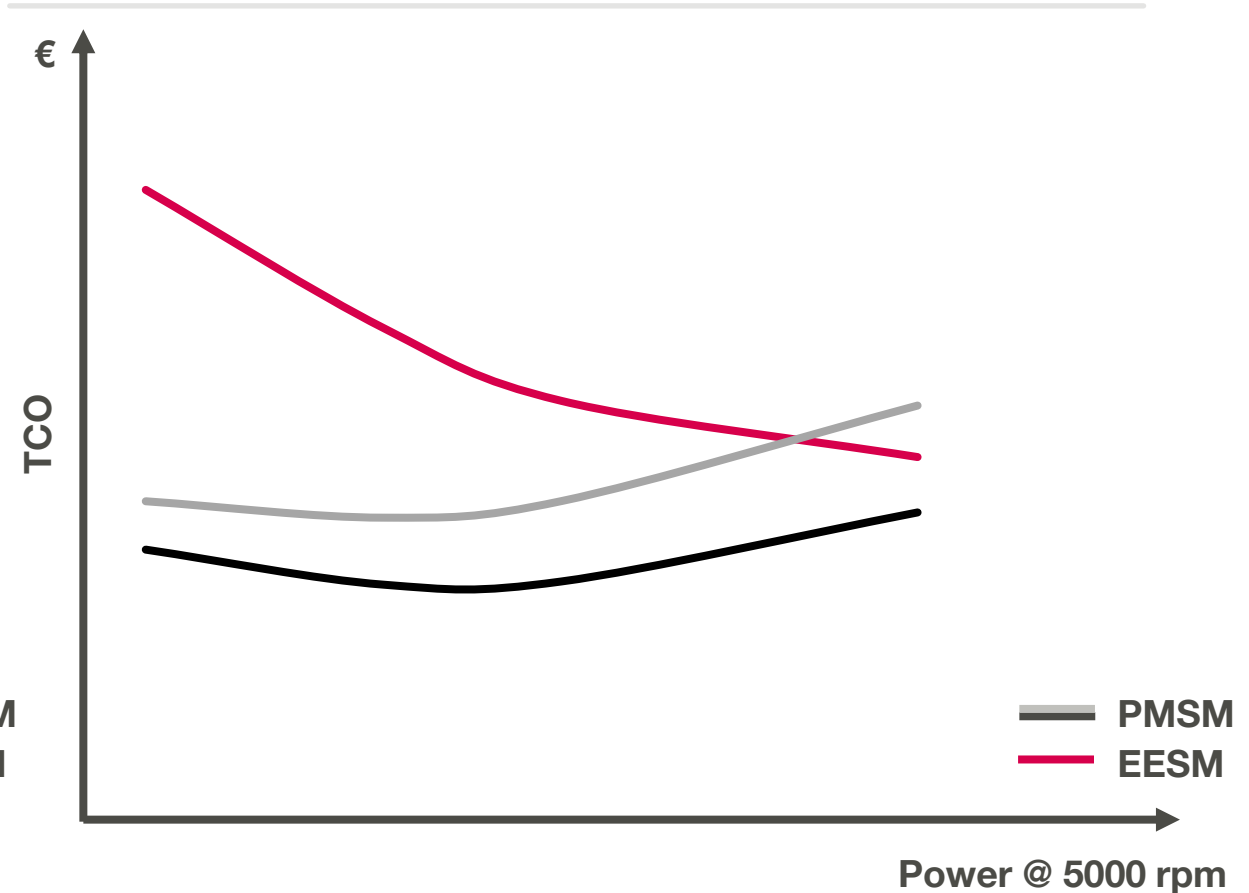
CONCLUSION

COSTS

BOM Cost PMSM vs. EESM



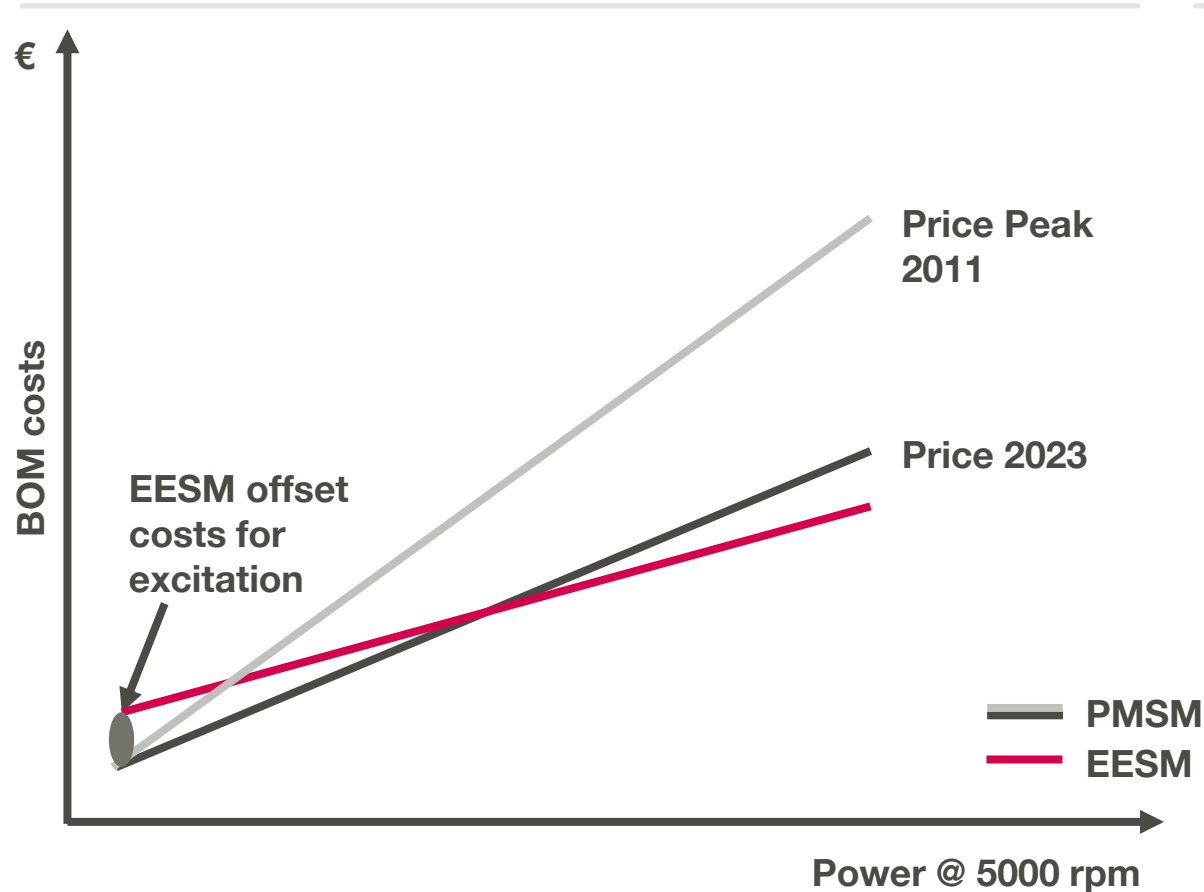
Total Cost of Ownership



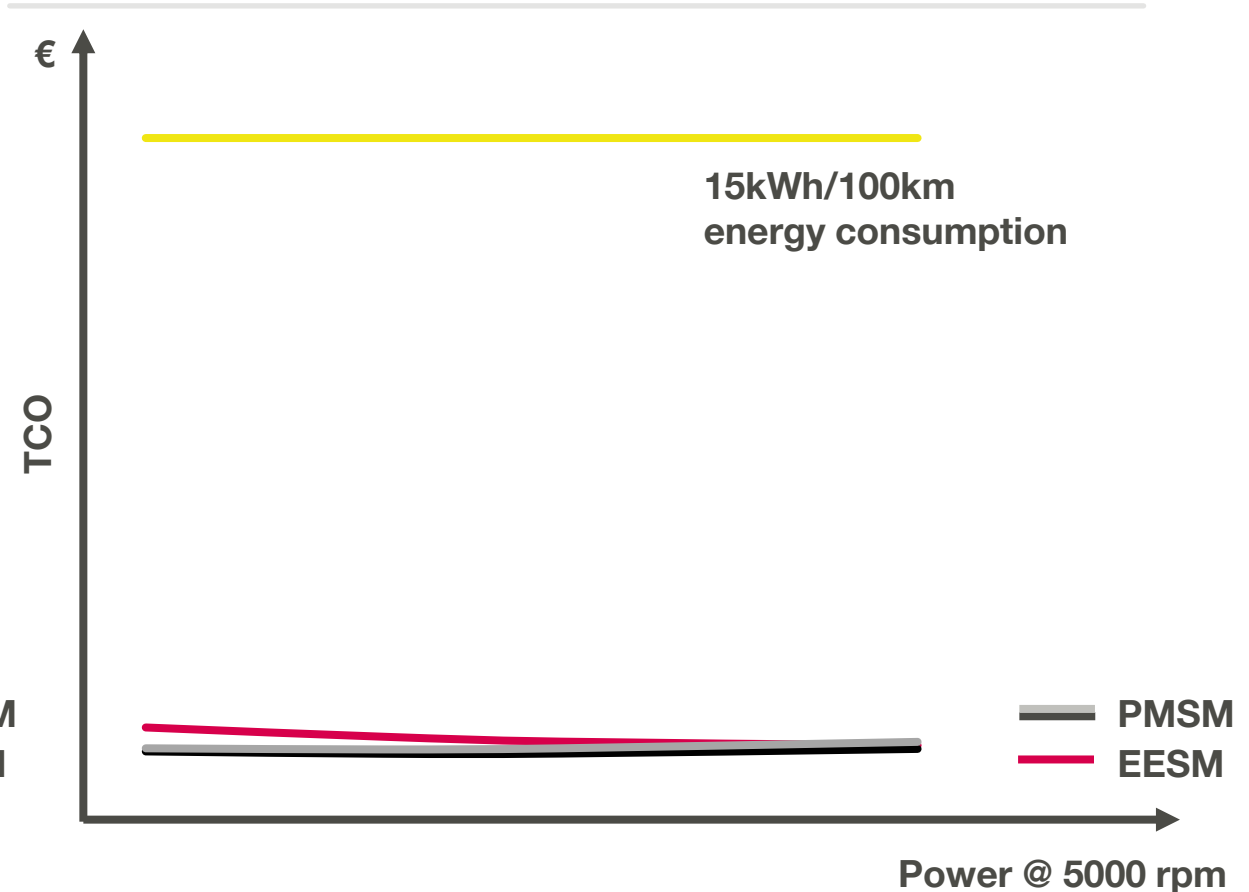
WILL EESM SUCCEED PERMANENT MAGNET - SM

COSTS

BOM Cost PMSM vs. EESM



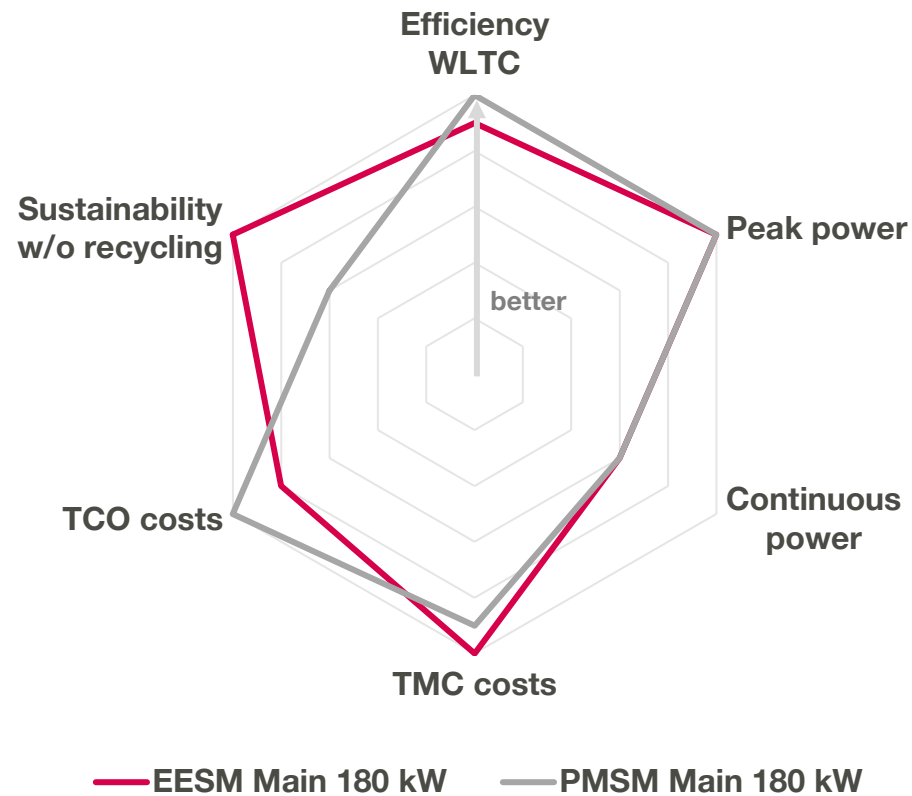
Total Cost of Ownership



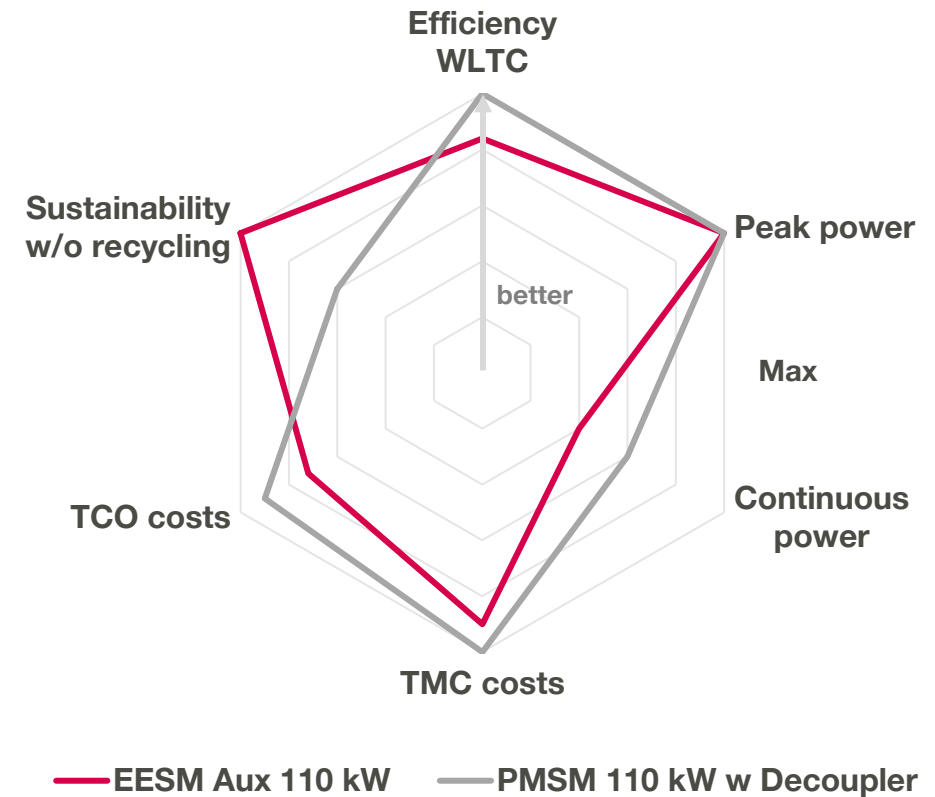
WILL EESM SUCCEED PERMANENT MAGNET - SM

QUALITATIVE COMPARISON PMSM VS EESM FOR D SEGMENT CAR

Main Motor Comparison PMSM vs EESM



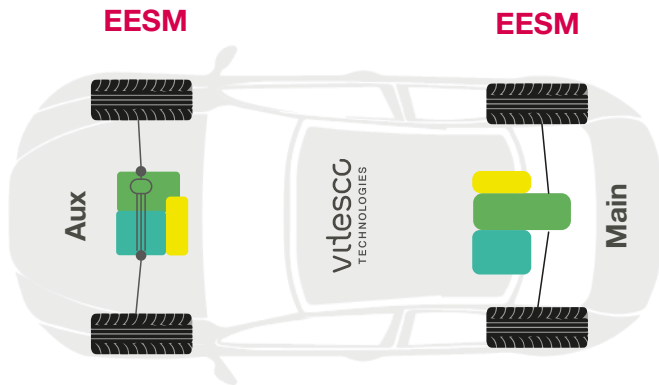
Auxiliary Motor Comparison PMSM vs EESM



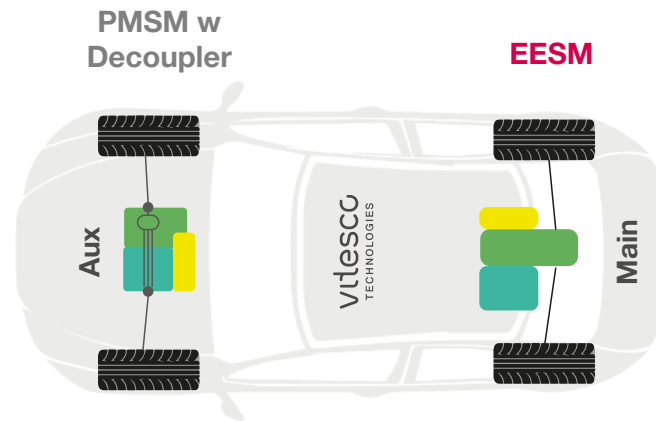
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OUR PLATFORM CONFIGURATION

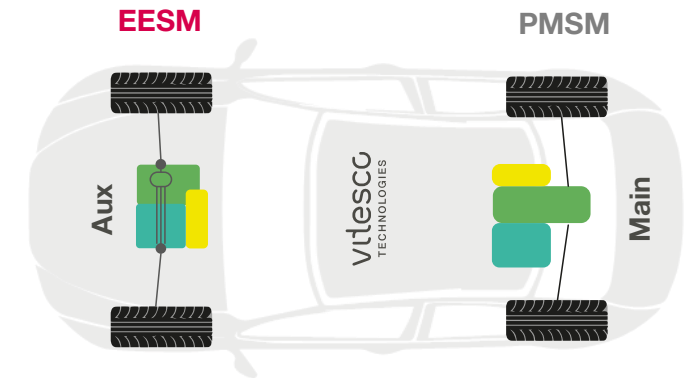
Configuration 1



Configuration 2



Configuration 3



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