



## D3.1 – Thermodynamic layout and combustion concept

Research Innovation Action

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## Publishable summary

This report describes the layout and simulations of the thermodynamic engine cycle with a new combustion concept for the Diesel/HVO engine developed in WP3 of LONGRUN. The work builds on an initial concept definition which has been developed in a workshop together with partners in WP3.

Starting with the base engine, a new combustion concept in combination with a high-performance turbocharger and a high pressure EGR system was applied. Initially, the BSFC was optimized at an engine-out NO<sub>x</sub> level of 10 g/kWh. This first development step reduced the BSFC by 6,3% but increased the peak firing pressure from 180bar to 260bar.

Next, different EGR concepts were investigated and optimized to assess the BSFC versus NO<sub>x</sub> trade-off towards lower engine-out NO<sub>x</sub> emissions. It could be shown that some of the concepts with a slightly increased BSFC (approximately 0,5 g/kWh) reached the level of 5 g/kWh NO<sub>x</sub> emission. The best NO<sub>x</sub> BSFC trade-off was achieved with a combination of high pressure EGR and turbo-compound or a combination of high pressure and low pressure EGR.

Finally, a roadmap towards 50% brake thermal efficiency is given. The chosen measures are an increased mechanical efficiency, a reduction of pressure losses and an increased turbocharger efficiency in combination with a Miller cycle.

With reference to the Grant Agreement Annex 1 Part A, the targets of this investigation were reached.

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### Project partners:

#	Partner	Partner Full Name
1	FEV	FEV EUROPE GMBH
2	DAF	DAF TRUCKS NV
3	FPT	FPT INDUSTRIAL SPA
4	FORD	FORD OTOMOTIV SANAYI ANONIM SIRKETI
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7	VOLVO	VOLVO TECHNOLOGY AB
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20	TECHNA	FUNDACION TECHNIALIA RESEARCH & INNOVATION
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22	UMIC	UMICORE AG & CO KG
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