PROJECT

CREEV

Novel Compound Rotary Engine Range Extender for Electric Vehicles

**Funding:** European (Horizon 2020)
**Duration:** Jul 2015 - Dec 2015
**Status:** Complete with results
**Total project cost:** €71,429
**EU contribution:** €50,000

**Call for proposal:** H2020-SMEINST-1-2015
**CORDIS RCN:** 197411

**Objectives:**

This project seeks to successfully demonstrate and scale up for market readiness, a completely novel, high efficiency, low emission, compact rotary engine range extender for electric vehicles. According to the EC, transport is the only major sector in the EU where greenhouse gas emissions are still rising, with road transport contributing about one-fifth of the EU's total CO2 emissions. Despite the existence of environmentally friendly electric vehicles, CO2 emissions continue to rise in the sector. This is because of range anxiety, the single greatest obstacle to the widespread adoption of electric vehicles (EV) and the environmental benefits they offer. As a result, while 44% of drivers consider emissions & environmental friendliness as important factors when buying a car, only 5% would consider buying an electric car due to range concerns. Whilst automotive manufacturers have sought to address the issue of range anxiety through the installation of range extenders, these existing extenders are limited in performance and do not fully meet vehicle manufacturers (OEM) needs.

The clear business opportunity is to provide tier 1 automotive powertrain providers and OEMs with breakthrough innovation in EV range extender technology that meets all of their needs. These include; high efficiency, low fuel consumption, low emissions, low noise, compact size, light weight and low vibration. The rotary (Wankel) type engine lends itself extremely well to this application, but has a number of inherent limitations. The key innovations in our solution (refer section 1.3) eliminate the disadvantages of the rotary engine whilst building upon its inherent strengths. Our breakthrough solution is novel, patent protected and lab tested/demonstrated at prototype stage. We initially require help to undertake a feasibility study to elaborate and de-risk our business plan. The successful exploitation of the technology will result in cumulative revenue of €79m after 6 years on the market.

**Parent Programmes:**
H2020-EU.3.4. - Horizon 2020: Smart, Green and Integrated Transport

**Institute type:** Public institution
**Institute name:** European Commission
**Funding type:** Public (EU)

**Lead Organisation:**

| Advanced Innovative Engineering (Uk) Limited |
| Address: |
| UNIT 2 RINGWAY INDUSTRIAL ESTATE EASTERN AVENUE |
| LICHFIELD |
| WS13 7SF |
| United Kingdom |
| **EU Contribution:** €50,000 |
Technologies:

<table>
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<th>EV support technologies</th>
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<td>On-demand range-extending service for EVs</td>
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**Development phase:** Demonstration/prototyping/Pilot Production

Key Results:

**Periodic Reporting for period 1 - CREEV (Novel Compound Rotary Engine Range Extender for Electric Vehicles)**

Rotary engines were conceived in 1929 and compared to piston engines, they provide high power/weight ratios in a compact form factor with low levels of vibration. However, rotary engines are often associated with high rotor tip wear, noise, poor efficiency and higher emissions than piston engines. The CREEV project addresses the disadvantages associated with rotary engines, opening up new opportunities in markets currently dominated by piston engines.

CREEV exploits two innovations: The first of these improves combustion efficiency & reduces emissions. This provides higher power density, improves fuel consumption and reduces noise. The second innovation delivers effective engine cooling which reduces temperature gradients within the engine. This results in reduced rotor tip wear, improving reliability and efficiency. When fully commercialised, CREEV will deliver compact, lightweight and efficient/clean engine technology with no requirement for oil filters or a sump. This reduces weight further and simplifies maintenance. Much interest has been shown in the technology and testing has already demonstrated very promising improvements in power, efficiency and noise reduction.

There is significant potential for CREEV, not least in the automotive sector, which has been evolving rapidly in recent years, driven by interest in electric vehicles (EVs) with very low emissions. Road transport contributes about one-fifth of the EU's total CO2 emissions, so greater adoption of EVs is a key part in supporting CO2 emissions within this sector. However, range anxiety remains a key barrier to mass-uptake of such vehicles and it has been reported that although 44% of drivers consider emissions to be important when selecting a car, only 5% would actually buy an EV due to range concerns. Better methods for extending range between charging stations are therefore needed to allow the EV market to reach full potential. Range extenders have been developed to address these concerns, but these are based on piston engines. Ideally, an EV requires a small, quiet and high power/weight ratio range extender that occupies less space. CREEV addresses this market need.

The main project objective is therefore to successfully scale up CREEV and further optimise performance. In addition to identified potential in automotive markets, this technology also has exciting potential in applications associated with aeronautical and marine markets.

**STRIA Roadmaps:**

- **Transport**
- **Transport mode:** Road transport
- **Transport sectors:** Passenger transport, Freight transport
- **Transport policies:** Environmental/Emissions aspects
- **Geo-spatial type:** Other