Innovate UK

The Low Carbon Vehicles Innovation Platform

Impact Review 2015

The Low Carbon Vehicles Innovation Platform

Working with the UK's automotive sector to develop new technologies to increase energy efficiency, reduce emissions and optimise vehicle use.

UK businesses are well placed to take advantage of the growing global demand for low-emission and energy efficient vehicles. In 2014, one in four electric vehicles bought in Europe was built in the UK, yet these new technologies take time and money to develop.

The Low Carbon Vehicles Innovation Platform (LCV IP) has 3 main goals:

- to contribute to the growth of the UK automotive sector
- to increase and accelerate the introduction of vehicle-centric technologies to the LCV market
- to help the UK reduce CO_2 and other emissions caused by road transport

In 2014-15 we invested over £45 million in transport. Through the LCV IP we're able to provide consistent and long-term support to the sector, working with an industry-led advisory panel to help shape the technological direction and priorities for the programme.

Organisations that have co-invested with Innovate UK and continue to provide support to the LCV IP are the Office for Low Emission Vehicles (OLEV), the Department for Business, Innovation and Skills (BIS) and the Engineering and Physical Sciences Research Council (EPSRC).

Department for Business Innovation & Skills

Office for Low Emission Vehicles

EPSRC Engineering and Physical Sciences Research Council

About this impact review

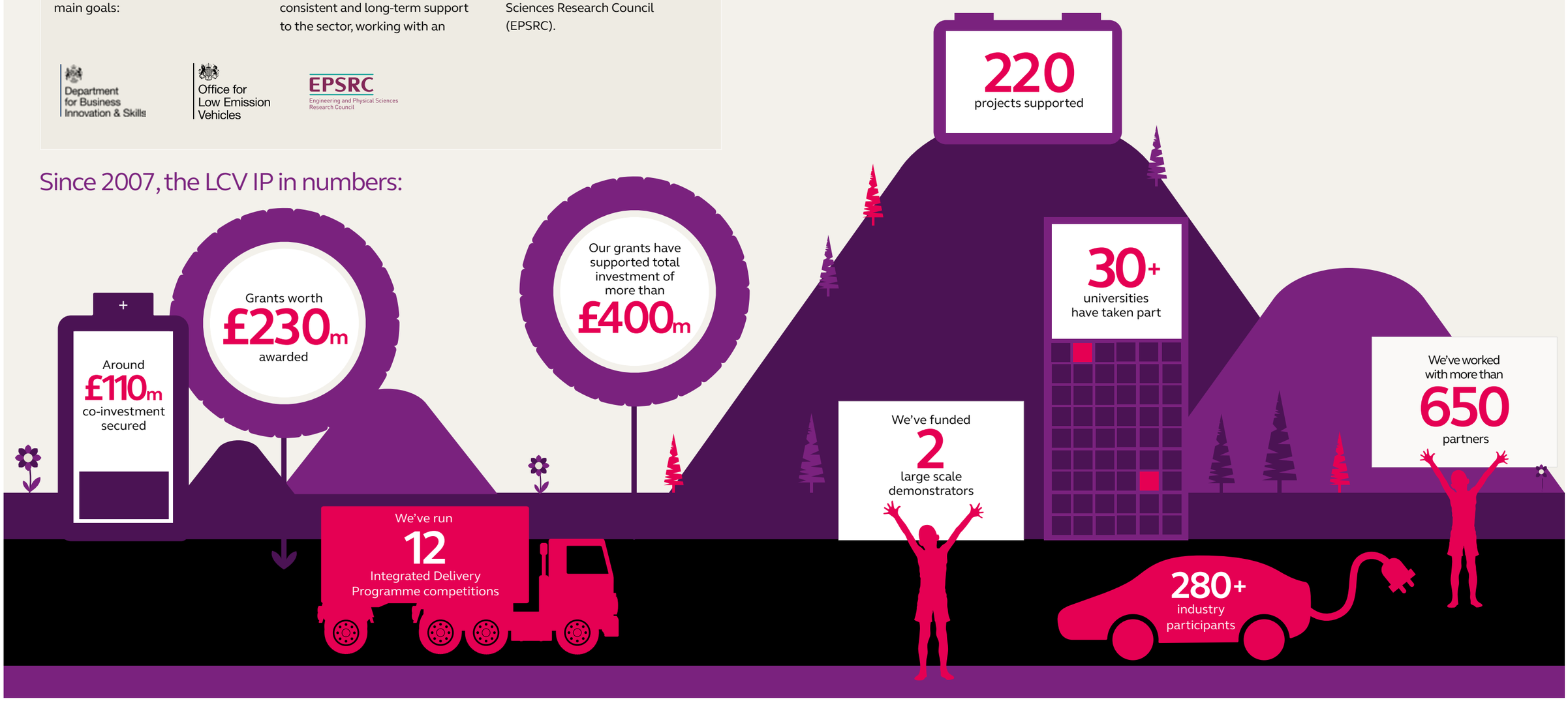
In order to fully understand the actual and anticipated impact of our investments so far we have focused this review on the 77 LCV projects that were completed as of 1 July 2014. These projects represent £79 million of funding from Innovate UK and our partners. We invited 285 participants from industry and higher education to complete 2 separate questionnaires and around 60% took part - representing 85% of the funds awarded.

We collected responses over a 6 month period in late 2014 and early 2015. The data was analysed by Innovate UK's Economics and Evidence team in line with Government best practice on impact appraisal, in particular HM Treasury's Green Book. Although this was not a full evaluation with a control group, we have used the best evidence available to control for deadweight, displacement, and leakages. All the statistics reflected in this report are based on the responses received in the survey. All responses were provided as commercial in confidence.

In the future, as more of our low carbon vehicle projects complete and move towards commercialisation, we aim to repeat this study and update this impact review.

Innovate UK is committed to robust economic evaluation of all its activities and is currently implementing a comprehensive evaluation plan. Completed evaluations will be published by Innovate UK upon completion.

Since 2007, the LCV IP in numbers:



Achieving return on investment

We used projected sales and turnover results from industry participants to calculate the potential return on investment (ROI) from the research and development grants awarded. The higher figure for each time period includes a multiplier to account for the expected increase in economic activity around the businesses receiving grant funding. A number of participants told us they were unable to provide accurate sales data so this lowered the amount of grant used in the analysis to £41 million. However, participants that responded to say that no future sales would arise from the project were included.

Based on 15 years of sales turnover forecasts supplied by industry participants, after adjustments for deadweight, displacement and leakage, the estimated ROI for every £1 invested by Innovate UK is £8 in the medium term and £20 in the longer term. When the supply chain effects multiplier is used, these figures rise to £14 and £34.

We asked participants to provide data over a maximum 15 year horizon as we know that it takes time to develop these types of technologies and exploit them. We also recognise that longer term benefits can be more difficult to predict so we have analysed the numbers over varying time periods, for example, if sales continue for 12 years rather than 15, the ROI would be £13 for every £1 invested. When the supply chain spill over effects multiplier is used, this figure rises to £22.

Forecast returns on UK investment

This £41m of support is forecast to add...

SUCCESS STORY:Flybrid Automotive

Being a member of a winning Renault Formula 1 team taught Doug Cross a lot about extracting maximum return from investment. But when the sport 'froze' engine development at the end of 2006, he and Renault F1's technical director for engines, Jon Hilton, set up their own venture, Flybrid Systems, to exploit the potential of kinetic energy recovery systems (KERS), especially in fuel-saving applications.

There are now more than 70 staff working on bringing Flybrid KERS and other LCV technologies to market.

The Flybrid technology comprises a flywheel connected to the wheels by a compact clutched flywheel transmission. Bus journeys, with regular stops and starts, are particularly suited to storing and releasing kinetic energy, which would otherwise be dissipated as heat – and wasted.

Patents protect several key inventions that allow a very much smaller and lighter flywheel to spin at more than 60,000rpm.

Jaguar Land Rover led the first Innovate UK-funded project in 2008 involving Flybrid as a partner. The total project cost was £3.3 million, and Flybrid was awarded £73,000 towards their £101,000 costs. Doug has no doubt of the benefit of this kind of collaborative R&D support, adding:

"A number of Innovate UK programmes have been tremendously supportive to the business at different stages, especially in de-risking the technology development."

A 2-year collaborative R&D project, begun in 2012 under Innovate UK's Low Carbon Vehicles Programme, involved Flybrid with Wrightbus, Arriva Bus & Coach, Voith Turbo and Productiv. It targeted a 15% reduction in fuel consumption in a production-ready flywheel hybrid midibus and Flybrid received £73,000 of the total funding of £700,000.

In January 2014, when the 2 co-founders completed a takeover deal with Torotrak Group, the business employed 22 staff and was valued at £26 million.

Find details of current LCV funding opportunities and apply online https://interact.innovateuk.org

Creating sales and economic growth

Innovate UK's mission is to accelerate UK economic growth - it's point 1 of our new 5 point strategic plan.

We asked survey participants to outline their ambitions and expectations for future sales growth now that their projects are complete. Reflecting the risky and uncertain nature of R&D, the responses varied between projects and partners, with many technologies still a number of years away from full commercial exploitation.

Following government guidelines, the annual sales forecasts supplied by industry participants were converted into Net Present Value estimates over the short, medium and longer term periods. The projects each had an average duration of 3 years and so the impacts were estimated after this period adjusting for deadweight, displacement, leakage and supply chain multipliers.

Total annual sales increase forecast over:

5 yrs	10 yrs	15 yrs
£0.5bn	£1.7bn	£2.9bn

SUCCESS STORY: Bladon Jets

Coventry-based Bladon Jets is about to start manufacturing thousands of innovative micro-gas turbine generators destined to power mobile phone masts in developing parts of the world.

The business has seen rapid growth over the last 4 years after working with Jaguar Land Rover on 2 Innovate UK-funded projects to develop its turbine as a range extender for hybrid electric cars.

While work continues to develop the turbine for use in hybrid electric vehicles in the long term, the research identified a more immediate market for the turbine in powering mobile phone masts in areas with poor grid support.

Manufacturing director Philip Lelliott said:

"Today, you see thousands of gas turbine engines produced at a cost of millions of pounds. Our vision is to turn that on its head and produce millions of gas turbine engines at a cost of thousands of pounds."

Bladon Jets is now talking to one of the world's leading mobile phone companies about supplying micro turbine generators as a power unit for mobile phone masts.

The power units will go into early-stage manufacture at The Proving Factory next year and thousands will be supplied to power phone masts in the developing world.

Philip said:

"The award of Innovate UK funding was a game changer for the business. We have been able to leverage the Innovate UK funding by a factor of at least 10 times."

"Our business plan sees us growing dramatically. We have plans to generate hundreds of millions of pounds of business and to employ a significant number of people directly and in the UK supply chain."

Bladon Jets employed 10 when it moved into its headquarters in Coventry in 2011 and has since grown rapidly to employ 55. Next year, it expects to create a further 250 jobs directly and in the supply chain.

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Increasing and protecting jobs

The survey also included questions on the expected number of jobs that would be created and safeguarded as a direct result of LCV projects and our forecasts are based on the data provided by survey participants.

We have adjusted the employment estimates to take account of deadweight, displacement and leakage and the results show that, in the medium term, around 5,000 jobs will be created and safeguarded and in the longer term nearly 12,000 jobs. Including a multiplier of 1.7 to adjust for supply chain job creation increases this estimate to around 20,000 jobs.

Our forecast for jobs created and protected

SUCCESS STORY: Oxis

When OXIS Energy first won funding from Innovate UK to develop a ground-breaking rechargeable battery cell their staff numbers were barely into double figures. Six years later, numbers have risen to nearly 60.

The marketplace is now waking up to OXIS and its novel lithium-sulfur (Li-S) technology.

Innovate UK is currently investing £850,000 in helping the company develop a Revolutionary Electric Vehicle Battery (REVB).

Not only are European car manufacturers showing interest but there are clear cross-overs into other markets such as aerospace, defence, energy storage and marine vessels.

A major advantage is that OXIS's Li-S cells have been proven in penetration, overcharging and short-circuit performance tests to be safer than the more volatile lithium-ion technology that has dominated the market for 2 decades or more.

It is one of the main reasons OXIS was chosen to provide batteries for the GATEway driverless vehicle project in Greenwich.

The OXIS battery cell is also not only lighter and more efficient, it is cheaper to produce and has less environmental impact because the active materials do not include rare earth metals.

Chief executive Huw Hampson-Jones said:

"That pioneering work is a direct result of Innovate UK funding."

He points to consistent year-on-year growth in revenues since 2010 and predicts the same for the next 5 years, adding: "By then I believe we will be a highly respected company with tens of millions of pounds of turnover in the UK."

Recently, the company raised a further £7 million from private British investors who believe in the technology. The investments will see a further increase in employment levels as OXIS moves into mass-production of battery cells.

Huw said: "Five years from now, we will be producing cells in their millions."

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Attracting private finance and capital investment

Innovate UK investment helps innovators and businesses to develop their technologies and ideas, particularly from TRL 3 to TRL 6 (Technology Readiness Levels), but it takes a lot more investment to then move the technology towards full commercialisation. Understanding how Innovate UK funding helps unlock further investment is a key part of understanding how it helps businesses on the journey from prototype to vehicle deployment.

Survey participants reported they had secured private finance worth £424 million to support further development once their initial LCV project had been completed - more than 5 times the initial grant investment made by Innovate UK and its partners. This extra funding, leveraged after Innovate UK support, is helping the businesses to take that major step towards commercial application. It includes venture capital funding raised by SMEs, bank finance and, in the case of the larger companies involved, their own investment.

LCV IP projects surveyed have attracted an extra **£424m** private investment

Private investment is more than **5X** the initial grant

£519m Capital investment has been made after project completion

SUCCESS STORY: Magnomatics

A gearbox without gears is about as innovative as it gets, especially when there is no physical contact between the moving parts.

But that is what Magnomatics is offering its customers, along with significant fuel savings when applied to road or rail transport systems, oil and gas installations, aerospace, marine and renewable energy technologies.

It has certainly helped that vehicle manufacturers are now more willing to embrace the notion of hybrid drive systems for vehicles and especially something as innovative as Magsplit, a contactless, very high efficiency, power transmission device.

Magsplit acts as a magnetic coupling within a hybrid powertrain, sitting in exactly the same place as a gearbox. As a continuously variable transmission it offers a very wide range of gear ratios. It means the engine can operate at peak efficiency.

Ford Motor Company was a partner in a 2-year collaborative R&D project that ended in 2014. There is now the very real prospect of Magsplit going into low-rate production in one of its target markets of marine, rail, wind turbines or automotive.

According to David Latimer, chief executive, the key benefits in gaining support from Innovate UK went beyond subsidising the investment risk:

"The opportunity to collaborate at close technical level with major OEMs has made us the company we are today. The support from Innovate UK was important in turning mere interest into 'Yes, we want to work with you'."

The company originated as a spin-out from Sheffield University in 2006. Backed by £4.5 million venture capital investment and with support from Innovate UK through the LCV IP, it has expanded to 28 staff.

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GLOSSARY

Deadweight - expenditure to promote a desired activity that would have occurred without the expenditure

Displacement - the degree to which an increase in productive capacity promoted by government policy is offset by reductions in productive capacity elsewhere

Leakage - the proportion of outputs that benefit those outside of the intervention's target area (leaking abroad) or group

Multiplier effects - further economic activity (jobs, expenditure or income) associated with additional local income or local supplier purchases

Technology Readiness Levels - a tool to manage the progress of research and development activity within an organisation - www.apcuk.co.uk/wp-content/uploads/2014/09/Automotive-Technology-and-Manufacturing-Readiness-Levels.pdf

Images: cover image, a Bladon Jets micro-gas turbine generators component. Pages 4-5, technical director and Flybrid Automotive co-founder Doug Cross. Pages 6-7, quality technician Jordan Clarke (main image) and manufacturing director Philip Lelliott (inset image). Pages 8-9, chief executive Huw Hampson-Jones (main image) and chief technology officer David Ainsworth (inset image). Pages 10-11, engineer Rob Frost (main image) and chief executive David Latimer (inset image).

The Low Carbon Vehicles Innovation Platform is part of the transport team at Innovate UK. If you'd like to know more about this study or the LCV IP in general, contact a member of the team via email support@innovateuk.gov.uk or call 0300 321 4357.

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Innovate UK is the UK's innovation agency. Innovate UK works with people, companies and partner organisations to find and drive the science and technology innovations that will grow the UK economy - delivering productivity, new jobs and exports. Our aim at Innovate UK is to keep the UK globally competitive in the race for future prosperity.

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