

LMT monitoring report: progress and insights from the Net Zero Propulsion Programme



UK Research & Innovation
Our ref: 245-747-02

LMT monitoring report: progress and insights from the Net Zero Propulsion Programme

Prepared by:

Steer Economic Development
14-21 Rushworth Street
London, SE1 0RB

+44 20 7910 5000

www.steer-ed.com

Prepared for:

UK Research & Innovation
Polaris House,
North Star Avenue,
Swindon, SN2 1FL,
UK

Our ref: 245-747-02

Contents

	List of acronyms and abbreviations	6
	Executive Summary	7
	Overview of delivery	7
	Key findings	7
	Technology development and commercialisation	7
	Partnerships and organisational development	8
	Barriers and enablers	8
	Early and potential long-term outcomes	8
	Next steps for the programme	8
	Recommendations for future evaluation	9
	Overall conclusions	9
1	Introduction & methodology	10
	Introducing the LMT portfolio	10
	The LMT portfolio monitoring framework and logic model	11
	Sources of evidence utilised	14
	Methodological limitations	15
2	Overview of NZP delivery	17
	Introduction	17
	Introducing the programme	17
	Insights from project delivery	18
	Conclusion	21
3	Building and strengthening partnerships through programme delivery	22
	Introduction	22
	Exploring the role of programmes in partnership development	23
	Types of partnerships formed, and how they have been used	24
	Beneficiary perspectives on the benefits of partnerships	25
	Conclusion	27
4	Development, commercialisation and deployment of new technologies	28
	Introduction	28
	Reported TRL progression across projects, and mechanisms driving this	28
	Intellectual property and information dissemination	29
	Commercial progress made by organisations	31
	Barriers and enablers to technological and commercial development	34
	Conclusion	36
5	Growing skills and organisational maturity through programme delivery	37
	Introduction	37
	How projects have contributed to skills development amongst partner organisations	37
	How projects have contributed to growth in organisational maturity amongst partner organisations	38

	The role of programmes in creating and safeguarding jobs	39
	Conclusion	40
6	Impacts on wider framework conditions and long-term outcomes	41
	Introduction	41
	The role of projects in driving adoption of new technologies	41
	The role of projects in shaping the regulatory environment	42
	Long-term outcomes	43
	Conclusion	44
7	Conclusion & Next Steps	45
	Summary of monitoring findings	45
	Next steps for the programme	46
	Recommendations for future evaluation	47

Figures

Figure 1-1: Delivery timelines for the programmes and evaluation	12
Figure 1-2: LMT portfolio high-level logic model	13
Figure 1-3: Sources of evidence utilised within the monitoring approach	14
Figure 2-1: MSP reports of project scope (n=14)	19
Figure 3-1: Number of new collaborations reported as a result of the IUK support in the past 12 months (n=39)	23
Figure 3-2: Change in partnerships in the previous year (n=13)	25
Figure 4-1: Number of beneficiaries which anticipate holding new patents as a result of the project in 3 years' time (n=12)	30
Figure 4-2: Number of media references to projects by LMT programme	31
Figure 4-3: Number of beneficiaries reporting that their project had featured in different news reports or publications (n=13)	31
Figure 4-4: MSP reports for project exploitation (n=14)	32
Figure 4-5: Perceptions of how beneficiary market positions had improved as a result of the project (n=12)	33
Figure 4-6: Beneficiary reports of when new products, services or processes will be launched as a result of the project (n=29)	34
Figure 5-1: Self-reported impact of the NZP project on organisation skill (n=13)	38
Figure 5-2: Number of additional FTE anticipated to be at organisations in five years' time due to the project (n=39)	40

Tables

Table A-1: Funding/ investment round	50
Table A-2: Beneficiary survey response rates and overall number of responses	52
Table A-3: Beneficiary and Wider Stakeholder Interviews	53

Appendices

A Sources of evidence utilised

B Case Study: Compact battery propulsion for inclusive regional trains

C Case Study: Higher performance modular dual motor propulsion system

D Case Study: Paradigm Shift

List of acronyms and abbreviations

Acronym	Meaning
B-DAS	Battery Driver Advisory System
CAA	Civil Aviation Authority
CCAM	Commercialising Connected and Autonomous Mobility
CO ₂	Carbon Dioxide
CR&D	Collaborative Research and Development
DfT	Department for Transport
DNV	Det Norske Veritas
EV	Electric Vehicle
FOAK	Rail First of a Kind
FTE	Full Time Equivalent
IAAPS	Institute of Advanced Automotive Propulsion Systems
IMS	Impact Management System
IP	Intellectual Property
IUK	Innovate UK
LFP	Lithium Iron Phosphate
LMT	Land and Maritime Transport
MSP	Monitoring Service Provider
NOX	Nitric Oxide and Nitrogen Dioxide
NZP	Net Zero Propulsion
OEM	Original Equipment Manufacturer
QMS	Quarterly Monitoring Scores
R&D	Research and Development
RSSB	Rail Safety and Standards Board
SME	Small and Medium Sized Enterprises
TDD	Transport Decarbonisation Demonstrator
TRL	Technology Readiness Level
TVH	Tees Valley Hydrogen
UAV	Unmanned Aerial Vehicle
UKRI	UK Research & Innovation
ZEHID	Zero Emission Heavy Goods Vehicle and Infrastructure Demonstrator

Executive Summary

Overall findings demonstrate that the Net Zero Propulsion (NZIP) programme has had a positive impact in progressing the technological development and adoption processes for multi-modal net zero propulsion solutions.

Overview of delivery

The NZP programme backed 14 collaborative research and development (R&D) projects across rail, maritime, aviation and on-road applications. Its purpose was to integrate propulsion subsystems, prove them on testbeds and benches, generate safety evidence for regulators, and chart credible paths to first deployments. The portfolio involved 42 project partners made up of 39 unique organisations, with a total of £8.6 million in funding. Consortia were typically SME-led with universities, operators and OEMs in support. Projects started between April and December 2023 and have now closed. The average project length was around 18 months.

Key findings

Technology development and commercialisation

Monitoring data shows 10 of 14 projects met planned timetables, with delays concentrated where teams depended on third-party assets or specialist components. Interviews corroborate this picture. Where test facilities and sites were available, teams met core technical milestones. Where access slipped, objectives were partially achieved.

All survey responses reported an increase in Technology Readiness Levels (TRL) since application, with the largest reported step being two TRL levels. Knowledge creation was visible in design packs, safety evidence and prototype results. A minority of teams filed or prepared patent applications during or shortly after the grant, and several expect to file in the next three years. Dissemination was strongest through technical documentation and partner channels. Wider media presence was limited, reflecting the early stage and safety-critical nature of much of the work.

Commercial signals were clearest where credible test results met a defined buyer need. Monitoring reports indicate most projects made good progress toward exploitation (12 out of 14 projects were scored as either “good” or “exceeding expectations” for project exploitation). Survey returns show most beneficiaries perceived an improved market position (nine of 13 survey responses reported the project has improved their market position either “somewhat” or “very much”) and expect their NZP work to lead to new products or services within the next ten years (26 of 29 IMS survey responses), with many anticipating launches within two years (12 of 29 IMS survey responses). Few reported products already in the UK market, which is consistent with current TRLs and the need for certification and infrastructure in several modes.

Three case study examples illustrate the scope of the programme. Hitachi Rail (Appendix B) used NZP support to design a compact battery enclosure and cooling system for low-floor regional trains and to build a strong safety evidence base through modelling and large-scale fire testing. That evidence fed into industry discussions and underpinned a tri-mode fleet contract. Talos (HiPERMod) converted a dual-flux motor concept into a rideable motorcycle demonstrator, filed patents and secured about £1.8 million of follow-on finance, opening conversations with original equipment manufacturers (OEM) (Appendix C). Zeroshift transmission used NZP to help develop a two-speed gearbox for

use on an electric motorcycle. The project enabled testing of the technology at the University of Bath and securing of intellectual property (Appendix D).

Partnerships and organisational development

Partnerships were purposeful and delivery focused. Most consortia grew from existing networks, then added an operator or fabricator as designs matured. Early operator input sharpened performance targets and safety requirements. Fabricator involvement helped translate drawings into buildable parts and clarified unit costs and catalogue routes. Formal brokerage offers were less widely used, but light-touch convening by intermediaries helped several teams find the right mix of collaborators. Overall, participants described clear roles, regular technical checkpoints and supportive monitoring that gave space to deliver.

Projects contributed meaningfully to organisational capability, with 12 of 13 survey respondents reporting the project had either a “great amount” or “fair deal” of positive impact on organisational skill levels. Teams reported gains in systems integration, controls, certification know-how and delivery discipline. Small and medium sized enterprises (SME) highlighted the value of building hardware-in-the-loop testing practice and more systematic evidence gathering. Survey responses point to notable skills uplift, alongside selective job creation and safeguarded roles. IMS returns indicate additional full-time equivalents (FTE) expected over the next five years for many participants.

Barriers and enablers

Barriers were mainly practical. They included access to suitable test assets and sites, long lead times for specialist components, the cost and limited availability of green hydrogen and related components and constrained domestic capacity for some large-scale safety tests. SMEs also reported cash-flow pressure from quarterly claims and the administrative effort of evidence gathering. SMEs reported that these challenges emerged due to both claims being paid quarterly and being paid in arrears leading to SMEs drawing down their available funds every quarter and having to carefully manage their funds before they can collect the next grant payment. Enablers included early involvement of operators and fabricators, access to appropriate test facilities, proportionate and hands-on monitoring, and early engagement with regulators and standards bodies.

Early and potential long-term outcomes

Early outcomes achieved by the programme include demonstrations of the technology, improved market positions of beneficiaries (including increased engagement with potential customers and end users) and strengthened engagement with regulators to help develop certification pathways and the future regulatory framework for new technologies.

Project beneficiaries reported potential long-term outcomes of the programme include decarbonisation and improved air quality, improved safety and reliability of propulsion technology, improved operational performance of vehicles and increased access to export markets.

Next steps for the programme

There is no confirmed successor NZP competition at this point. If further support is commissioned, it should focus on converting proven prototypes into certified, purchasable products and on removing delivery bottlenecks through targeted brokerage, access to facilities and clear expectations on design-for-manufacture.

Recommendations for future evaluation

Finally, many material impacts will emerge after project close. Future evaluation should track outcomes 12 to 36 months post-completion, covering certification progress, operational pilots, catalogue or framework listings, commercial contracts and exports, verified emissions reductions, jobs and safeguarded roles, follow-on finance and IP.

Overall conclusions

The programme has delivered significant technological progress, stronger partnerships and early commercial signals. To convert this into deployments, practical gaps now need attention. Helpful actions would include easier access to domestic test and certification pathways, continued emphasis on early operator and fabricator involvement, and SME-friendly delivery mechanics that ease cash flow during build and test. With these elements in place, the NZP cohort is well positioned to turn technical advances into real-world decarbonisation, safety and supply chain benefits.

1 Introduction & methodology

Introducing the LMT portfolio

- 1.1 The LMT portfolio comprises seven grant-funding programmes spanning a range of technologies, transport modes (including rail, road and maritime), and objectives. The seven programmes which make up the LMT portfolio are: the Zero Emission Heavy Goods Vehicle and Infrastructure Demonstrator (ZEHID); the Maritime Decarbonisation programme; the Commercialising Connected and Autonomous Mobility (CCAM) programme; the Tees Valley Hydrogen (TVH) Transport Hub programme; the Rail First of a Kind (FOAK) programme; the Net Zero Propulsion (NZP) programme; and the Transport Decarbonisation Demonstrator (TDD).
- 1.2 The seven programmes vary in objectives, size, complexity and duration. Constituent projects can range from single applicant six-month feasibility studies costing around £25k to deliver, to four-year multi-partner collaborative research and development (R&D) projects which can cost millions of pounds.

Purpose of this report

- 1.3 Steer-ED and Technopolis were commissioned by IUK, in partnership with the Department for Transport (DfT) to conduct a monitoring commission on behalf of the LMT portfolio and the constituent seven programmes (note: the maritime decarbonisation programme research has been delayed to 2026 due to concurrent research). This report is one of six LMT programme reports focussing on the NZP programme presenting final findings, synthesised from across a range of evidence sources, described below. The delivery timelines for the individual programmes and the evaluation/monitoring process are presented in Figure 1-1.

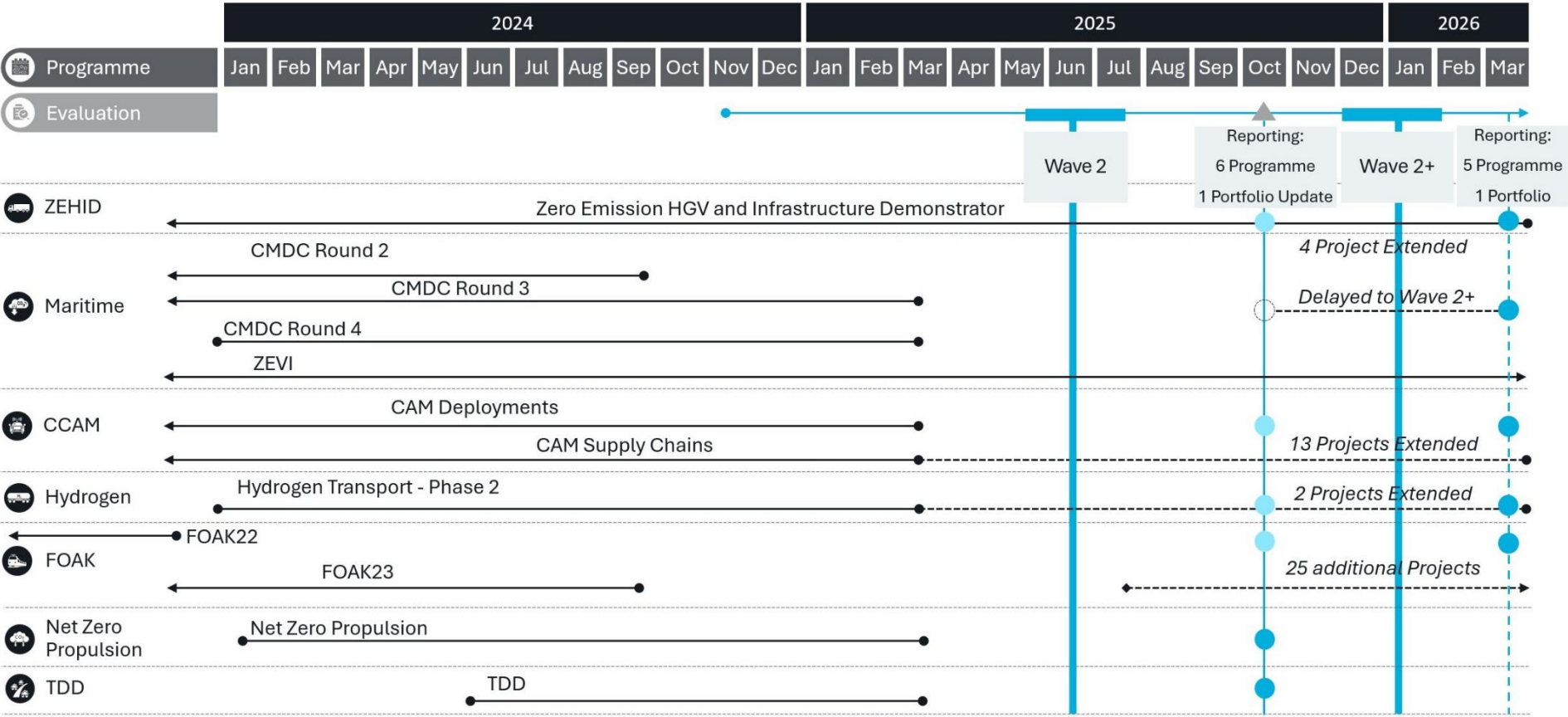
Introducing the NZP Programme

- 1.4 The NZP programme supports collaborative R&D that advances zero-emission propulsion across rail, maritime, aviation and on-road applications. Unlike other LMT programmes, the funding for the NZP programme came from IUK rather than DfT. Funding has been delivered through a collaborative R&D competition format. Grants are awarded to UK businesses working with universities, test centres, OEMs and operators. Awards cover eligible R&D costs under Innovate UK (IUK) rules, with industry match funding required. The competition ran during 2023 and 2024, with the majority of projects starting between April and December 2023 and completing by March 2025. Some early projects reached completion in mid to late 2024, while others continued through Q1 2025.

The LMT portfolio monitoring framework and logic model

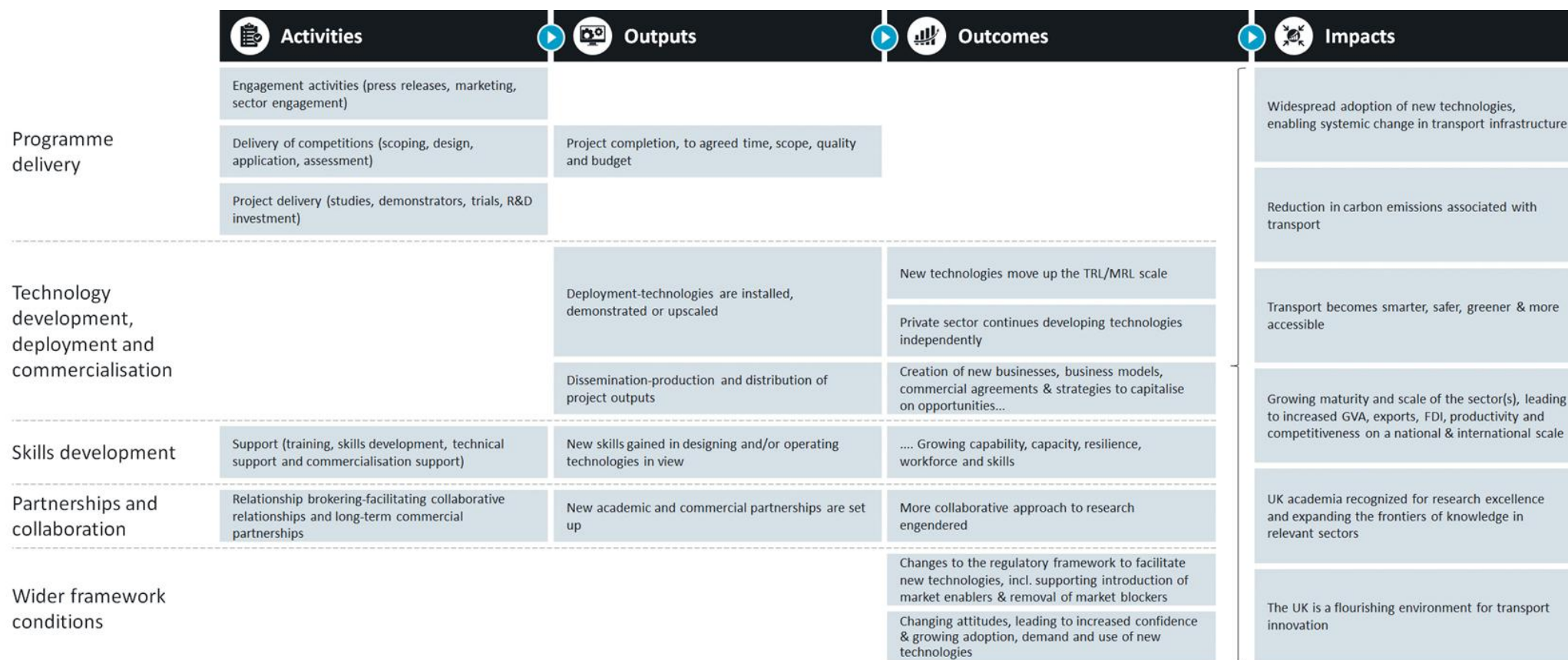
- 1.5 This programme level report (and the wider LMT monitoring framework) is structured around the portfolio logic model, presented in Figure 1-2. This shows the causal relationships between activities conducted and how those are expected to lead to long-term programme impacts, via outputs and outcomes. The logic model is divided into five themes, reflecting five key underlying mechanisms: programme delivery; technology development, deployment and commercialisation; skills development; partnerships and collaboration; and wider framework conditions. Each of the subsequent chapters of this report is titled after one of these five themes, providing a structured exploration of the causal mechanisms.

Figure 1-1: Delivery timelines for the programmes and evaluation



Source: Steer-ED, 2025

Figure 1-2: LMT portfolio high-level logic model

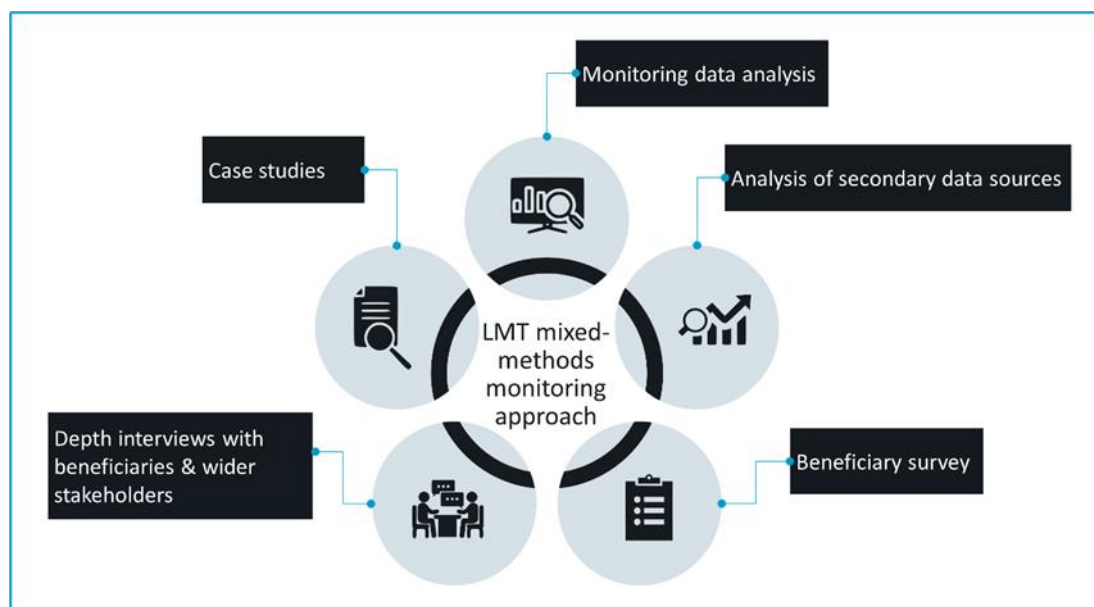


Source: Steer-ED and Technopolis, 2024

Sources of evidence utilised

- 1.6 Figure 1-3 below sets out the five types of evidence collection utilised for this monitoring commission. These evidence strands were selected in order to provide a broad and deep understanding of the portfolio, triangulating across a range of qualitative and quantitative research methods, and gathering inputs from a range of different perspectives.

Figure 1-3: Sources of evidence utilised within the monitoring approach



Source; Steer-ED, 2024

- 1.7 A detailed description of the scope and coverage of methods deployed across the portfolio is presented in Appendix A and is briefly summarised below for the NZP programme:
- **Monitoring data analysis** – spanning three data sources: applicant information data, Quarterly Monitoring Scores (QMS)¹, Monitoring reports and the Impact Management System (IMS).
 - **Analysis of secondary data** – including: Crunchbase to further explore whether businesses participating in LMT programmes are attracting external investment; Meltwater, a media monitoring platform to assess the public dissemination of LMT projects in the period from 12 August 2024 to 12 August 2025; and Dimensions, a research database that provides patent and publication data².
 - **Beneficiary survey** - An online survey of beneficiaries was developed and distributed across all programmes within scope of this report, amounting to 220 recipients across the portfolio. The survey had a range of multiple choice and free text questions. Both project leads and partners were invited to complete the survey,

¹ QMS scores are provided by Monitoring Service Providers as part of Quarterly Review Meetings (QRM) with each project.

² This data was based on metadata [as of 01/09/2025 for Wave 2] from Digital Science's Dimensions platform, available at <https://ukri.dimensions.ai/>. Access was granted under licence agreement with UKRI.

meaning that multiple responses could be captured from each project. Unique surveys were created for each programme and whether a beneficiary had responded in the previous wave. The survey was open for a period of approximately six weeks during July and September 2025. For the NZP programme, 13 responses were received from a total of 39 beneficiaries, representing a 33% response rate (compared to 66% response for the portfolio as a whole)³. Survey respondents covered nine of 14 projects. Of the survey respondents, six had responded during the wave 1 survey, while seven were answering the survey for the first time. It is important to highlight that the survey respondents in this wave differed from those in Wave 1. As such, while the findings offer valuable insights, they represent a cross-section comparison rather than a longitudinal comparison across waves.

- **Depth interviews** – comprised one-hour depth interviews conducted with programme beneficiaries and a selection of wider stakeholders (knowledgeable industry stakeholders from both commercial and academic institutions) during August and September 2025. The number of interviews undertaken varied by programme, in accordance with the number of stakeholders involved in the programme. For the NZP programme a total of eight beneficiaries and four wider stakeholders were interviewed.
- **Case studies** – three case studies have been undertaken for this programme (a total of 16 across the portfolio). For the NZP programme, the case studies selected were: Compact battery propulsion for inclusive regional trains; Higher performance modular dual motor propulsion system; and Paradigm shift. Findings from these case studies are integrated across this report and are presented as vignettes with separate full write-ups presented within the annex. All case studies have been reviewed by the programme's independent panel of subject-matter experts, selected for their expertise in relation to the programme or technology in question.

Methodological limitations

1.8 The key methodological limitations are as follows, which should be considered against the findings within this report:

- **Many technologies are still at the early stages of development**, meaning long-term impacts have not yet occurred. Many impacts are unlikely to emerge until several years after projects have completed. This is particularly the case for innovation funding, where numerous steps occur between initial project funding and measurable market outcomes. The findings gathered at this early stage (even if projects have closed) should therefore be considered indicative of a longer-term trajectory rather than conclusive.
- **Dependency on self-reporting:** although multiple sources of evidence have been examined, including consultation with wider stakeholders and industry experts, there is nonetheless an emphasis on understanding impacts via discussion with – or reporting by – project beneficiaries. Beneficiaries may sometimes emphasise positive outcomes or focus less on challenges, thus resulting in findings which could overstate the true impact of the portfolio. Wherever possible, the views of wider

³ Survey response totals vary across questions because some beneficiaries did not complete every item. Throughout the report, the base number of responses is shown for each question to aid interpretation.

stakeholders and industry experts have been considered alongside beneficiary viewpoints to mitigate this risk.

- **Heterogeneity of the portfolio:** The programmes within the portfolio vary significantly in terms of scale, technology, and commercial readiness. Applying a consistent methodology across the seven programmes is therefore challenging. To address this, Steer-ED and Technopolis sought to achieve a balance between providing consistent research tools across the portfolio, while also allowing for some tailoring to reflect the differences between programmes.
- **Survey fatigue among respondents:** Repeated surveys of beneficiaries can lead to fatigue, causing lower response rates or incomplete responses and reduced data quality. This risk has been managed via briefing sessions with beneficiaries and proactive management of communications to ensure stakeholders understand the purpose of the research and benefits of participating. Across the portfolio, the beneficiary survey achieved a project response rate of 66%, which is still considered good representation.

Structure of this report

1.9 The remainder of this report is structured as follows:

- **Section 2: Overview of NZP programme delivery** outlines the current status of the NZP programme and presents the progress made.
- **Section 3: Building and strengthening partnerships through programme delivery** focuses on how the NZP programme has fostered partnerships across industry, academia, and Government.
- **Section 4: Development, commercialisation and deployment of new technologies** explores the progress made by the NZP programme in developing new technologies and progressing on the pathway to commercialisation.
- **Section 5: Growing skills and organisational maturity through programme delivery** assesses the impact of the NZP programme on enhancing skills and growing businesses and organisational capacity and capability.
- **Section 6: Impacts on wider framework conditions and long-term outcomes** discusses the potential long-term impacts of the NZP programme on broader industry and regulation.
- **Section 7: Conclusions & next steps** concludes the report.

2 Overview of NZP delivery

Introduction

Key Messages

- NZP funded 14 projects across rail, maritime, aviation and automotive, awarding £8.6m to 39 partners through 42 grants. Consortia averaged three partners per project.
- Delivery focused on subsystem design and integration, rigorous test and validation, safety and certification planning, and early route-to-market work with operators, fabricators and investors.
- 10 of 14 projects met planned timetables. Slippage was tied to access to third-party assets and operators, data or facility bottlenecks, and approvals windows, most acute in aviation.
- Beneficiaries reported clear guidance and responsive monitoring. Challenges included the effort required for claims preparation and quarterly payment cycles that strain SME cash flow.
- Key lessons were to secure test assets and permissions early, plan around certification milestones, involve fabricators and end users sooner, protect time for evaluation and dissemination, and add a bridge from collaborative research and development (CR&D) to first commercial pilots.

- 2.1 This chapter provides a detailed overview of the NZP portfolio, outlining the objectives, timelines and key features of the programme, drawing on an analysis of monitoring data plus insights from the beneficiary survey. It goes on to characterise the delivery progress across the projects and offer insights from project delivery drawn from beneficiary interviews.

Introducing the programme

- 2.2 The NZP programme funds collaborative R&D that advances zero-emission propulsion across rail, maritime, aviation and automotive applications. The emphasis is on integrating subsystems, proving them on testbeds, addressing safety and certification needs, and setting up credible paths to first deployments. Objectives include accelerating decarbonisation, strengthening UK supply chains, and shortening the time from laboratory to market.
- 2.3 The current competition ran in 2022 and 2023. Projects started from April to December 2023 and all 14 NZP projects have been closed by August 2025. Consortia typically involve an SME lead alongside universities, test centres, OEMs and operators. The 14 projects received a total grant amount of £8.6m split across 42 different grants. The

programme had 39 unique partners with an average consortium size of three partners. Grant funding provided by IUK for projects ranged from £200k to £1.14m. An average of £617k of grant funding was provided by IUK per project. The average grant funding provided by IUK to project partners was £206k.

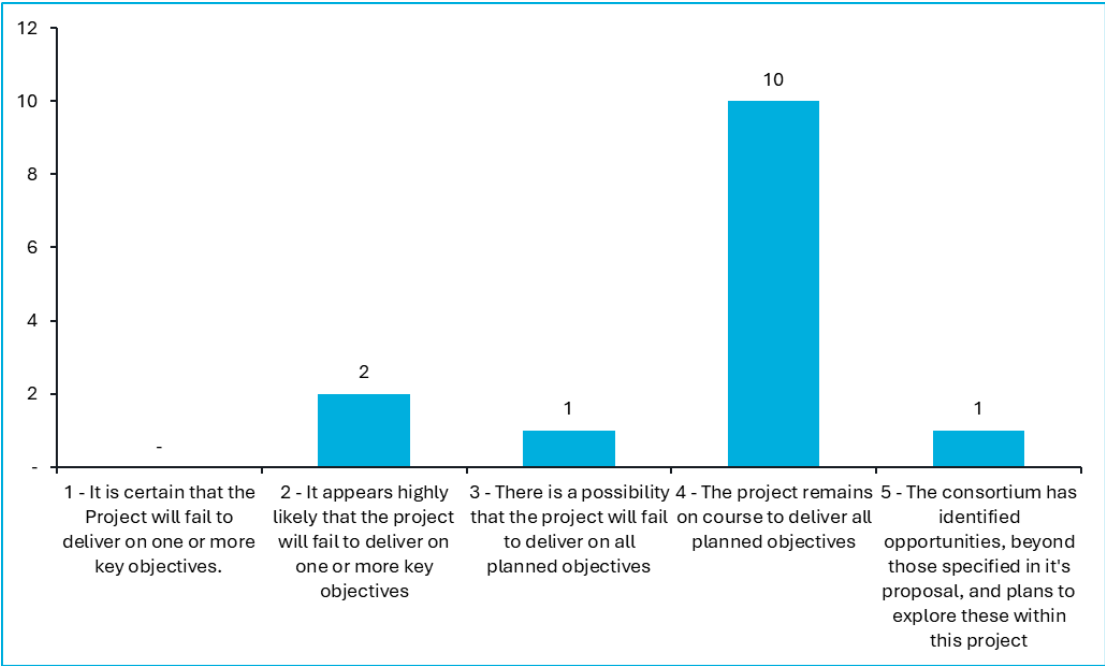
- 2.4 According to the QMS data, 10 of the 14 projects had met their planned timetable. Four of the projects had either met their milestones after the planned timetable or are yet to meet their milestones despite project closure.

Insights from project delivery

Project activities

- 2.5 Across the portfolio, projects concentrated on a mix of design, integration and evidence-gathering activities:
- **Subsystem design and integration:** Battery propulsion for low-floor regional trains, hydrogen storage and fuel management for rail, rare-earth-free traction motors, multi-speed electric drivetrains for light vehicles, and standardised control and interface products to speed fuel-cell and battery integration.
 - **Test and validation:** Hardware-in-the-loop, bench and testbed testing; ground demonstrators for hydrogen-electric powertrains and liquid hydrogen handling; feasibility and approvals work for a hydrogen crew transfer vessel conversion.
 - **Safety and certification planning:** Compliance planning with aviation and maritime authorities, and preparation of evidence for future approvals.
 - **Route-to-market groundwork:** Early operator engagement, fabricator dialogues, and investor readiness where appropriate.
- 2.6 The projects ranged in length between 304 days (approximately 10 months) to 669 days (approximately 22 months), with an average project length of 541 days (approximately 18 months). The longer project lengths reflected the time needed to design, build, test and evidence subsystem performance before moving to platform demonstrations.
- 2.7 Interviews indicate most teams achieved core technical milestones where test assets and facilities were available. This is further demonstrated through the QMS reporting of project scope, with 10 projects achieving all planned objectives at their closure as shown in Figure 2-1.

Figure 2-1: MSP reports of project scope (n=14)



Source: QMS data (IUK), Steer-ED analysis (August 2025). Question: How well has the project delivered against its objectives? (Answer: Cost Scoring Matrix, Scores 1-5)

- 2.8 Trials that depended on third parties or certification windows progressed more slowly. This was particularly a theme amongst projects delivering net zero propulsion for aircraft. A number of project partners reported that finding an airfield willing to trial the technology was difficult with key challenges reported around the regulatory framework and establishing safety procedures.

Beneficiaries’ delivery experience

- 2.9 Beneficiaries described a generally positive delivery experience with clear materials, pragmatic oversight and space to get on with the work. Monitoring Service Providers (MSPs) were seen as experienced and responsive. At the same time, smaller firms felt the mechanics of delivery could be smoother, particularly on claims, payment timing and feedback on grant applications from the independent assessors.
- 2.10 On the application process, interview panels were viewed as focused and constructive. Written feedback on unsuccessful grant applications was seen by some as lacking in detail, which made it harder to improve the quality of subsequent applications for other UKRI grant competitions.

“Get immensely frustrated with the bid process... feedback is a problem.” - NZP beneficiary

- 2.11 Day-to-day engagement with IUK worked well. Reporting was described as proportionate and increasingly evidence based. Numerous interviews reported working with IUK on previous grant projects and were therefore aware of the IUK grant management processes. First-time participants asked for more examples of good submissions, especially where work is design heavy rather than software led. The main friction point

was finance. SMEs reported that preparing claims and aligning timelines to evolving work packages took significant effort.

- 2.12 SMEs noted that claim line-by-line scrutiny can slow internal finance workflows.
- 2.13 One team described their MSP as “experienced and tough,” and appropriate, but still asked for more proportionality in claims review when overall budgets are on track. Some leads recommended partnering with a university on grant management to smooth processes and free up technical staff.
- 2.14 Cash flow came through as a recurring pressure. Quarterly claims paid in arrears strained start-ups and micro-SMEs, which make up a significant number of NZP beneficiaries. Beneficiaries reported that the pressures on cash-flow meant that managing resourcing and planning activities around their cash flow was a burden for beneficiaries. Several suggested monthly or milestone-based claims for smaller firms, or modest upfront advances to cover early build and test costs.

“Start-ups do not have much cash... a partial upfront amount would be very helpful.” - NZP beneficiary

- 2.15 One beneficiary also noted that bridging from one call to the next can take months, which risks losing momentum and can be a risk to survival for smaller SMEs that are more reliant on grant funding to continue their operations.
- 2.16 Delivery barriers were mostly practical. Teams depended on third-party assets and operators, on certification windows, and on access to data and facilities. Where those fell into place, technical milestones were met. Where they slipped, objectives were only partially achieved. This was a particularly big challenge for projects developing newer technologies such as hydrogen propulsion or electric propulsion for flight which have a less established regulatory and supply chain environment. Others highlighted the gap between R&D and a compliant route to purchase, especially where public buyers procure services rather than prototypes. Enablers included early access to sites and operators, strong intermediary support, and a hands-on but flexible monitoring approach.
- 2.17 Lessons coalesced around delivery discipline and market readiness. Teams stressed the importance of securing test assets, sites and permissions early and of planning work around certification milestones. They also urged involving fabricators and end users sooner so designs can progress into catalogues or standard specifications and protecting time for evaluation and dissemination rather than focusing only on build and test.
- 2.18 For projects that have closed, post-award activity has focused on patenting, investor engagement and developing their technology to enable the next stage of demonstrations on more commercially viable vehicles.

“The fledgling pre-commercialisation project was a massive help... helped us get one private investor and we could consolidate our IP.” - NZP beneficiary

- 2.19 Others are preparing catalogue entries with fabricators or seeking follow-on grants to move from bench results and small-scale operational trials to larger scale testing and more targeted engagement with end customers.

Conclusion

- 2.20 The NZP programme has enabled significant progress in the development of technologies and laid practical groundwork for deployment. Most projects met core milestones, produced usable evidence and clarified routes to certification. Where delivery slipped it was largely due to access to assets, facilities and approvals rather than weaknesses in the underlying concepts. Beneficiaries valued clear guidance and responsive monitoring, though smaller firms felt cash flow pressure from quarterly claims and saw limited learning from brief bid feedback.
- 2.21 To convert this progress into deployment, delivery mechanics and market bridges matter. A defined follow-on step from collaborative R&D to first pilots, smoother payment profiles for SMEs and clearer exemplars for reporting would remove common frictions. Early involvement of operators and fabricators should be standard, so designs move quickly into catalogue or standard specifications. Better access to test infrastructure and timely engagement with regulators will shorten time from testbed to route. If these conditions can be met, the NZP programme is well positioned to achieve real-world decarbonisation, safety and supply chain benefits.

3 Building and strengthening partnerships through programme delivery

Key Messages

- Most NZP partnerships built on existing networks, typically an SME–university core with an OEM or operator.
- Early operator and fabricator involvement unlocked data, sites and testbeds, helping teams turn designs into testable hardware and catalogue-ready offers.
- The programme facilitated wider partnership development, particularly across modes.
- Partnership gains were widespread:
 - 7/14 beneficiaries reported new partnerships, and 9/14 reported strengthened ones.
 - IMS returns showed 23/39 partners citing new collaborations, and 9/13 respondents reporting stronger ties.
- Where dependencies on third-party assets or approvals slowed progress, regular checkpoints, clear roles and joint replanning helped partners stay aligned and keep work moving.

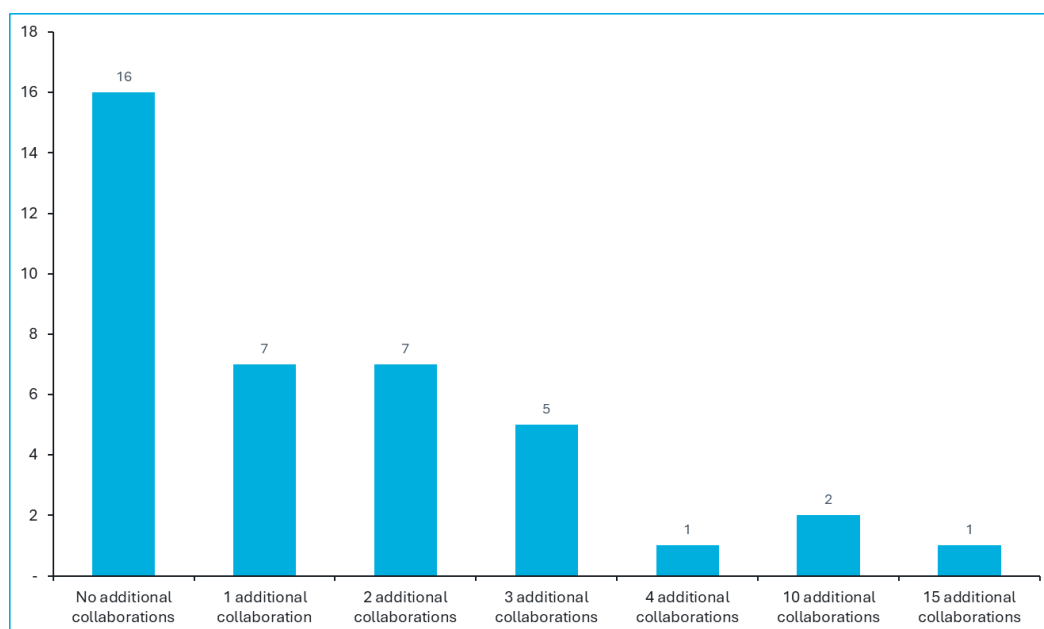
Introduction

- 3.1 A key objective of the LMT portfolio is to encourage a more collaborative approach to research through fostering new academic and commercial partnerships. As a result, NZP programme applicants were required to deliver their project in partnership with at least one other organisation. Participating organisations could include businesses, charities, academic institutions, public sector organisations and research and technology organisations.
- 3.2 This chapter sets out the role that project delivery has played in building and strengthening partnerships between industry, academia and regulators. It explores the mechanisms through which new partnerships were formed, and the NZP programme's contribution to strengthening these relationships. It goes on to describe beneficiaries' accounts of the types of partnerships formed and their anticipated (or realised) benefits.

Exploring the role of programmes in partnership development

- 3.3 Most consortia grew from existing professional networks and previous collaborations, with the grant acting as the catalyst to formalise roles and timelines. Teams often started with a core R&D pairing of an SME and a university, then added an OEM or operator to anchor real-world requirements.
- 3.4 According to the beneficiary survey, seven of 14 beneficiaries have reported that the NZP project resulted in new partnerships, while nine of the 14 responses reported that the project had strengthened existing partnerships. This is further strengthened by the IMS data, where 23 of the 39 responses reported new collaborations because of their NZP projects. As shown in Figure 3-1 the number of collaborations reported to have been formed ranged from one to 15 amongst responses to IMS survey.

Figure 3-1: Number of new collaborations reported as a result of the IUK support in the past 12 months (n=39)



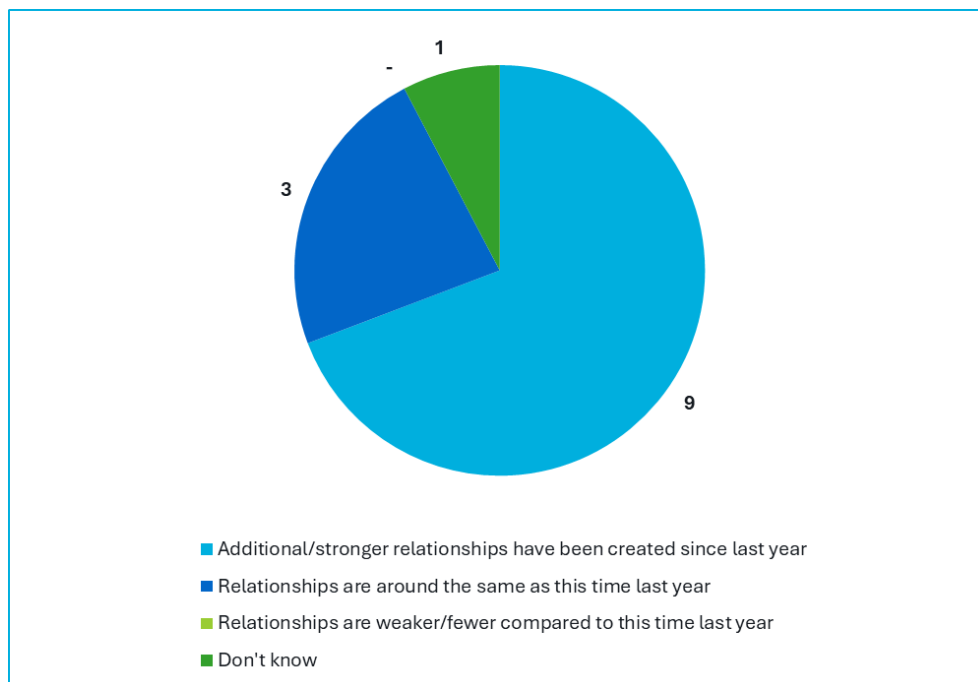
Source: IMS data (IUK), Steer-ED analysis (August 2025), Question: As a result of this IUK support, how many new collaborations have you made with external organisations in the last 12 months?

- 3.5 These partnerships models are demonstrated through the case studies:
- Hitachi Rail (Appendix B) - a major OEM worked with an engineering partner and a university to integrate battery propulsion for regional trains, which kept safety and certification needs at the centre of design and test planning.
 - HiPERMod (Appendix C) - brought a design-led SME together with powertrain specialists and control electronics partners to re-engineer an electric motorcycle system for performance and cost.
 - Paradigm Shift (Appendix D) – brought together a gearbox design firm and a motorcycle manufacturer to produce an electric two-speed gearbox which was tested at the University of Bath.

- 3.6 Intermediaries and convenors helped several partnerships take shape. Wider stakeholders described how bodies such as Cenex and the Niche Vehicle Network introduced potential collaborators, aligned expectations, and pointed teams to the next rung of support. One wider stakeholder noted that projects often worked well and maintained momentum between funding rounds when:
- 3.7 Partnerships matured through regular technical checkpoints, shared access to testbeds and facilities, and clear division of effort. Where an operator or fabricator was engaged early, design choices were easier to translate into testable hardware and later into catalogue or framework-ready offers.

Types of partnerships formed, and how they have been used

- 3.8 Partnerships brought together firms that could design and build, organisations that would eventually operate the technology, and teams that could test, validate and guide approvals. Common patterns included SME-university pairings to push core research into working prototypes, with an OEM or tier-one supplier shaping requirements and providing platforms or components. Several rail and aviation projects coupled a technology lead with a university test group and an operator so that testbed results could flow into route or aircraft use-cases. Intermediaries such as Cenex and the Niche Vehicle Network often acted as convenors, helping teams find the right mix of collaborators and plan the next step in the funding pathway. As designs matured, many consortia added fabricators or manufacturing partners to prepare catalogue-ready products and engaged with certification or classification bodies to map a route to approval.
- 3.9 The nature of the NZP programme helped facilitate the formation of partnerships. The need for NZP technologies to be integrated into powertrains and existing vehicles drove beneficiaries to find partners who could support the development of these integrated solutions for vehicle manufacturers. For example, on one project, an aircraft design firm (the lead) collaborated with a powertrain engineering firm, a developer of electric motors, a specialist in fuel cell technology and firm developing cryogenic storage. According to the beneficiary survey, nine of the 13 responses reported that additional or stronger partnerships had been created in the past year (Figure 3-2).

Figure 3-2: Change in partnerships in the previous year (n=13)

Source: Beneficiary Survey, Steer-ED analysis (August 2025), Question: (To what extent has the project contributed to creating new relationships/partnerships or strengthen existing ones?) How does this compare to the situation this time last year? (Answer options: Relationships: Additional/stronger relationships have been created since last year, Relationships are around the same as this time last year, Relationships are weaker/fewer compared to this time last year, Don't know)

- 3.10 Participants described partnerships as purposeful and grounded in delivery. Many drew on prior relationships, which shortened start-up time and built trust. Monitoring was seen as supportive without being intrusive, and partners valued clear roles, shared access to testbeds and facilities, and regular technical checkpoints. Where collaboration depended on third-party assets or certification windows the pace was uneven, but teams reported that expectations remained aligned.
- 3.11 There was little evidence of widespread leverage of specific IUK and Catapult supports services from beneficiaries. Of the 30 responses to the IMS survey, only four reported working with the IUK business connect service and/or engaging with Catapult Centre support.
- 3.12 Most consortia began with a technical nucleus and then widened to reflect real-world constraints. Operator input sharpened performance targets and operational envelopes. Fabricator discussions turned drawings into buildable parts and clarified unit costs. In several cases investor conversations followed technical progress, particularly once teams had credible test data or a visible route to certification. Where trials slipped, partners kept momentum through joint replanning and by sequencing work so that bench or testbed testing could continue while access or approvals were resolved.

Beneficiary perspectives on the benefits of partnerships

- 3.13 Partnerships accelerated access to facilities, data and platforms, which in turn moved TRLs forward. Several beneficiaries reported clearer routes to market, stronger investor

readiness and more robust IP positions. Teams also pointed to practical learning that would be hard to gain in isolation, including safety evidence, integration know-how and procurement insight from operators and OEMs.

- 3.14 An aviation beneficiary noted that the grant-backed collaboration “helped us get one private investor and we could consolidate our IP.” A rail beneficiary highlighted the value of having a university manage its own grant stream within the consortium, which eased administrative load on the SME.
- 3.15 One further benefit of partnerships highlighted by a few beneficiaries was the ability to integrate multi-modal thinking around net zero propulsion technology. The beneficiaries argued that by establishing partnerships with organisations traditionally working across different modes enabled knowledge of how challenges with net zero propulsion technologies were being addressed in other sectors to be shared and supported access to a wider range of potential end customers that may want to purchase all or part of the technology being developed.

“Alignment and working together and thinking cross sector between different sectors using net zero propulsion technologies is quite important and quite critical to make the whole” – NZP Wider stakeholder

- 3.16 One lead beneficiary in the aviation sector reported that they learnt a great deal from their predominantly automotive partners, as they argued the automotive sector is much more cost-sensitive than the aviation or aerospace sector. This beneficiary also reported being approached by a maritime organisation interested in their product as a result of the project increasing access to customers from other modes. These benefits were corroborated by other beneficiaries, with one beneficiary in the rail sector reporting that they had pivoted in the short run to selling their energy management technology for hydrogen fuel to other modes when they struggled to find rail customers.
- 3.17 Looking ahead, partners expect to use these relationships to progress short operational pilots, formalise catalogue listings with fabricators, and pursue follow-on funding to bridge into first commercial deployments. Several teams plan to deepen ties with operators to run route-or site-based demonstrations, while others will return to the same universities and test centres for certification-relevant evidence. There is also interest in carrying successful pairings into new modes or adjacent markets, particularly where the same integration toolchain or subsystem can be adapted.

Case study vignette showcasing partnership development and the benefits to the project/organisation

Hitachi Rail (Appendix B) advanced a new battery system for low-floor commuter and suburban trains by designing a compact, modular enclosure and cooling package that increases energy density while preserving safety. Working with DB ESG and the University of Birmingham, the team validated the design through extensive modelling and large-scale fire testing of LFP cells at a specialist facility in Germany, generating rare, railway-scale evidence on thermal runaway, gas emissions and effective mitigations such as water-cooled plates and inter-cell insulation. The work culminated in full manufacturing drawings and a design that fits within UK loading-gauge constraints.

The Hitachi Rail consortium shows how an OEM, an engineering partner and a university combined strengths to target a clear market gap. The team aligned platform constraints with subsystem innovation, used simulation and testbed work to refine battery enclosure and cooling concepts, and kept safety and certification needs at the centre of planning. Working in this way reduced integration risk, produced evidence that can be used in future approvals, and set up a path to a full-scale prototype after the grant. Partners finished the project with a shared view of next steps, a clearer route to manufacture, and relationships that will carry into testing on representative routes.

Conclusion

- 3.18 Partnerships played a central role in delivery across the NZP programme. Most consortia drew on established relationships, which reduced start-up time and supported clear division of responsibilities. Partnerships were essential in the dissemination of knowledge and best practice across beneficiaries, allowing more integrated solutions to be developed and increasing access to a wider range of customers.
- 3.19 As projects moved from design into testing, regular technical checkpoints and shared access to facilities helped partners manage risk and maintain progress. Early involvement of operators clarified operational requirements and safety evidence needs. Engagement with fabricators supported design-for-manufacture and gave teams a clearer view of unit costs and catalogue routes.
- 3.20 Where projects depended on third-party assets, certification windows or data approvals, progress was more uneven. Formal brokerage offers were used inconsistently, limiting their potential to widen partner pools beyond existing networks. Administrative processes, including data sharing and change control, were managed effectively in many cases but added friction for smaller firms.
- 3.21 Future rounds could strengthen partnership performance by making light-touch matchmaking a routine step, encouraging early operator and fabricator participation, and providing template agreements for data access and collaboration. Clearer guidance on governance and risk management would help consortia respond to delays without losing momentum. With these adjustments, partnerships formed under the NZP programme are well placed to carry technologies from testbed to first deployment and to support scale-up across sectors.

4 Development, commercialisation and deployment of new technologies

Key Messages

- Projects progressed along the TRL pathway by designing, integrating and validating subsystems on testbeds, then planning short operational trials.
- Knowledge creation was substantive and practical. Teams produced manufacturing drawings, safety evidence and test datasets, and several filed or prepared patents. Public-facing dissemination was modest relative to technical reporting.
- Commercial signals were strongest where credible testing met a clear buyer. Examples include contract wins linked to validated designs and follow-on private investment secured off the back of working demonstrators.
- After projects have closed, most technologies require significant development to be commercially viable however multiple beneficiaries reported that difficulties in accessing follow-up funding have significantly slowed down this progress.
- The main constraints were practical and included access to assets and specialist components, limited test infrastructure, and certification timing. Enablers included early operator and fabricator involvement, visible demonstrators, robust evidence packs and early dialogue with regulators.

Introduction

- 4.1 This chapter explores the extent to which NZP projects have been successful in developing and deploying technologies, as well as progressing towards commercialisation.

Reported TRL progression across projects, and mechanisms driving this

- 4.2 Most teams reported moved up the TRL scale by designing, testing and refining before planning short real-world trials.
- 4.3 Outside of the electric vehicle automotive sector, the integration of net zero propulsion technologies into vehicles is nascent. Most beneficiaries reported that their projects

aimed to develop prototypes to be tested in real world demonstrations, from which the technology could be developed further for applications on a wider range (and often larger more commercially attractive for end customers) of vehicles.

- 4.4 The Hitachi Rail case study (Appendix B) project exemplifies this. The consortium redesigned a compact battery enclosure and cooling system for low-floor trains, then used modelling and specialist fire testing to prove the concept. That evidence supported a shift from paper design to manufacturing drawings and a plan for a full-scale prototype.
- 4.5 Other beneficiaries who were interviewed described similar patterns. An aviation SME working on a clean hybrid powertrain for unmanned aerial vehicles (UAV) built the integrated system and reached the point of planned flight validation but could not proceed with the hover test due to asset and approvals timing. A propulsion integration supplier developing a standard hardware and software toolkit explained that their approach lets adopters reuse proven controllers and interfaces.

“[Proven toolkits can] accelerate people’s development by months.” - NZP beneficiary

- 4.6 Together, these examples show how integration on shared testbeds, early operator input and realistic test plans drive TRL gains even when final trials are delayed.
- 4.7 Six beneficiaries responded to the survey question focussed on TRLs. All six reported that the TRL of their technology has increased since they completed their project application. The largest rise in TRL reported by a beneficiary in the survey was progression from TRL2 and TRL4.

Intellectual property and information dissemination

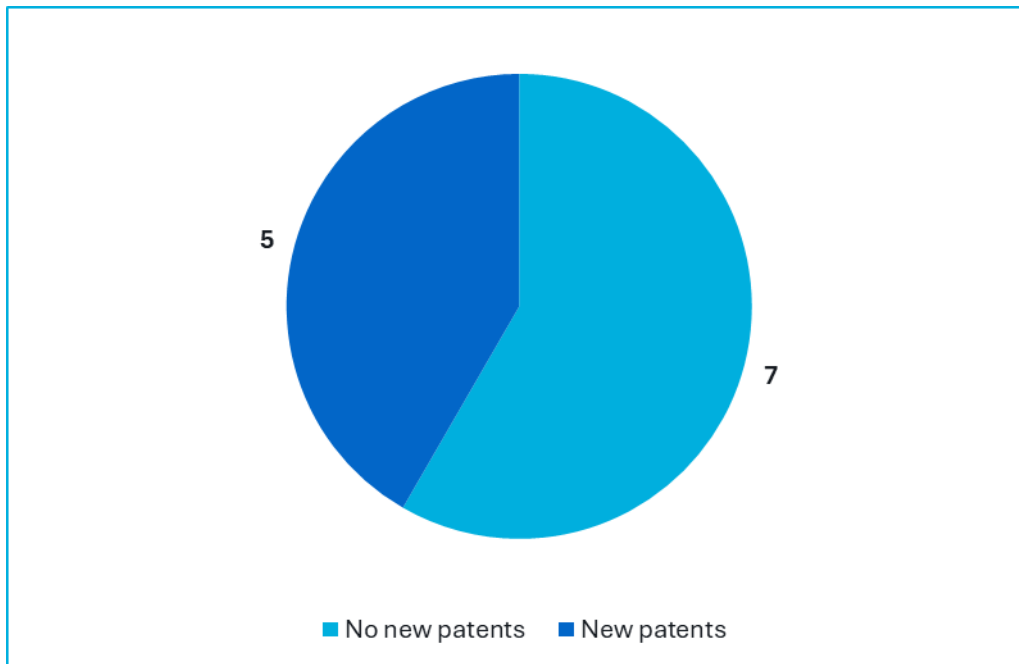
- 4.8 Across the programme, most knowledge creation has come from lab and testbed testing, design verification, and early demonstrations. Hitachi Rail’s battery train project (Appendix B) generated a full suite of manufacturing drawings for a compact, modular enclosure and cooling system, alongside a large body of safety evidence from lithium iron phosphate fire testing. Those results have been fed into industry discussions led by the Rail Safety and Standards Board (RSSB) and helped shape Hitachi’s design approach for near-term deployment.

“I don’t think we’re going to sell another train in the UK without a battery on it.” - NZP beneficiary

- 4.9 Beneficiaries described the programme as the “massive help” needed to bridge pre-commercial gaps. One firm said the award directly helped them secure a private investor and consolidate their IP, a step they judged unlikely through UK private finance alone at this stage.
- 4.10 With regards to IP, Talos (HiPERMod) used the grant to move from concept to a working dual-flux motor demonstrator and to file patents that protect its core design (Appendix C). The patents had been submitted at the time of interview, with grant decisions pending. In parallel, the team documented inverter integration and drive-cycle performance and began using the demonstrator to brief OEMs and investors.

- 4.11 Another beneficiary reported that they had secured a patent for the technology while preparing to test their engine on a freight locomotive, indicating both protection of IP and a pathway into operational trials.
- 4.12 As shown in Figure 4-1, five of the 12 responses to the beneficiary survey reported that they anticipated their organisation to hold new patents as a result of the NZP project within three years' time. Three respondents reported that their organisation already held new patents as a result of the project

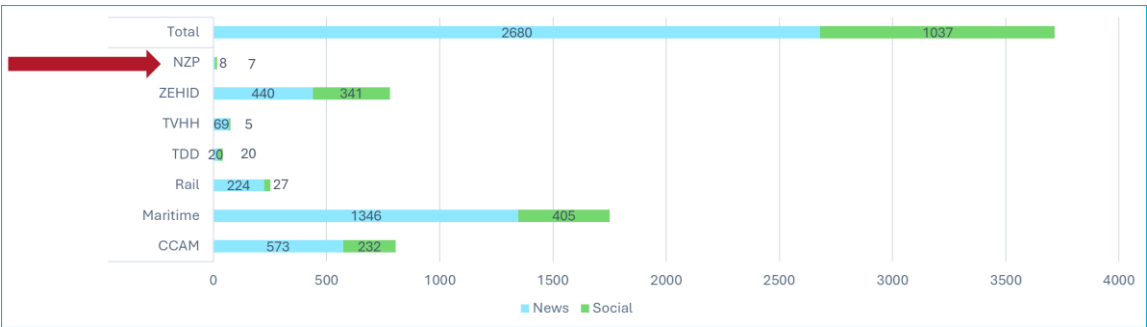
Figure 4-1: Number of beneficiaries which anticipate holding new patents as a result of the project in 3 years' time (n=12)



Source: Beneficiary survey, Steer-ED analysis (August 2025), Question: How many additional patents do you expect your organisation to hold in 3 years' time, as a result of completing the project? (Answer option: [Number] additional expected to result in 3 years' time]

- 4.13 Dissemination has ranged from technical packs shared with partners, to press and conference activity through case studies. Hitachi (Appendix B) highlighted extensive engagement with academic and standards bodies off the back of its testing, while Talos (Appendix C) used the motorcycle demonstrator to secure meetings with investors and prospective OEMs. According to the beneficiary survey, seven of 13 responses reported that technical reports or outputs had been developed as a result of the NZP project. In addition, as shown in Figure 4-3, one beneficiary reported that their project had featured in an academic journal while a beneficiary reported that the IUK funding for the project helped fund a research student work on the project, who then produced academic outputs as a result.
- 4.14 Public engagement and promotion of the NZP projects however was not a major output of the programme. As shown in Figure 4-2, the projects in the NZP programme had the fewest number of media references of all LMT programmes, with only 15 media references identified.

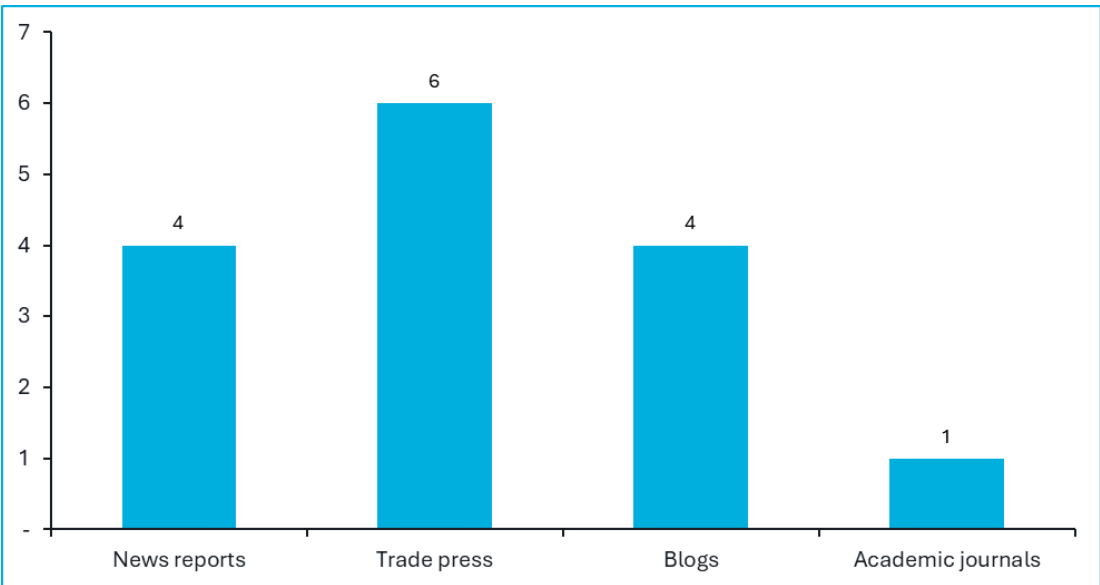
Figure 4-2: Number of media references to projects by LMT programme



Source: Meltwater media analysis, Technopolis analysis (data collected August 2024 to August 2025)

4.15 This is further demonstrated by the responses to the beneficiary survey. Under half of all responses reported that their project had been featured in each of the following publications: news reports, trade press and blogs (Figure 4-3).

Figure 4-3: Number of beneficiaries reporting that their project had featured in different news reports or publications (n=13)



Source: Beneficiary Survey, Steer-ED analysis (August 2025), Question: Has the project been featured in any new reports or other publications (e.g. trade press, blogs, articles etc)? (please tick all that apply) (Answer options: News reports, Trade press, Blogs, Academic journals, Other (please specify, Project has not featured in any news reports or publications, Unsure)

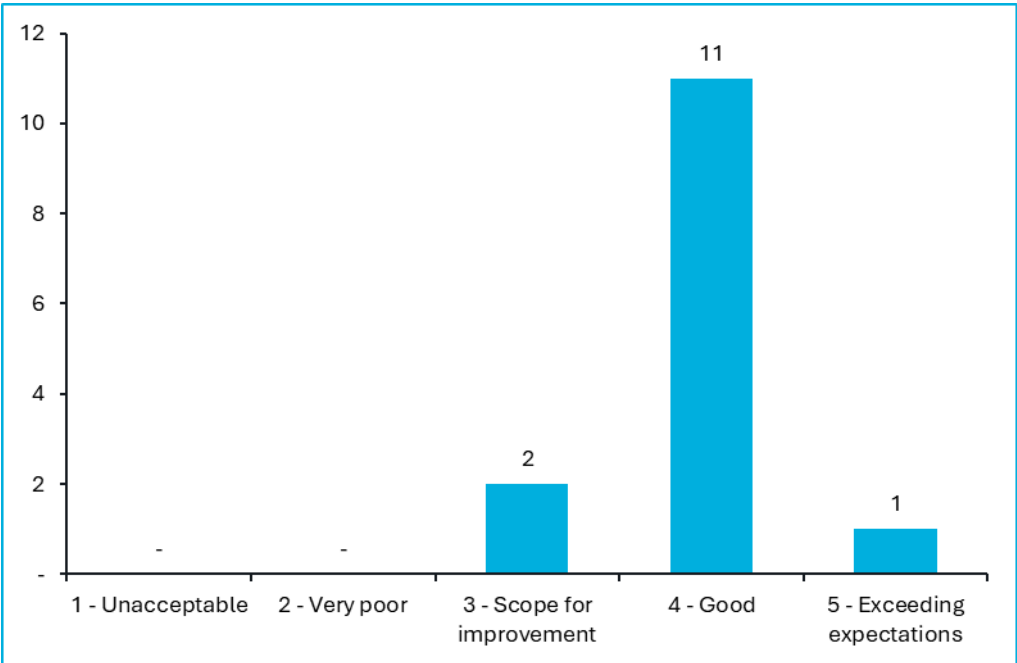
Commercial progress made by organisations

- 4.16 Commercial signals are strongest where projects paired credible testing with a clear buyer. Hitachi’s (Appendix B) design work and safety evidence supported a contract award to supply tri-mode trains for Grand Central, with the compact enclosure rolled into bid proposals and future fleets. The project team noted that involvement in the NZP project allowed them to present a mature, modular design as customers moved to procure battery capability.
- 4.17 Talos (Appendix C) converted a concept into a rideable demonstrator and used it to secure follow-on finance of about £1.8 million.

“IUK has taken that risk with us and now we’re in a much better position.” - NZP beneficiary

- 4.18 Near-term products are expected first in two-wheel applications, with later scaling into passenger and commercial vehicles.
- 4.19 From the QMS monitoring reports, 11 of the 14 projects showed good progress in terms of exploiting the technology developed during the project (Figure 4-4). One project was exceeding expectations in terms of exploitation. This reflects progress since wave 1, where three of the 14 projects still had scope for improvement in terms of exploitation. This evidence around commercial progress was reinforced by findings from partner interviews.

Figure 4-4: MSP reports for project exploitation (n=14)

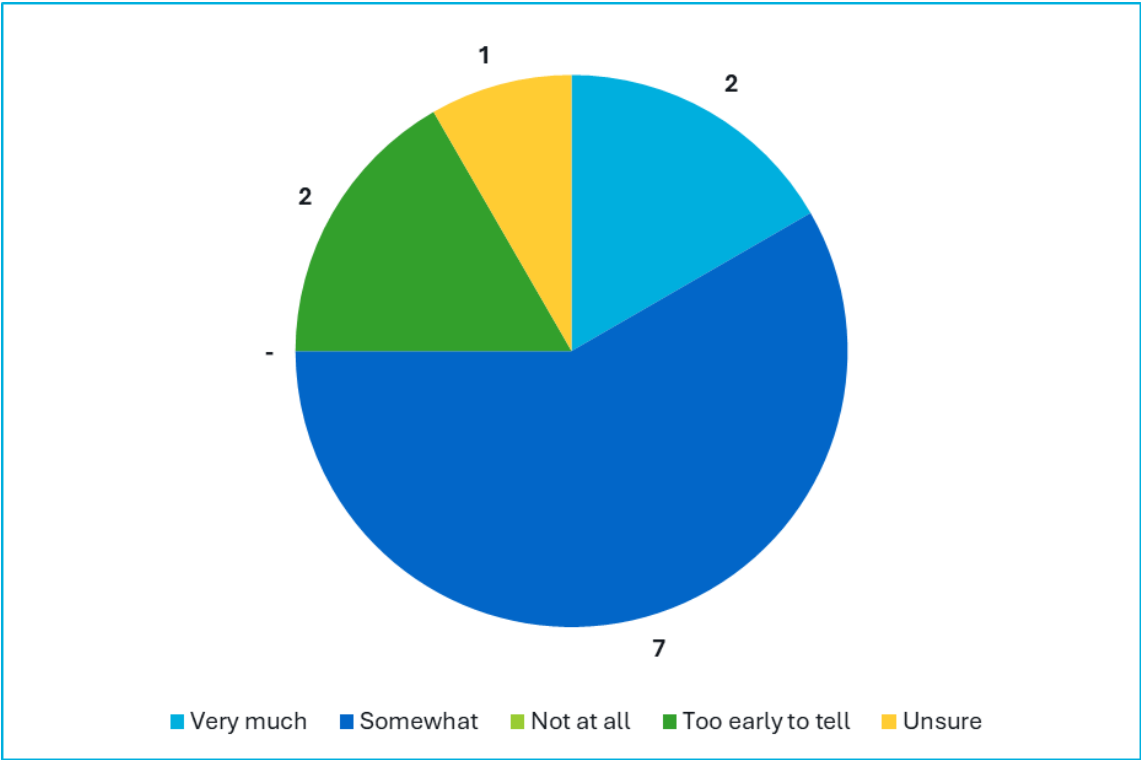


Source: QMS MSP reports (IUK), Steer-ED analysis

“[A pre-commercialisation award] helped us get one private investor” – NZP beneficiary

- 4.20 According to the beneficiary survey, seven responses reported that their market position had improved somewhat as a result of the project, while two responses reported that it had improved very much (Figure 4-5). This reflects the progress projects have made since wave 1, where only eight of 15 survey respondents reported an improved market position as a result of the project, while six beneficiaries reported it was too early to tell.

Figure 4-5: Perceptions of how beneficiary market positions had improved as a result of the project (n=12)

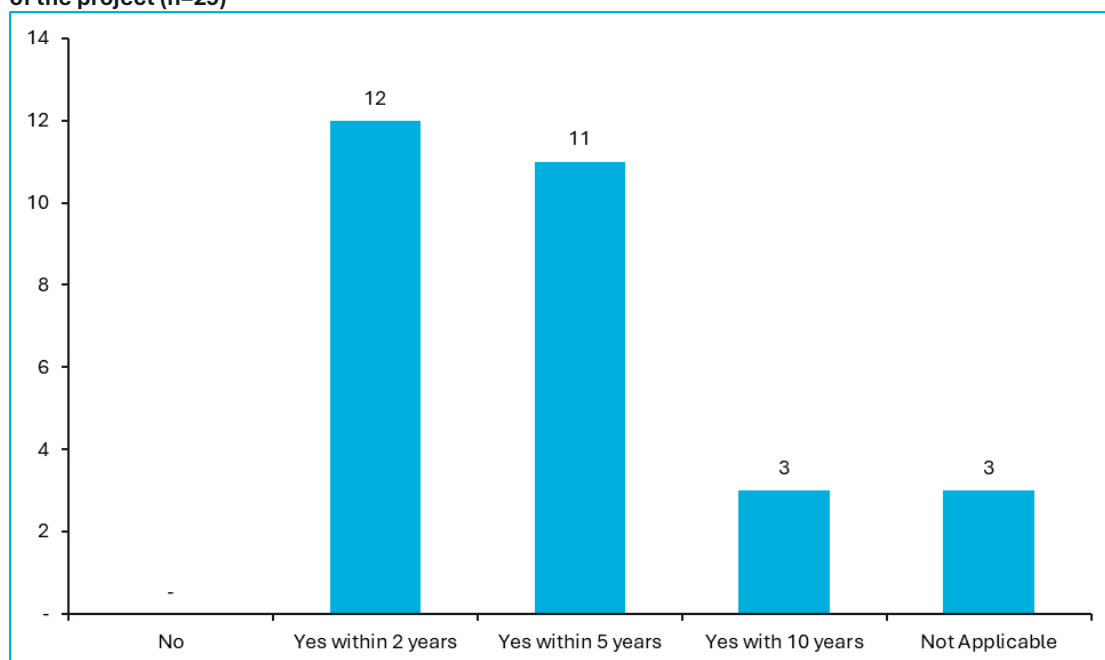


Source: Beneficiary survey, Steer-ED analysis (August 2025), Question: To what extent would you say your market position as an organisation has improved as a result of this project? (If you are not a business, select 'NA') (Answer options: Very much, Somewhat, Not at all, Too early to tell, Unsure, NA)

4.21 Despite this, none of the 12 responses to the beneficiary survey reported that new products or services had been brought to the UK market yet. This reflects the relatively early stages of TRL most of the technologies developed in the NZP programme are and the often-nascent market for net zero propulsion technologies. Only one of the 12 survey responses reported that a new product or service had been brought to an overseas market. Several beneficiaries reported that outside of the electric vehicle automotive market, end customers of net zero propulsion technologies are often very risk averse and therefore wary of purchasing technologies which are yet to be tested on the types of vehicles they sell.

“It still is the case really ... where we need to develop the technology to then ... act as a catalyst for that market” – NZP beneficiary

4.22 There was however widespread confidence amongst beneficiaries interviewed that the technical development and learning delivered by the NZP projects would result in new products and services being brought to UK and overseas markets. This is corroborated by the IMS data, where 26 of the 29 responses report that the NZP project would result in new products, services or processes being launched within the next 10 years (Figure 4-6). Twelve of which report that they anticipate new products, services or processes being launched within the next two years.

Figure 4-6: Beneficiary reports of when new products, services or processes will be launched as a result of the project (n=29)

Source: IMS data, Steer-ED analysis (August 2025), Question: As a result of this IUK support, does your business expect to launch any new or significantly improved products, services or processes? This question is not required for public sector organisations, RTOs, academic institutes or individuals

Barriers and enablers to technological and commercial development

- 4.23 Common barriers were practical rather than conceptual. Teams cited test asset availability, lead times for specialist components, and short delivery windows that left little space to recover from supplier failures. Beneficiaries also reported that a lack of infrastructure was a challenge to commercialise their technology. This was particularly important to beneficiaries attempting to develop hydrogen propulsion systems. A number of consultees reported that the high price and difficulty to acquire green hydrogen alongside a limited supply chain for components related to hydrogen propulsion systems in the UK created barriers to the development and commercialisation of the technologies.
- 4.24 In regulated settings, certification steps set the pace for integration and trials. Hitachi's (Appendix B) work was slowed by the need to go abroad for large-scale fire testing due to limited UK capacity, though the resulting data materially strengthened the safety case and influenced standards work.
- 4.25 A significant barrier to commercialisation reported by multiple project beneficiaries was the challenge of accessing follow-up grant funding quickly following the conclusion of the NZP project to continue the development of the technology to a higher TRL level. This a particular issue for SMEs who face more pressures on their cash flows. A few beneficiaries reported having to pause or slow-down development of their technologies after the end of the NZP project as they looked to find follow-up funding.

"Once the project ended, we essentially no longer had budget to continue it ... there wasn't a clear follow-on funding pot to move to" – NZP beneficiary

4.26 Several beneficiaries stated that changes to IUK grant competitions could help mitigate the cliff-edges partners face in progressing the development of their technology. Beneficiaries suggested a range of ideas including streamlined approval processes for follow-up grants for projects which had demonstrated delivery against objectives for previous grant funding awards and funding awards with more regular funding gates which make it easier to continue accessing small amounts of funding to maintain momentum.

4.27 Enablers fell into three groups:

1. Clear test evidence that reduces buyer risk.
2. Visible demonstrators that help investors and OEMs assess readiness.
3. IP protection that supports partnership and licensing discussions.

Talos' (Appendix C) path captures all three: patent filings, a running motorcycle, and investor traction.

"Where we were three years ago, external investors would not really be interested... It was just some ideas... Now we're in a much better position." – NZP beneficiary

4.28 Regulatory clarity also matters. Several interviewees linked progress to early dialogue with regulator, standards bodies and test houses and asked for a clearer bridge between collaborative R&D and first commercial pilots so that learning, certification, and tooling can complete before market entry. Several beneficiaries developing net zero propulsion systems for aircraft reported that they have had positive interactions with the Civil Aviation Authority (CAA), with several reporting being part of the CAA's hydrogen sandbox to support the development of regulation relating to hydrogen as a fuel source for aviation. These interactions and relationships have helped enable their technology to be developed in ways to be compliant with the regulations and has helped the CAA modernise and update its regulations to be in line with the progress of net zero propulsion technology.

Case study vignette showcasing a project which has made notable commercial progress

Hitachi Rail used NZP support to turn a compact battery enclosure and cooling concept for low-floor regional trains into a contract-ready design (Appendix B). Working with DB ESG and the University of Birmingham, the team combined modelling with large-scale fire tests to evidence safety, then translated results into full manufacturing drawings that fit within UK loading-gauge constraints. The commercial payoff followed quickly: the design underpinned a tri-mode train contract with Grand Central and has been carried into further bids, while the safety findings have been shared with industry bodies.

Progress was helped by a clear customer need, early operator input, and a consortium that joined platform engineering, safety, and testing. The main hurdles were practical; limited UK capacity for rail-scale battery fire testing and the administrative overheads typical of regulated projects. Even so, the grant de-risked the expensive evidence base and shortened the path from idea to a product operators can buy.

Conclusion

- 4.29 The NZP programme has moved multiple propulsion technologies from concept toward deployable products. Most projects reported TRL gains, created usable technical assets and, in several cases, strengthened their IP positions. Where testing produced credible evidence and a defined customer need existed, projects converted progress into tangible commercial outcomes such as contract awards, investor commitments and clearer routes to market. However, most projects reported that significant additional development and testing was required for their technologies to be commercially viable for vehicle manufacturers.
- 4.30 Further momentum now depends on addressing practical challenges. Better access to domestic test facilities, predictable certification pathways and timely availability of test assets would reduce delay risk. Early involvement of operators and fabricators should remain standard practice so designs translate quickly into buildable products and catalogue routes. Targeted support for the step between collaborative R&D and first pilots would help teams complete validation, prepare documentation and engage buyers. With these adjustments, projects are well placed to progress from testbed to route and deliver decarbonisation and competitiveness benefits at scale.

5 Growing skills and organisational maturity through programme delivery

Key Messages

- NZP projects delivered clear skills gains in systems integration, controls, safety and test methods. Beneficiaries reported strong contributions of their projects to upskilling their staff.
- Organisational maturity improved through tighter project governance, more streamlined grant management processes, earlier alignment to certification milestones, and better management of test assets and evidence.
- Employment effects were positive but selective. Respondents reported both job creation and job safeguarding, with IMS data indicating further FTE growth expected over five years.
- Persistent constraints were specialist recruitment, cash flow for SMEs, and time spent on claims and change control.

Introduction

- 5.1 Delivery of NZP projects is expected to stimulate growth in the capability, capacity, resilience, workforce and skills of beneficiary organisations, ultimately leading to growth in the maturity and scale of the net zero propulsion sector, with corresponding economic benefits. This chapter sets out the mechanisms by which activities have impacted organisational skills and maturity, and the role of the programmes in creating and safeguarding jobs.

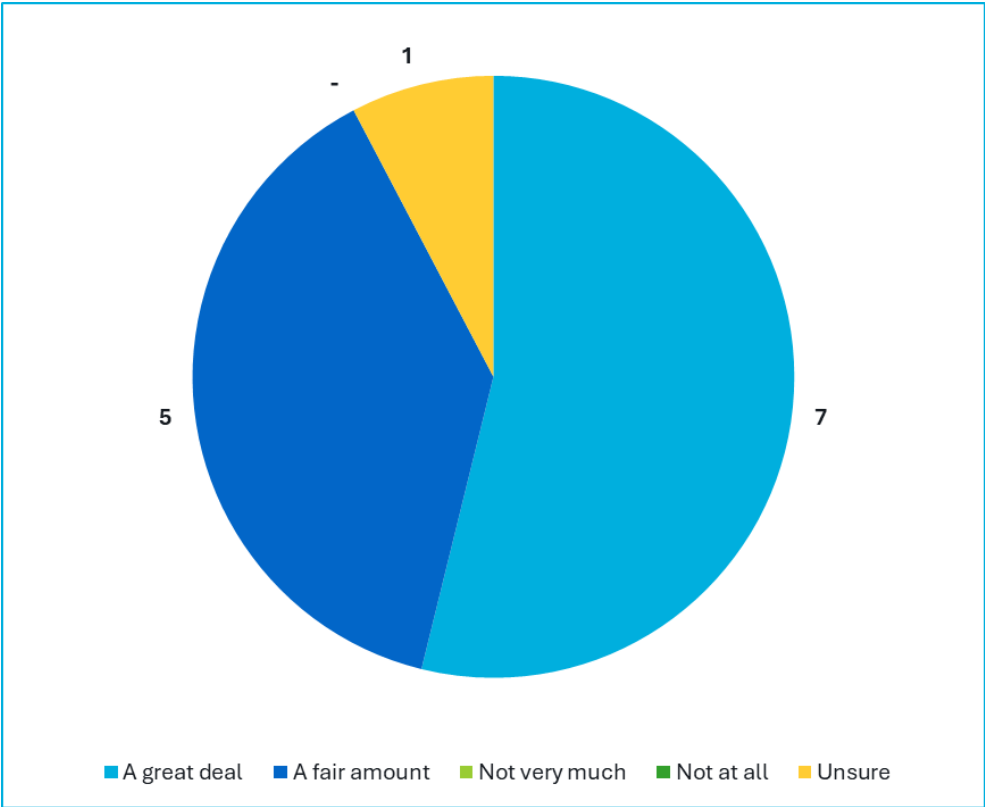
How projects have contributed to skills development amongst partner organisations

- 5.2 Across projects, teams described meaningful technical and organisational upskilling. One aviation developer said the project “hugely increased capability,” adding new skills and people into the team, while also noting how hard it is to recruit specialist controls engineers at the right level and cost. A beneficiary in the rail sector highlighted how the NZP project enabled their employees to become specialists in the technology. Developers building standardised hydrogen fuel cell integration platforms highlighted skills gains from hardware-in-the-loop testbed work and from packaging “off-the-shelf” controllers and interfaces that others can configure quickly. As one interviewee put it,

having a pre-built controller that “just needs customising” can save months of development time and builds integration know-how in the process.

- 5.3 The contribution of the NZP projects to organisation skill levels is corroborated by the responses to the beneficiary survey. Seven of 13 responses reported that the project had contributed a “great deal” to the organisation’s skill level while five beneficiaries reported that it had contributed a “fair amount” (Figure 5-1).

Figure 5-1: Self-reported impact of the NZP project on organisation skill (n=13)



Source: Beneficiary survey, Steer-ED analysis (August 2025), Question: To what extent has the project had a positive impact on skill levels within your organisation? This could include for example commercial, technical, or regulatory knowledge/skills (Answer options: A great deal, A fair amount, Not very much, Not at all, Unsure)

- 5.4 Wider stakeholders reinforced these themes but also highlighted a persistent skills gap at the commercialisation stage, where small teams lack business planning, route-to-market and regulatory skills. Wider stakeholders reported that micro-SMEs often juggle concept development with day-to-day operations and benefit when projects explicitly build these capabilities.

How projects have contributed to growth in organisational maturity amongst partner organisations

- 5.5 Teams stressed the value of securing test assets, sites and permissions early, and aligning workplans to certification milestones to avoid late bottlenecks. Where partners faced delays or supply chain issues, leads learned to keep testbed-based testing moving so skills and IP continue to build even if vehicle trials slip. Several interviewees

emphasised planning time for evidence collection, evaluation and dissemination rather than focusing only on build and test.

- 5.6 A few beneficiaries did note that the NZP project had enabled them to mature their grant and project management processes. One beneficiary reported that the project had enabled them to streamline their financial processes to more easily access financial information to process their grant claims. Another beneficiary reported that the project had enabled them to develop their risk management and project management processes to better lead large innovation projects.
- 5.7 Skills gains are already shaping next steps. Aviation and hydrogen teams reported stronger systems integration capability, a clearer view of regulatory pathways and a better sense of end-user requirements. These improvements are feeding into refined business cases and investor conversations. Others said the experience strengthened ties with test-platform partners and universities, creating a pipeline for future bids and technical collaboration.
- 5.8 Across the programme, beneficiaries also described broader capability lifts that make future delivery more likely. Interviewees cited better grasp of the market context, stronger project management, and improved readiness to apply for further grants.

Case study vignette showcasing how a project has resulted in the maturing and skills development of the organisation(s) involved

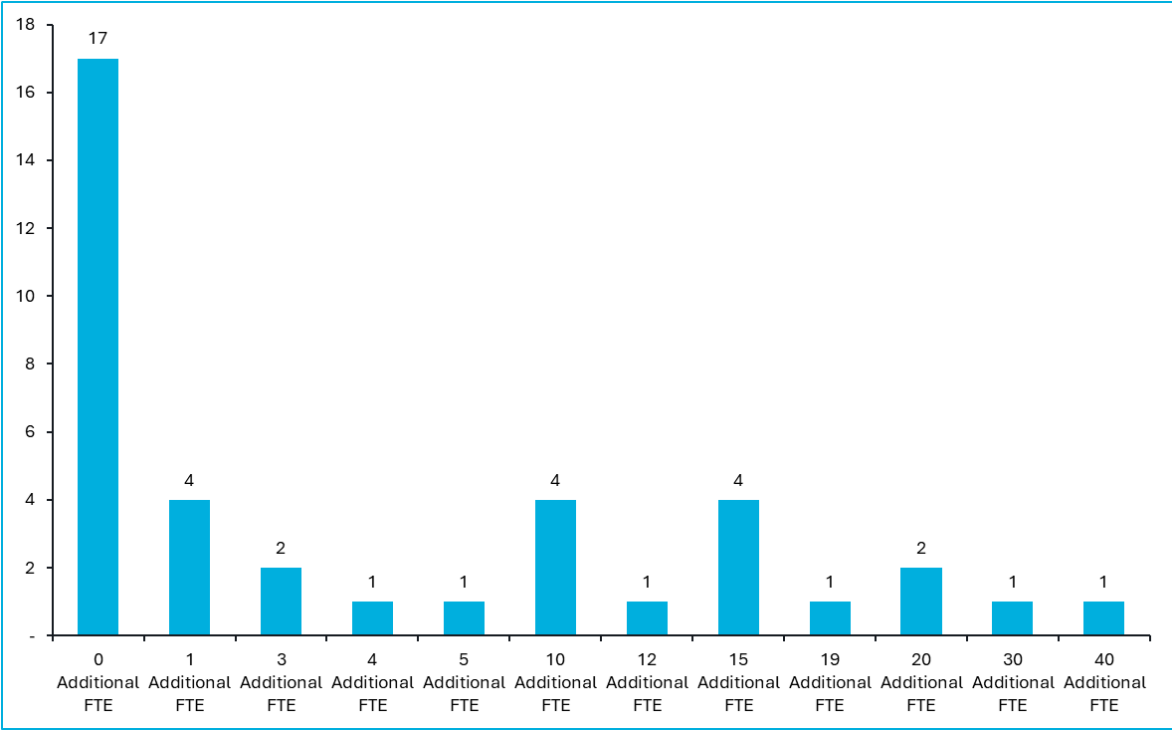
Talos used HiPERMod to move from a consultancy mindset to a product-oriented business (Appendix C). The project funded new engineering hires, specialist modelling tools, and a build-and-test programme that took its dual-flux motor from early concepts to a working motorcycle demonstrator. In the process the team learned to balance simulation with physical validation and to hold scope when partners failed, rebuilding the plan after two collaborators went into administration. They also developed internal processes for testbed testing, documentation, and IP management, filing patents to protect the core design. “Where we were three years ago, external investors would not really be interested in the company because it was nothing proven. It was just some ideas. IUK has taken that risk with us and now we’re in a much better position.” The demonstrator became a credibility anchor with OEMs and investors, helping Talos to secure £1.8 million in follow-on funding and to plan the next steps toward higher TRLs. In short, the project accelerated skills growth in powertrain design and controls, strengthened delivery discipline, and built the commercial acumen needed to engage fabricators and scale manufacturing.

The role of programmes in creating and safeguarding jobs

- 5.9 Interviewees described selective hiring linked to project needs, particularly in systems, safety and integration roles, although specialist recruitment remains difficult for some. Consultees indicated that a greater emphasis was placed on upskilling and developing their exiting workforce rather than significantly expanding their number of FTE. According to the beneficiary survey, five of 13 responses reported that the NZP project had resulted in new jobs being created while eight of 11 responses reported that jobs had been safeguarded because of the project. This is corroborated by the IMS data. Of the 39

responses, 22 reported that additional jobs would be created because of the project. The number of additional FTE created by the project ranged from one (four instances) to 40 (one instance), as illustrated in Figure 5-2.

Figure 5-2: Number of additional FTE anticipated to be at organisations in five years' time due to the project (n=39)



Source: IMS data (IUK), Steer-ED analysis (August 2025), Question: As a result of this IUK support, how many more or less Full Time Equivalent (FTE) employees do you expect to have in your business in five years' time? This question is not required for public sector organisations, RTOs, academic institutes or individuals

Conclusion

- 5.10 The NZP programme has strengthened capability across participating organisations. Teams built deeper technical skills in integration, controls and safety, and adopted more disciplined delivery practices, including earlier planning around certification, streamlined grant and project management processes, firmer change control and more systematic evidence gathering. These improvements are already shaping next steps, from clearer routes to market and investor engagement to more confident engagement with operators and fabricators. However, the findings highlight that specialist recruitment remains difficult and administrative processes weigh heavily on smaller firms, limiting rate of organisational development.

6 Impacts on wider framework conditions and long-term outcomes

Key Messages

- Willingness to adopt the types of technologies supported by the programme is improving, moving from curiosity to cautious confidence where working prototypes and realistic trials are visible, albeit there is a large gap to vehicle manufacturers having the confidence and trust to adopt the technologies widely.
- Several projects have informed regulators and standards bodies with new safety and performance evidence, especially in hydrogen fuel propulsion for aviation, rail battery systems and maritime certification pathways.
- Anticipated long-term benefits span decarbonisation, safety, operational efficiency and exports, contingent on translation from prototype to certified product.
- The most persistent barriers are stagnant regulatory barriers, certification timelines, limited infrastructure (causing both high operating costs), asset and test facility access and growth finance for hardware after grants end; enablers include early regulator engagement, credible evidence packs and visible demonstrations.

Introduction

- 6.1 This chapter discusses the role that projects have played in affecting trust in, and adoption of, new technologies, plus contributions to the regulatory environment. It then goes on to discuss evidence about potential longer-term outcomes that may be delivered by the portfolio.

The role of projects in driving adoption of new technologies

- 6.2 Interviewees described a steady shift from curiosity to cautious confidence, especially where projects could show working prototypes or realistic trials. In rail, clear safety evidence around battery systems helped move conversations from “can this be done” to “where can we use it,” while demonstrators in road and light mobility gave investors and OEMs something tangible to evaluate. Stakeholders also noted that familiarity with mainstream automotive electric vehicles (EV) has helped, however the willingness to use

and trust other net zero propulsion technology lags significantly behind automotive EVs. As one wider stakeholder put it, public perceptions of EV capability can be five years behind the reality, so visible demonstrations still matter.

- 6.3 Survey findings reinforce the direction of travel. A clear majority reported that they expect their technologies to be exportable, and many had already engaged with users or publicised results to build trust. The common message was that seeing technology in operation, rather than only on slides, is what unlocks confidence. However, multiple beneficiaries did reflect that customers predominantly wanted to be ‘followers’ and were only willing to invest in the technology once it had been proven to be possible for it to be integrated into commercially feasible vehicles.

The role of projects in shaping the regulatory environment

- 6.4 Several NZP projects have generated evidence that regulators and standards bodies can use. The most developed example is in rail, where large-scale fire testing of lithium iron phosphate battery packs created new data on thermal behaviour and gas emissions. This materially improved understanding of mitigation strategies and fed into safety work led by the RSSB. The same project highlighted a domestic gap in test infrastructure, since the team had to use a specialist facility overseas.
- 6.5 In the aviation sector, multiple beneficiaries reported being part of the CAA’s Hydrogen Sandbox, a regulatory sandbox to test and develop the regulation of hydrogen as an aviation fuel and argued that the NZP projects had strengthened their collaboration with the CAA and their ability to influence the regulations around hydrogen.
- 6.6 In maritime, consortia have worked with classification and flag authorities as they map certification pathways for zero-emission workboats. Engagement with bodies such as the Maritime and Coastguard Agency and Det Norske Veritas (DNV) is helping to clarify steps from prototype to compliant vessel, even if wider sector incentives remain uneven.
- 6.7 Despite this, a few beneficiaries did highlight that regulation can lag behind the development of net zero propulsion technologies which slows down their ability to test and develop their technology to commercial use compliantly and suppresses the confidence of potential customers in adopting the technology. An example of the slow moving regulatory environment is the lack of regulation covering unmanned drones beyond visual line of sight operations.

Case study vignette showcasing how a project has helped to contribute to changes in the regulatory environment

Hitachi Rail’s “Compact Battery Propulsion for Inclusive Regional Trains” (Appendix B) partnered with DB ESG and the University of Birmingham to design a compact battery enclosure and then prove its safety through full-scale fire testing (Appendix B). The tests showed that water-cooled plates and inter-cell insulation could prevent thermal runaway even under extreme conditions. Findings have been shared into RSSB workstreams and are now informing safety expectations for battery-equipped trains. This evidence base also strengthened Hitachi’s commercial case, contributing to a contract to supply tri-mode trains that use the new design.

Long-term outcomes

- 6.8 Looking ahead, interviewees expect a mix of environmental, safety, operational and economic benefits if projects scale:
- **Decarbonisation and air quality.** Battery-equipped regional trains could displace thousands of diesel engines over time, cutting CO₂ and local pollutants, while maritime and aviation electrification and hydrogen systems promise cleaner operations once infrastructure and certification are in place.
 - **Safety and reliability.** Better-understood battery fire behaviour and more predictable electric drivetrains support safer operations. Several teams also reported designs that fail safely, for example freewheeling rather than abrupt braking in certain fault modes.
 - **Operational performance.** Modular propulsion and integration toolchains are expected to reduce maintenance and commissioning time, and to shorten design-to-deployment cycles for future vehicles and retrofits.
 - **Economic impacts and exports.** Companies reported stronger investor interest and new routes to market following prototypes and case studies. Survey results suggest high confidence in future exportability across the portfolio.
- 6.9 The near-term focus is on converting prototypes into certified, replicable products. In rail, designs are moving into contracted fleets, which should bring visible benefits as units enter service. In two-wheel and light-vehicle markets, demonstrator bikes and integration IP have attracted follow-on funding and OEM interest, with an eye to scaling into passenger cars and commercial vehicles once performance is proven at smaller scale. Maritime timelines are more dependent on classification approvals and infrastructure plans but are progressing through staged trials. In aviation, most beneficiaries plan on integrating their technologies into larger powertrains and testing their technologies on larger, more commercially attractive aircraft.
- 6.10 The main barriers cited were certification timelines, fragmented or limited test infrastructure, and the difficulty of raising growth capital for hardware after grants end. A lack of infrastructure to support the technologies, including grid connections, limited infrastructure for refuelling and charging and supply-chain constraints can slow pilots and diminish the business case for the technology. An example of this is in the adoption of hydrogen as a fuel. As highlighted by project beneficiaries and wider stakeholders, the price of hydrogen has not fallen as anticipated over the past five to 10 years. This has harmed the price competitiveness of hydrogen fuel propulsion systems against other propulsion technologies and has limited the willingness to adopt the technology from end users. Project beneficiaries and wider stakeholders further highlighted that the high cost of hydrogen has also disincentivised the construction of hydrogen fuel infrastructure. This lack of hydrogen infrastructure adds costs to the testing of hydrogen fuel propulsion systems by project beneficiaries and to potential implementation costs for end users.
- 6.11 Some sectors remain change-averse without stronger policy signals or joint action across asset owners, operators and ports. On the enabling side, visible demonstrations, credible safety data and early engagement with regulators were seen as decisive. IUK's profile and communications also helped raise market confidence.

Case study vignette showcasing the long-term impacts of one of the technologies being developed

Talos's HiPERMod project (Appendix C) used grant funding to turn a dual-flux motor concept into a working motorcycle demonstrator, file patents and shift from consultancy to a product-led company. The demonstrator became the proof point that unlocked investor interest and OEM conversations. Progress was not linear. Two delivery partners went into administration, and the team absorbed additional work, but flexibility in delivery and a clear demonstration pathway helped keep momentum. The result is a higher-efficiency motor with a safer failure mode and a commercial plan to scale into larger vehicle classes over time.

Conclusion

- 6.12 The NZP programme is beginning to shape the conditions for market adoption and long-term impact. Demonstrators and credible test evidence are shifting perceptions among buyers and investors of both the ability to implement and run net zero propulsion systems at a low competitive cost and the technologies' ability to solve commercial challenges for end users. By addressing challenges on both the supply and demand-side, the projects have contributed to improvements in the business case for the commercial implementation of net zero propulsion technology. Additionally, targeted engagement with regulators has clarified approval routes and informed emerging standards for new net zero propulsion technologies, thus easing their future implementation. However, there is still considerable development and demonstration of the net zero propulsion technology required for customers to be willing to adopt them into their vehicles.
- 6.13 If the current pipeline converts to certified, replicable products, benefits should materialise across emissions, safety, reliability and UK competitiveness. Realising this potential will depend on several practical enablers. Access to domestic test facilities, predictable certification windows, development of the regulatory environment, increased infrastructure deployment to reduce the operating cost of the technologies, an expansion of the supply chain for components and timely site and asset availability remain critical. A clearer bridge from collaborative R&D to early operational pilots would help teams complete validation, secure approvals and build user confidence. With these elements in place, the NZP programme is well positioned to turn technical progress into the development of technologies which can be integrated into commercial vehicles and drive adoption by end-customers at scale.

7 Conclusion & Next Steps

Key Messages

- Overall findings demonstrate that the NZP programme has had a positive impact in progressing the technological development and adoption processes for multi-modal net zero propulsion solutions
- Most projects met milestones, raised TRLs and produced usable design and safety evidence.
- Early commercial signals are visible and promising (contracts and follow-on finance), but most products are not yet on the UK market due to nascent market for net zero propulsion technology outside of EVs.
- The programme supported the strengthening of partnerships including across different modes, helping disseminate best practice more widely and improve access to a wider range of potential customers.
- The programme supported the upskilling of staff, particularly in SMEs and supported increased grant and project management maturity.
- The programme enabled the strengthening of relationships with regulatory bodies, a major example of this being the strong engagement with the CAA for projects in the aviation sector.
- Future evaluation should track longer-term outcomes 12–36 months post-completion, including exports, environmental benefits, jobs and safeguarded roles, and follow-on finance

Summary of monitoring findings

- 7.1 This report is structured around the LMT portfolio logic model, which is divided into five themes: programme delivery; partnerships and collaboration; technology development, deployment and commercialisation; skills development; and wider framework conditions. The key findings from the monitoring commission in each of these areas are set out below.
- 7.2 Overall findings demonstrate that the NZP programme has had a positive impact in progressing the technological development and adoption processes for multi-modal net zero propulsion solutions.
- 7.3 The NZP programme supported 14 collaborative R&D projects across rail, maritime, aviation and on-road applications. In total, 39 partners received 42 grants and £8.6 million of funding. Consortia were typically SME-led and included universities, operators and OEMs. Most projects focused on designing and integrating subsystems, testing and validation, preparing safety evidence, and mapping certification routes. QMS data show the majority met planned milestones, with delays where projects depended on third-party assets or specialist components.

- 7.4 Partnerships generally strengthened during delivery. Early involvement of operators and fabricators helped turn designs into buildable products and clearer routes to market. Several projects consolidated their IP and a minority filed patents during or shortly after the grant. Teams designed and integrated subsystems, proved them on testbeds and benches, and prepared for short real-world trials. Survey returns indicate all responding beneficiaries reported a rise in TRL since application, with the largest reported progression being two TRL levels. Knowledge creation was visible in design packs, safety evidence and prototype results. Dissemination was strongest through technical documentation and partner channels, while wider media presence was limited.
- 7.5 Commercial signals were clearest where credible test results met a defined buyer need. This is demonstrated across case study projects and interviewed beneficiaries. For example, Hitachi Rail's (Appendix B) compact battery enclosure and safety evidence supported a tri-mode fleet contract and is informing further bids. Talos's HiPERMod demonstrator (Appendix C) helped unlock about £1.8 million in follow-on finance and opened OEM discussions. Survey results align with this trajectory. Most responses reported an improved market position and a strong expectation that NZP work will lead to new products or services within the next ten years, with many expecting launches within two years. At the same time, very few reported products already in the UK market.
- 7.6 Skills and organisational maturity grew alongside the technical work. Seven of 13 survey responses reported a large contribution to organisational skills, with teams highlighting gains in systems integration, controls, certification know-how and project delivery discipline. Jobs were both created and safeguarded at modest scale, with IMS returns indicating additional FTEs expected over the next five years for many participants.
- 7.7 Barriers were mainly practical. Beneficiaries cited tight delivery windows, supplier and asset availability, the cost and access of hydrogen and related components, and limited domestic capacity for certain large-scale tests. SMEs also reported cash-flow strain from quarterly claims and the administrative load of evidence gathering. Enablers included early operator and fabricator involvement, access to suitable test facilities, a hands-on but proportionate monitoring approach, and early engagement with standards and certification bodies.

Next steps for the programme

- 7.8 There is no confirmed successor NZP competition at this point. If further support is commissioned, it should focus on converting proven prototypes into certified, purchasable products and on removing practical bottlenecks that slow delivery. A future offer could include:
- **SME-friendly delivery mechanics:** Allow monthly or milestone claims for smaller firms, with the option of a modest mobilisation advance. Provide example claim packs and reporting templates that fit design-led projects as well as software projects.
 - **Easier access to test and certification pathways:** Broker access to domestic facilities for battery use, hydrogen storage and propulsion testing through framework agreements or vouchers. Run regular clinics with regulators and classification bodies so projects can align test plans with approval needs from the start.
 - **Early involvement of end users and fabricators:** Require a named operator and build partner in consortia where appropriate. Ask for a costed route to manufacture,

catalogue-ready specifications and an indicative unit cost profile as part of the final deliverables.

- **Targeted brokerage and peer learning:** Convene buyer days with operators and OEMs, investor readiness sessions, and practical workshops on safety evidence, standards and documentation. Use light-touch matchmaking to widen partner pools beyond existing networks.
- **Focused visibility to aid adoption:** Support concise case studies and demonstrations that show technology working in realistic settings. Prioritise channels that reach operators, standards bodies and investors.

- 7.9 If no new competition is launched, low-cost actions can still help the cohort. These include publishing short technical briefs and case studies, signposting to other funding routes, hosting regulator and standards roundtables, and convening showcase sessions where teams present ready-to-pilot technologies to potential buyers.

Recommendations for future evaluation

- 7.10 Many of the most significant impacts of the NZP programme will only become clear over time, as prototypes move from testbed to certified use and wider adoption. Continued evaluation beyond the delivery window is essential to capture these longer-term benefits.
- 7.11 A priority is follow-up tracking at 12, 24 and 36 months after project completion. This should check whether prototypes progress to certification, operational pilots, catalogue or framework listings, and commercial contracts in the UK or overseas. It should also record replication across operators and platforms. Without this monitoring there is a risk that important successes or barriers will not be seen once programme funding ends.
- 7.12 Future evaluation should place more emphasis on environmental outcomes as deployments scale. Early projects have shown technical feasibility, but the full value lies in verified reductions in greenhouse gas emissions and improvements in air quality, alongside safety and reliability gains in live service. These outcomes will only be measurable after some time and should be tracked against clear baselines.
- 7.13 Economic impact analysis over the longer term is also needed to capture job creation and safeguarding, SME growth, manufacturing scale-up, inward investment, licensing and exports. Capturing these indicators, together with supply chain development and follow-on finance raised, will be critical to assess the programme's contribution to green growth and the wider industrial strategy.

Appendices

A Sources of evidence utilised

Monitoring data analysis

- A.1 Three forms of programme monitoring data are captured by IUK and were provided to Steer-ED for analysis, as follows:
- **Applicant information data** is basic ‘demographic’ data covering organisations awarded funding. The data includes the beneficiary’s name, project name, project description, competition programme, the total amount of funding, which was initially bid for, the grant funding amount provided, project start and end date.
 - **QMS monitoring reports** are quarterly assessments undertaken by external MSP; typically, industry professionals who are knowledgeable about the technology in question and are contracted to provide an independent assessment of project progress on a quarterly basis. Their assessment covers the project’s scope, time, cost, exploitation, risk, and project management. Officers score each of these project aspects as well as providing commentary as to the reasoning behind their scores.
 - Data captured via IUK’s **impact management system (IMS)**. IMS is a data collection system which is, at the time of writing, being rolled out across all IUK programmes. It captures data upon project commencement, during project delivery, and following project completion, and is provided in the form of short-answer multiple choice, quantitative, or character-limited free-text responses. It covers subjects such as patents, technology progression and partnerships (amongst others). For this wave, IMS data was provided for only four programmes: FOAK (FOAK 2023 competition), CCAM Deployments and Supply Chain, NZP and TDD. It should also be noted that the data available varied across these four programmes, with fewer questions being asked of FOAK beneficiaries compared to CCAM beneficiaries. We anticipate additional data from IMS will be available for subsequent monitoring activities.

Analysis of secondary data sources

- A.2 Three sources of secondary data were explored for inclusion within this document:
- Crunchbase**
- A.3 To further explore whether businesses participating in LMT programmes are attracting external investment, and whether LMT participation aligns with investment-raising events, Technopolis have made use of Crunchbase – a platform that provides information on businesses and funding events.
- A.4 Of the ~430 unique organisations participating in LMT projects, Technopolis were able to identify 215 (50%) in Crunchbase (the remainder were mainly public orgs and universities). Of these, 88 have one or more instances of securing external funding (251 deals in total, 2010-2025). Crunchbase provides details on the type of funding, the date and the financial amount.

- A.5 Findings evidenced that investment/ funding activity was relatively low pre project participation, and increased gradually, peaking during IUK LMT project period — with the highest number of investment/funding rounds in 2023 (63). This suggests a clear increase in funding and investment round announcements following the start of IUK LMT project participation.
- A.6 Table A-1 shows the different types of funding / investment round that are captured.

Table A-1: Funding/ investment round

Investment Type	Number	Investment Type	Number
Grant	131*	Non-equity assistance	4
Seed	28	Post-IPO debt	5
Pre-seed	7	Private equity	3
Series-A	16	Series-B	6
Equity crowdfunding	5	Corporate Round	2
Convertible Note	2	Series-C	2
Debt Financing	7	Undisclosed / Unknown	28
		Grand Total	251*

Source: Technopolis Crunchbase data, 2025. *Note: 13 LMT grants are included, which have then been removed from the subsequent analysis.

- A.7 For the 88 companies with funding data, Technopolis have tracked deals (both volume and value) over time at the company level. Technopolis have analysed the total number and value of deals for each company since the start of their LMT project, and then also compared this with the number and value of deals achieved in an equivalent period prior to the project start date (i.e. if the LMT project started 2 years ago, Technopolis have compared the 2 years, pre- and post this start date)
- A.8 At the overall portfolio level, this reveals:
- LMT participants have achieved 110 deals since their project started. This is 43% higher than the 77 deals they achieved in the same length of time before project start.
 - LMT participants have achieved deals worth \$4.7bn since their project started. This is more than five times higher than the \$0.8bn achieved in the same length of time before project start.
 - On average (per company, amongst these 88), organisations have secured 1.3 deals worth \$52.9m since project start, and 1.0 deals worth \$9.7m in the same period before.

Meltwater analysis

- A.9 To assess the public dissemination of LMT projects, a structured search of media output was conducted using Meltwater, a media monitoring and analytics platform. The data collection for each project covered the past year (period from 12 August 2024 to 12 August 2025), capturing online news and print, as well as social media activity on platforms, blogs, and forums. For accuracy, search queries were tailored for each project by combining project titles or acronyms with lead organisation names, and articles were manually screened to remove irrelevant results. The search process also involved an

iterative refinement of keywords to ensure that retrieved content was directly attributable to the projects.

- A.10 Meltwater's metrics enabled assessment of both the quantity and quality of media coverage. Estimated views gauged the average exposure of articles, reach measured the potential audience size, and engagement captured interactions across platforms such as Facebook and Twitter. These data points were collected for each project and aggregated at the programme level, providing a comprehensive overview of LMT projects' media performance.

Dimensions

- A.11 Dimensions is a comprehensive research database that provides patent and publication data. The LMT projects were identified within the Dimensions dataset. However, only Maritime and Rail (FOAK) of the seven programmes were associated with patents and only Maritime, Rail (FOAK) and CCAM were associated with publications within the dataset⁴. As not all the programmes were associated with patents and publications from the dataset, there is some discrepancy to self-reported information from project beneficiaries which will be further explored with the Dimensions team. Dimension data has therefore only been included for programmes where patents and publications have been linked.

Beneficiary survey

- A.12 An online survey of beneficiaries was developed and distributed to all project beneficiaries within scope of this report, amounting to 220 recipients. Both project leads and partners were invited to complete the survey, meaning that multiple responses could be captured from each project. The survey included a range of multiple choice and free text questions and allowed for the gathering of valuable additional data beyond the core data collected by IUK via IMS, QMS monitoring reports and applicant information data.
- A.13 Unique surveys were created for each programme and whether a beneficiary had responded in the previous wave. The number of questions therefore varied slightly between programmes and whether a beneficiary had responded in the previous wave. However, the core survey questions remained consistent between programmes and whether a beneficiary had responded in the previous wave. The survey was completed by 36 beneficiaries which had not returned a survey in the previous wave and 109 beneficiaries which had returned a survey in the previous wave.
- A.14 The survey was open for a period of approximately six weeks, from 23 July 2025 to 1 September 2025. The survey received a total of 145 responses, with some projects receiving multiple responses. In total the survey achieved a portfolio response rate of 66%. This is a good response rate for a survey of this type and means that responses to the survey can be considered broadly representative of beneficiary views.
- A.15 Table A-2 shows the beneficiary survey response rates and number of responses from unique organisations within each of the seven programmes.

⁴ This data was based on metadata [as of 01/09/2025 for Wave 2] from Digital Science's Dimensions platform, available at <https://ukri.dimensions.ai/>. Access was granted under licence agreement with UKRI.

Table A-2: Beneficiary survey response rates and overall number of responses

Programme	Number of Responses	Number of beneficiaries sent the survey	Response Rate
ZEHID	30	42	71%
CCAM	51	70	73%
Hydrogen	11	11	100%
FOAK	26	39	67%
Net Zero propulsion	13	39	33%
TDD	14	19	74%
Total	145	220	66%

Source: Steer-ED survey response analysis, 2025

Depth interviews with beneficiaries and wider stakeholders

Interview methodology

- A.16 The qualitative research component comprised one-hour depth interviews conducted with programme beneficiaries and a selection of wider stakeholders. The interviews were held using MS Teams and were guided by a topic guide.

Beneficiary interviews

- A.17 As Table A-3 shows, a total of 61 interviews were undertaken with project beneficiaries (project leads, and in some cases project partners) during the period 4 August 2025 to 25 September 2025. The number of interviews undertaken varied by programme, in accordance with the number of stakeholders involved in the programme. The ZEHID and CCAM programmes were a key focus for beneficiary interviews due to the substantial number of beneficiaries participating in these initiatives.

Wider stakeholder interviews

- A.18 Interviews with wider stakeholders took the same format and were conducted with a selection of knowledgeable industry stakeholders (from both commercial and academic institutions), based on recommendation by IUK and programme sponsors. These interviews were conducted over the period from 1 August 2025 to 24 September 2025. As Table A-3 shows, a total of 50 interviews with wider stakeholders were completed. Priority was given to programmes with the largest funding allocation, and therefore ZEHID and CCAM were a key focus for wider stakeholder interviews.

Table A-3: Beneficiary and Wider Stakeholder Interviews

Programme	Number of Beneficiary Interviews	Number of Wider Stakeholder Interviews
ZEHID	14	15
CCAM	21	10
Hydrogen	5	9
FOAK	8	8
Net Zero propulsion	8	4
TDD	5	4
Total	61	50

Source: Steer-ED interview analysis, 2025

Interview notes and analysis

- A.19 All interviews were recorded and transcribed using the automatic transcription facility on Microsoft Teams. A note-taker also attended each interview and took detailed notes of the conversation between the interviewer and the interviewee. Following the interview, the notes taken by the note-taker and any notes taken by the interviewer were either manually coded or analysed using qualitative analysis software, Atlas.ti. Both forms of analysis were guided by a coding frame aligned with the study's research questions and topic guide to ensure consistency. Coding was conducted by the programme leads and project team support to ensure consistency and reduce bias, with openness to emerging themes. Learnings from these interviews, supported by quotations, are provided throughout this report.

Case studies

- A.20 A total of 16 case studies have been developed for the monitoring commission (two or three case studies for each programme). Three of these have been developed for this report and are presented as vignettes within the report and as separate full write-ups within the annex. The case studies were developed through interviews with project leads and supporting desk research. All case studies have been reviewed by the programme's independent panel of subject-matter experts, selected for their expertise in relation to the programme or technology in question. This provides a valuable external perspective on the importance and potential long-term impact of the technology in question.

B Case Study: Compact battery propulsion for inclusive regional trains

Introduction	
Project Value	£202,703
Project Duration	23 months
Start date	8/01/2023
End date	31/01/2025
Context & Objectives	
Project summary	This project advanced the development of next-generation zero-emission battery trains for the UK, targeting commuter and suburban services. It built on Hitachi Rail's earlier hybrid train trial and focused on making battery systems more compact, modular, and safe. Specifically, key aims were to: • Develop a modular battery enclosure and cooling system to increase energy density while reducing size, enabling lower floors and improved accessibility. • Validate fire safety and mitigation measures through large-scale testing of lithium iron phosphate (LFP) cells. • Produce verified designs and manufacturing drawings to support near-term commercial deployment.
Context	Hitachi is a multinational rolling stock manufacturer. The challenge was twofold. Around 2,000 ageing diesel units still in UK service and decarbonisation requires rapid shift to zero-emission alternatives. However, the UK's railway has unique constraints: tighter loading gauges and limited underfloor space for batteries compared with much of Europe. Meeting the required range and power levels within that space had not yet been solved. Second, the industry lacked knowledge on how lithium iron phosphate (LFP) batteries behave in railway-scale applications, particularly in fire or failure conditions.

Objectives	The project's key objectives included: • Reducing the volumetric size of the battery enclosures to support low-floor accessible train designs; • Increasing modularity and maintainability; and • Validating fire safety through large-scale testing. At its core, the project was focused on turning conceptual ideas into a practical, commercial design that could be deployed on real UK routes.
Project Activities	
Outline of process activities	Hitachi Rail worked in partnership with DB ESG and the University of Birmingham, supported by suppliers such as Turntide Technologies. Together they developed a modular battery enclosure design and undertook extensive safety validation. One of the most significant activities was a programme of large-scale fire testing at Sphere, a specialist facility in Germany. No equivalent UK facility was available, which created delays and highlighted a gap in domestic testing infrastructure. The tests forced LFP cells into thermal runaway conditions and measured both fire behaviour and the gases emitted. Results showed that Hitachi's proposed fire mitigations - including water-cooled plates and inter-cell insulation blocks - performed exceptionally well, often preventing runaway entirely. The tests also provided data on hydrogen fluoride emissions, giving the team a much clearer understanding of how to design exhaust systems and inform safety standards. Alongside this, the University of Birmingham contributed academic modelling and simulation to validate the designs, while Ricardo supported hazard assessments and safety cases. DB ESG led on mechanical design of the enclosures. Together, the consortium produced a complete set of manufacturing drawings and a modular design concept that could be easily adapted for future contracts.
Outcomes & Impacts	
Outcomes	The project achieved its main objectives and, in some areas, exceeded expectations. The design is unique in the UK market, able to pack sufficient energy into the constrained loading gauge while enabling lower floors for improved passenger accessibility. While the project's core objectives focused on compact design, modularity, and maintainability, one of the most valuable outcomes turned out to be the fire testing programme and knowledge of LFP stability. Hitachi Rail and its partners discovered that their fire mitigation systems, particularly the water-cooled plates and inter-cell insulation blocks, were far

	more effective than expected. In some tests, the cooling systems were so robust that the team could not induce thermal runaway, even under extreme conditions. The fire testing generated new insights not previously available to the rail sector, raising the overall level of industry knowledge and directly feeding into regulatory work by the RSSB. Although the project activities stopped short of producing a physical demonstrator, by the end of the project in February 2025, Hitachi secured a contract with Grand Central to supply tri-mode trains using the new battery design. Further bids are also leveraging the design, and Hitachi anticipate that all future rolling stock tenders in the UK will require some form of battery capability. <i>“I don’t think we’re going to sell another train in the UK without a battery on it.” Case study beneficiary</i>
Impacts	Beyond the UK, the compact, modular design has attracted international interest through Hitachi’s global rail network. While no contracts have yet been signed, the technology has already been put forward in proposals overseas, showing export potential. The impacts are both immediate and longer term: • In the short term, the project has strengthened Hitachi’s market position, improved technical knowledge, and delivered a design now being commercialised, as demonstrated by the contract secured with Grand Central. • Over time, widespread adoption could remove thousands of diesel engines from the UK network, cutting CO₂, NOx and particulates, lowering maintenance costs, and enabling quieter, more accessible trains.
Additionality	The project contributed to addressing the challenge of the UK railway industry’s reliance on diesel traction for its rolling stock, accelerating the development of battery technology and adding to the level of overall industry knowledge. Hitachi Rail would probably have developed a product eventually, because customer demand is strong and it aligns with their rolling stock strategy. But without IUK support, progress would have been: • Slower – they would have waited until a commercial contract forced the investment. • Less collaborative – they would not have had the same level of engagement with DB ESG, the University of Birmingham, or Ricardo, meaning they’d have missed out on academic insights and rigorous hazard assessments from a wider range of industry experts.

	• Less comprehensive – they would not have been able to carry out the dedicated fire testing programme with the same efficiency, which became one of the project’s most important contributions. <i>“I think we probably would have got there, but it just wouldn’t have been done with the same efficiency or with the type of insight we got from having a collaborative project like this.”- NZP beneficiary</i>
Successes and lessons learnt	
Key lessons	Three major successes were identified • The technical insights from fire testing • The positive industry reception (including press coverage and dissemination through RSSB) • Hitachi’s ability to seamlessly move from design concept to live commercial contract The latter was particularly valuable; by having the Innovate-funded design ready, Hitachi could present customers with a mature solution rather than starting from scratch. There were, however, important lessons. The lack of UK fire testing capacity was a significant barrier, forcing the project to rely on facilities abroad and delaying design validation. Administrative burdens, particularly securing independent accountants’ reports, were disproportionately time-consuming compared with the technical work. On the technical side, the project reinforced the importance of modularity and fire safety as differentiators in the market and showed how academic–industry collaboration can accelerate innovation.
Next Steps	Hitachi Rail is now integrating the battery design into trains for Grand Central, due to enter service in 2028. It is pursuing further contracts in the UK and abroad and expects the design to become a core part of its rolling stock offering. The company is also continuing to contribute to RSSB working groups, ensuring its fire safety findings shape emerging industry standards. Future opportunities include retrofitting existing diesel fleets with battery units, exporting the modular design overseas, and developing complementary products such as a Battery Driver Advisory System (B-DAS) to optimise energy use. <i>“[The project has] raised the bar for the industry in terms of understanding of how this type of battery technology can be utilised in the railway context.”- NZP beneficiary</i>

C Case Study: Higher performance modular dual motor propulsion system

Introduction	
Project Value	£1,092,321
Project Duration	21 months
Start date	1/6/2023
End date	28/2/2025
Context & Objectives	
Project summary	Talos was founded in 2018 by two co-founders, both experienced engineers with long careers in the automotive industry. The IUK-funded HIPERMod project gave the company the opportunity to transition from consultancy into a product-based business. The project centred on the development of a dual flux electric motor design, integrating permanent magnets and electromagnets in a single rotor. This technology offers higher efficiency across a broader speed range, reduced reliance on costly permanent magnets, and lower overall operating costs.
Context	Electrification is critical to decarbonisation of transport, but motor innovation has lagged compared to battery advances. Talos's dual flux technology fills an important gap by addressing both efficiency and supply chain resilience. Talos' tech aims to: • Improve the efficiency and performance of electric motors. • Reduce reliance on permanent magnets, which are expensive, environmentally damaging to produce, and subject to supply chain risk (China dominates production). • Enable smaller, cheaper batteries while extending range, reducing cost, and lowering emissions.
Objectives	The key aims of the project were to: • Develop and test a novel dual flux electric motor. • Integrate the motor into a demonstrator motorcycle. • Generate new IP and patents.

	Position the company to attract investors and commercial partners.
Project Activities	
Outline of process activities	The grant enabled Talos to expand its capabilities rapidly. The company hired new engineers, invested in specialist modelling and simulation tools, and built and tested prototype components. Collaboration was central. Talos initially worked with ARC Ltd, an electric motorcycle manufacturer, before partnering with Lyra Electronics to support inverter development. Both partners subsequently went into administration, forcing Talos to restructure its project plan and assume a larger share of the work. Despite these disruptions, the company successfully built and tested a demonstrator motorcycle equipped with the dual flux motor. There were technical challenges too, notably, deciding when to stop iterating designs and commit to physical builds. Reliance on external suppliers also drove up costs, with logistics and transport accounting for around 10% of the budget. Nevertheless, the combination of simulation and real-world validation proved powerful, accelerating progress from low-level concepts (TRL 2–3) to working demonstrators (TRL 4–5). The project’s biggest success was demonstrating the dual-flux motor in a working motorcycle, moving the concept from theory into a tangible prototype that could prove its efficiency and reliability. This demonstrator was critical in building credibility with investors and OEMs, helping Talos to attract follow-on funding and industry interest. Alongside this, the company secured patents for its technology, transitioned from consultancy to product-led start-up, and expanded its technical team. The ability to adapt when delivery partners went into administration was itself a success, showing resilience and ensuring the project still delivered meaningful outcomes. Talos found the LMT programme supportive and enabling. IUK’s flexibility, particularly when partners failed, was seen as pivotal in keeping the project on track, and MSPs provided constructive oversight without creating undue burden. The application process was workable, though securing partner commitments was challenging, and the requirement for additional accountant reports during delivery was an administrative frustration.
Outcomes & Impacts	

Outcomes	By the end of the project, Talos had: • Produced a working demonstrator motorcycle showcasing the dual flux motor. • Filed patents and secured valuable intellectual property (submitted patents have not yet been granted but IP protections are in place). • Transitioned from consultancy to a high-growth start-up, attracting strong investor interest. • Increased technical capacity through new hires and specialist skills • Technically, Talos proved its concept in hardware, moving the technology from TRL 2-3 to TRL 4-5, with plans to reach TRL 7-8 in the next phase.
Impacts	Efficiency improvements of 10–20% could reduce vehicle emissions significantly, while reduced reliance on permanent magnets lowers costs and mitigates environmental damage from mining. The design also offers a safer failure mode: rather than sudden heavy regenerative braking, the motor freewheels, improving safety in real-world use. The project raised Talos’s profile with OEMs and investors, securing £1.8 million in follow-on funding through the Drive to 35 programme. For a small start-up, this credibility was significant <i>“Where we were three years ago, external investors would not really be interested in the company because it was nothing proven. It was just some ideas. IUK has taken that risk with us and now we’re in a much better position.” – NZP beneficiary</i>
Additionality	The grant was essential. Without it, Talos would have not been able to fund the resource costs to develop the technology and would have had to continued focussing on consultancy work to maintain company cash flow. This would have resulted in the technology progressing much more slowly, if at all. The funding enabled demonstrator builds, IP generation, and investor engagement.
Successes and lessons learnt	
Key lessons	A number of factors underpinned the project’s success. Strong founder expertise and a long-term vision provided resilience when partners failed. The decision to focus on motorcycles as a manageable first application proved strategic, allowing Talos to refine the technology at a realistic scale before moving into larger markets. Key lessons included the importance of balancing simulation with physical validation, the need for demonstrators to build credibility, and the value of flexibility, both from IUK, who

	adapted requirements when partners collapsed, and from Talos, who absorbed additional work. Barriers included partner insolvencies, reliance on suppliers, and wider sector downturns, while enablers were IUK's flexibility, Talos's internal expertise, and strong investor appetite once the demonstrator was in place.
--	--

D Case Study: Paradigm Shift

Introduction	
Project Value	£515,391
Project Duration	20 months
Start date	01/09/2023
End date	31/03/2025
Context & Objectives	
Project summary	The Paradigm Shift project aims to develop and test a prototype two-speed gearbox for an electric motorcycle. The project is a beneficiary of the Zero Emission Propulsion CR&D competition run by IUK. The project was awarded a grant offer of £515,391 by IUK. Although electric vehicles can launch and reach top speeds with a single gear ratio, adding a light and cheap gearbox could improve the performance of electric vehicles while reducing the cost of the overall build of the vehicle. In addition, this technology may be applicable to a range of vehicle types and engines. The project is a partnership between BSA Company Ltd (a subsidiary of Mahinda Group, which resurrected the BSA brand upon their introduction of the Gold Star petrol-powered motorcycle in 2016), Zeroshift Transmissions, a subsidiary of the Jardines Group, and the University of Bath. BSA Motorcycles and Zeroshift Transmissions are developing the gearbox, while testing of the prototype occurs at the Institute of Advanced Automotive Propulsion Systems (IAAPS) facility at the University of Bath.
Context	Currently, most electric vehicles rely on a single gear ratio and while they do not require a two-speed gearbox, this can help an electric vehicle improve its range, acceleration and speed. The Paradigm Shift project looked to address three key issues which increase the feasibility of installing two-speed gearboxes in electric vehicles: • The cost - which is considered to be too expensive; • The weight – they are too heavy; and • The electric system – which replaces the gearbox hydraulics.

	The concept of developing a lighter, more energy efficient and smaller gearbox was not necessarily a new idea. Indeed, Zeroshift Transmissions Ltd was originally working on the idea in the mid-2000s; however, during the 2007/08 global financial crisis, the financial backing for the project was withdrawn and the project concluded early. BSA Company Ltd. is currently in a consortium sponsored by the Advanced Propulsion Centre UK to develop an electric “retro-roadster” motorcycle targeted at the mid-performance segment. In 2022, BSA Company Ltd approached Zeroshift Transmissions Ltd about a potential collaboration and to restart the project for their electric motorcycle. Once the partnership was agreed, the team decided to approach IUK for project funding.
Objectives	The Paradigm Shift project aims to develop a two-speed gearbox which satisfies the following criteria for the partner BSA motorcycle: • The gear shift must be smooth; • The gear shift must be quiet; • The gearbox must be packaged within the motorcycle; • The gearbox must be durable; • The gearbox must improve the motorcycle acceleration compared to its single speed equivalent; • The gearbox must help improve the city cycle range of the battery; and • The gearbox aims to lower the cost of building the motorcycle compared to the current configuration (the battery and motor can be downsized). In addition, the project has wider objectives, including: • To derisk the process of adding two-speed gearboxes to electric vehicles of all types by proving the viability and performance benefits of this two-speed gearbox. • To provide a more-efficient gearbox which can be applied to combustion engine vehicles as well as electric vehicles. By replacing conventional hydraulics with electrical actuation, the gearbox will be more energy efficient, and less energy will be lost in the power transmission from the engine (in a combustion engine vehicle) or motor (in an electric vehicle) to the wheels.
Project Activities	
Outline of process activities	The Paradigm Shift project has developed the technology for a two-speed gearbox which can be applied to electric motorcycles – with potentially wider application to other electric vehicle types as well as combustion engines.

	To test the technology, the project has utilised a rig at the IAAPS facility at the University of Bath to test the performance of the gearbox and make changes in response to the observations from the tests. The project will also carry out final back-to-back testing. The project originally intended to trial the technology with an existing motorcycle clutch; however, due to the level of expertise and knowledge within the team, the project was able to develop a new type of clutch to test the technology. The new clutch was smaller and lighter. While this had some implications in terms of cost and delivery timeframes, this was considered to be key to the success of the project. Another success highlighted by the project manager was the collaboration with IAAPs and access to the IAAPS facility. This added value to the project by enabling robust testing of the technology and access to the team and their expertise. The feedback from the IAAPs team gave the partners confidence in the project technology regarding novelty and wider applicability.
Outcomes & Impacts	
Outcomes	The project has developed a prototype two-speed gearbox for an electric motorcycle, which is lighter and cheaper than current alternatives for electric vehicles and contains an effective electrical system to power the gear shifts. In the process of developing the two-speed gearbox, the project has also developed a novel and innovative clutch design. The project will test the prototype gearbox on a rig to test the performance of the gearbox compared to a single speed BSA EV motorcycle. The project will use the testing of the gearbox on the rig to ascertain the rideability of the motorcycle with the new gearbox packaged into the vehicle The final back-to-back testing will aim to prove the performance superiority over the conventional configuration of the BSA Motorcycle without a two-speed gearbox. The results of the test will help contribute to the patent applications Zeroshift Transmissions have made to secure the IP from their novel work. Once IP is secured, the project will use the IAAPS facility to demonstrate the project to other members of the automotive industry to gain further funding to develop the gearbox further and eventually commercialise the technology. Other outcomes noted by the project manager including the relationships formed with partners, many of which were new, including IAAPs. This relationship is expected to continue post-project completion.

Impacts	The project has the possibility of providing wide-ranging impacts which could greatly affect and disrupt the automotive industry. The project aims to first prove the feasibility of adding a two-speed gearbox to electric vehicles. If cheap, light and well-packaged, the gearbox will be commercially attractive to add to electric vehicles. The application of this technology also offers the possibility of reducing the size and weight of electric vehicle batteries and motors, the two most expensive components of the majority of electric vehicles. The addition of a two-speed gearbox to electric vehicles could also improve the range and acceleration of electric vehicles. By reducing the cost and weight of electric vehicles and improving their performance, the improved gearbox developed in this project could increase the attractiveness of electric vehicles in comparison to combustion engine vehicles to customers and thus increase the uptake of electric vehicles amongst end users. However, a rise in uptake would be heavily dependent on whether the project can deliver both initial capital and operating cost savings for end users. Any increase in electric vehicle uptake caused by this project would contribute to a reduction in carbon emissions and help decarbonise the automotive industry. The project's objective of developing electrical actuation to replace gearbox hydraulics and its development of a novel clutch concept could have wide impacts on the automotive industry beyond the electric vehicles sector. These technologies could be applied to vehicles including combustion engine cars and motorcycles (including excavators, diggers, tractors and tanks). By applying these novel technologies to combustion engine vehicles, they could reduce energy loss during transmission from engine to wheels. This could improve the efficiency of these vehicles and reduce their cost.
Additionality	The IUK funding for the project has been essential for the continuation of the Paradigm Shift project. The funding has enabled Zeroshift Transmissions to take risks and invest their workforce's time in innovation R&D that they may have otherwise been unwilling to do. Without the additional funding for the project from IUK, Zeroshift Transmissions would have been nervous about starting the Paradigm Shift project.
Successes and lessons learnt	
Key lessons	The Paradigm Shift project has led to many lessons being learnt. During the course of the project, technical changes were made which delayed the progress of the gearbox development and testing.

	The original application for funding had a couple of mistakes which needed addressing. Moreover, the project initially used a conventional motorcycle clutch which was too big and heavy to be viable for the prototype. These hiccups have led to the project being delayed. To accommodate this, a couple of change request were made to IUK to overcome these hurdles and keep the project on track to achieve its outputs. The process of working through the change requests and dealing with project timeline issues with IUK has been smooth. IUK have been reportedly relatively hands off with the project, but their desire for frequent updates on project delivery and bi-weekly meetings has enabled them to stay on top of any issues or delays and the team have been able to access their support to keep the project moving forward. A key enabler of the project has been the seamless collaboration of the partners in the project. Zeroshift and BSA Motorcycles have worked incredibly well together. This effective collaboration allowed the company to spend an extra £20k to help cover the additional costs associated with the new clutch design. However, if the Paradigm Shift project had been able to make more drastic changes to the project brief, secure additional finance and deliver the project over a longer timeframe they may have been able to develop and test the new clutch more comprehensively. By developing more variables on the new clutch design and being able to test the variants (by conducting back-to-back comparison tests), the project could further de-risk the gearbox for industry when they seek to commercialise the new design.
--	---

Control Information

Prepared by

Steer Economic Development
14-21 Rushworth Street
London, SE1 0RB
+44 20 7910 5000
www.steer-ed.com

Steer project/proposal number

Our ref: 245-747-02

Author/originator

Rebecca van Zanten, Morgan Anthony

Other contributors

Neil Brown, Isabel Claydon, Amber Gunter

Version control/issue number

LMT Programme Monitoring Report_NZP_DRAFT
LMT Programme Monitoring Report_NZP_FINAL

Prepared for

UK Research & Innovation
Polaris House,
North Star Avenue,
Swindon, SN2 1FL,
UK

Client contract/project number

Reviewer/approver

Josh Stott, Rebecca McCormack, Ali Memory

Distribution

Client: Steer:

Date

25 September 2025
31 October 2025

Progressive thinking
No time for business as usual