Department for Business Innovation & Skills

RESEARCH

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Process Evaluation of the Advanced Propulsion Centre

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Executive Summary

Introduction

This report outlines and evaluates the key steps in the process for delivering the Advanced Propulsion Centre (APC). The objective of this strand of the evaluation, as set out in the Terms of Reference for the study, is to enable the Department for Business, Innovation and Skills (BIS) to understand if the processes work well, how they could be improved (in terms of reducing barriers to and costs of participation and increasing the number of applicants) and whether they are the best possible processes to deliver value for money for this kind of scheme.

Due to the timing of this research, the evidence collected for this evaluation was primarily focused on projects that applied to the APC competition in the first two rounds (APC1 and APC2), involving £59 million of grant funding. While some early anecdotal evidence was also gathered from APC3 (which was in the application and appraisal stages at the time of the research), it should be assumed that this evaluation only reflects the process that was in existence at the time of APC1 and APC2.

The methodology has involved collecting and triangulating evidence from a variety of sources including:

- In-depth case study interviews with successful and unsuccessful applicants;
- Interviews with automotive firms that have not applied to APC;
- Consultations with stakeholders internal and external to the APC process; and,
- Review of process documentation (including submitted applications, appraisal forms and monitoring forms) and wider literature.

Overall assessment of programme

There is a general consensus among applicants and stakeholders (including both officials overseeing and administering the process and external industry stakeholders) that the APC is the right approach to provide a catalyst for the necessary product development in the UK automotive industry. The competition is complementary to the Innovate UK led Low Carbon Vehicle Innovation Platform (LCV-IP) and provides funding for projects that would not be suitable for any other Innovate UK scheme.

It is possible that many APC projects would be in scope for other BIS competitions, including the Advanced Manufacturing Supply Chain Initiative (AMSCI) and the Regional Growth Fund (RGF). However, as of March 2015, no further funding is expected to be available from AMSCI while the last round of RGF closed in September 2014, although firms can apply for the Exceptional RGF or national or regional programmes that were allocated funding by RGF to disburse to smaller businesses. Some of these are still operating. Moreover, these competitions are much broader in scope and are not mission oriented, which means that they are not set up to ensure that selected projects are in line with the technology roadmaps identified by the UK Automotive Council.

The UK's major competitors in the automotive sector, including Germany, France, China and the US, have all identified the development of low emission vehicles as being important for the future growth of the sector, and the governments of these countries have made significant investment in relevant capacity building.

The evidence from case study interviews suggests that the APC is providing an additional catalyst for projects that were in the pipeline anyway. Some projects would have progressed with private finance in the absence of APC but at a slower pace or on a smaller scale (e.g. in bilateral partnerships).

In particular, the APC has been necessary for the development of collaborations, helping the industry to reap the benefits of working collaboratively while minimising the risks and disincentives of doing so. Due to the complexity of the technologies involved and the need for diverse specialist expertise, most of the projects funded by APC would not proceed to the same scale or scope except through vertical collaboration.

Marketing and communication, and application process

Consultations with applicants and stakeholders suggest that awareness levels are high amongst OEMs[1] and other large firms and low amongst small and medium sized enterprises (SMEs). Awareness is also low among potentially successful applicants to the competitions funded through the LCV-IP. The LCV-IP is an Innovate UK programme which funds early stage research into low carbon vehicle technology and as such provides a potential pipeline of projects to APC. It should be acknowledged, however, that a marketing strategy has only recently been put in place. Levels of international awareness have proven more difficult to gauge, though the view of stakeholders was that the scale of subsidies available were sufficiently large to be influential.

Recommendation

It is recommended that monitoring information on the progress of LCV-IP projects is fed back to APC UK Ltd to allow them to have some oversight of the pipeline of projects coming through, and target their marketing more effectively (subject to appropriate information sharing agreements being signed).

Concerns have been raised around the number of applications being received by the APC, which appear low relative to LCV-IP. Quality over the first two rounds was high, with all but one passing minimum technical standards. However, there was a fall in quality in APC3 (including projects at an insufficient stage of technical development). Branding issues were raised as an issue, with the APC evocative of a physical research facility rather than a grant programme.

[1] Original Equipment Manufacturers – end of supply chain vehicle assembly firms

Recommendation

There may be benefits in reviewing how the APC is branded to make it more obvious to applicants what the scheme involves, and how it is fundamentally different to competitions funded through Innovate UK. More strategically, alignment of the early stage funding available from Innovate UK with the late stage funding provided through APC could also minimise resources wasted and simplify the landscape for applicants. If applications were made through a more general gateway, BIS and Innovate UK could route the application through to the appropriate competitions (rather than relying on the applicant to do so themselves). Note that this would involve some alignment of the marketing and communications and application processes, but other parts of the process can be managed independently by Innovate UK and APC UK Ltd respectively.

Greater integration or information sharing between early and late stage funding could be beneficial in allowing APC UK Ltd to take a more pro-active role in identifying fundable projects, as well as allowing them to more actively intervene in catalysing new partnerships at earlier stages of technical development (which may not lead to an immediate pay-off in the form of new APC applications, but could support the creation of a pipeline of fundable projects).

No major concerns were raised about the clarity of programme scope and eligibility criteria. However, applicants appeared ill prepared for the value for money (VfM) aspects of the appraisal process, an issue for which corrective action has already been taken for later rounds, in the form of improved guidance for applicants on what to expect from this aspect of the appraisal. Care will be needed to avoid making the VfM calculations too transparent to applicants, though clearly advising applicants on how to structure the delivery of their projects so as to maximise economic benefits to the UK will be potentially beneficial.

A number of issues were highlighted in this review that may be inhibiting applications. These include the timing of application rounds and their duration, the cost of preparing an application, and the requirement for OEM or Tier One involvement. The latter two points are picked up below, but applicants stressed that the time required to build a consortium and prepare a written submission is substantial (and the windows allowed may not be sufficient to secure involvement from an OEM, who may take two months to decide on whether to participate).

Recommendation

A timetable of future rounds should be published on the APC website to give potential applicants confidence that future funding will be available, and the flexibility to prepare applications over longer timescales if required.

The requirement for OEM or Tier One involvement was also raised as a substantial issue that may exclude many SMEs from applying. In particular, those SMEs that are strategically aligned to an OEM would likely take a junior role in a partnership. Those that do not have existing relationships would struggle to secure involvement as there would be

no incentive for the OEM to commit resources. As such, this criteria will likely limit applications to the APC.

Recommendation

While the removal of requirements for OEM involvement may increase applications, there is a clear rationale for these restrictions in that this involvement will be required to reach consumers in large quantities (and bids without the involvement of OEMs may be of a much higher risk). Consideration of the potential for a smaller funding round, aimed at testing the commercial potential for bids without OEM involvement, could be one way of testing whether such risks are acceptable. Alternatively, such a constraint could be relaxed by requiring a letter of support from an OEM rather than a financial commitment to the project (to provide some evidence of commercial potential).

The cost of preparing an application may also be inhibiting application volumes (particularly for more “marginal” projects).

Recommendation

An expression of interest (EOI) process, allowing applicants to submit an outline bid in advance of a full application, could encourage higher application volumes. Whilst expression of interest meetings provide an opportunity for early feedback. This would also offer an opportunity for BIS or Innovate UK to provide more detailed feedback that could enhance the quality of full applications.

Appraisal and selection process

There is currently no formal scope check for APC prior to applications being passed to assessors. Having this additional step may improve the efficiency of the process, by ensuring that VfM and technical assessors are only asked to look at bids which are within scope. Alternatively, this problem could be addressed through the introduction of a formal EOI prior to full submission.

Recommendation

The introduction of an EOI stage into the application process would improve the efficiency of the appraisal process by requiring assessors only to look at those bids that pass a minimum threshold of quality.

The technical assessors are highly experienced and have in-depth technical knowledge of relevant technologies and how they fit into technology road maps. The moderation process

ensures that any specialist knowledge of a particular assessor is given sufficient weight, while the feedback and interview process allows the assessors to understand fully all project proposals, and ensure their questions are answered. However, the fact that most assessors are in the same professional networks as many of the applicants could expose the appraisal process to perceptions of conflict of interest, although it should be noted that assessors are expected to declare any conflicts of interest before undertaking the assessment, and there is no evidence from the evaluation that appraisal scores are biased in any way. It was also found that the time allotted to technical assessors to appraise the bids appears to be inadequate relative to the task involved.

Recommendation

Innovate UK may wish to consider whether the remuneration to technical assessors could be reviewed, to ensure that the thoroughness of the technical assessment is not compromised.

As well as technical expertise, the technical assessors also have a wider industry and market knowledge and are best placed to judge whether a given project proposal has commercial viability. While a certain degree of commercial risk is inevitable for R&D projects, it appears that the process does enable these risks to be understood fully.

The process for generating additional information and clarification from applicants enhances the accuracy of the assessment but there is a question as to whether this is necessary for all but marginal applications. Additionally, there is a case for suggesting that more support could be given to applicants on the information required for the VfM assessment, and the process by which that information will be assessed, without “giving away too much”.

In general, both successful and unsuccessful applicants find the feedback from the technical assessment to be very helpful for enhancing their bid, although mainly to help them better explain their project rather than make substantial changes. Opinions of the VfM feedback were more mixed, however. The process could be made more streamlined by providing a single piece of feedback and a single point of contact for applicants during the appraisal stage. This has now been implemented for APC4.

Recommendation

The guidance for the VfM assessment could be reviewed to ensure that applicants provide comprehensive and accurate data on economic benefits and additionality minimising the need for further iterations. It is noted, however, that improvements to the guidance have been made for APC4.

The interview is felt by both applicants and technical assessors to be a very important part of the process and ensures that the technical assessors are completely happy that the

project is fundable. While cost savings could be made by limiting the number of attendees and/or inviting only more marginal projects to interview, the risk to decision-making from making efficiencies from this process are deemed to be significant. BIS economics now participate in panels (from Round 3). To further reduce any risk of bias or conflict of interest in the panel's decisions, including one or more panel member from outside of the industry may help the panel to be perceived as more impartial and independent.

Recommendation

The interview panel could be expanded to include one or more industry experts from outside the automotive sector to provide an alternative perspective alongside the technical assessors. This individual could also take part in the moderation process, to reduce any perceived bias among the technical assessors.

Lead applicants spend significant resource engaging with the appraisal process, although generally they do not feel that this is disproportionate relative to the funds involved. An entire appraisal process involves about 1,400 hours of APCUK Ltd, Innovate UK and BIS time (including external assessors).

There is also significant time involved from technical and VfM assessors. In particular, technical assessors report that the amount of time they spend appraising each project is significantly higher than the consultancy time allocated by Innovate UK.

Efficiency could be improved by: filtering out inappropriate applications prior to appraisal through an EOI or scope check; providing improved guidance to applicants for the VfM assessment; and streamlining the appraisal process to ensure that applicants get a single piece of feedback and engage with a single contact.

There is also scope for a fuller integration of the VfM and technical aspects of the appraisal process, both in terms of reducing duplication in the application form and providing a more integrated customer journey with a single point of contact throughout the process.

Recommendation

The appraisal process could be more integrated so that applicants get a single set of feedback and work through a single main contact. This has now been implemented in APC4. We also recommend reducing the number of questions in the application form by identifying duplication between the VfM and technical questions, and recognise that substantial improvements have been made for the APC4 application form.

Contracting and due diligence process

Due diligence is a key part of the process to ensure that project partners are financially sound and the grants are State Aid compliant. For APC, the process is evidently light touch with minimal administrative burden on applicants. While there is no indication that the due diligence process is insufficiently rigorous, it should be noted that the grant size for APC is significantly higher than for most other Innovate UK competitions, and therefore the risks associated with these payments are substantially higher. The due diligence requirements for other BIS programmes, including RGF and AMSCI, are substantially higher than for APC, involving external expertise and requiring significant input from applicants. While these requirements created an additional burden for applicants, the process evaluations for both of these programmes did not deem it appropriate to reduce the thoroughness of either the financial or State Aid due diligence processes.

There is no indication that the financial viability assessment led to any changes in consortia, funding levels or project plans. The process was light touch and required little involvement from applicants. Only one project that has gone through the contracting stage so far (in the first two rounds) has modified its consortia post-application in order to meet State Aid requirements.

It has been noted that Conditional Offer Letters and Grant Confirmation Letters do not currently commit applicants to any outcomes except to make the agreed expenditure and progress the project.

Recommendation

The competition partners may consider including reference to other outcomes in the Conditional Offer Letter, in particular key performance indicators that were included in the application and upon which the project was appraised. This could be done in such a way that applicants are held to account for their economic impact without being forced to commit to uncertain outcomes beyond the control of the applicant, given the nature of the R&D. This may include integrating technical or engineering milestones upon which payments are conditional. This would allow BIS the option to consider aborting the project, if the early testing and development is not meeting pre-defined technical standards, and recycle the funds into more promising proposals.

We recommend that any changes are applied only to future rounds and not applied retrospectively to projects that are already in the process. It is expected that some changes to the conditions of the grant will be introduced as standard in APC4.

In spite of the due diligence itself being light touch, the amount of resource required from applicants to draw up the collaboration agreement and finalise project plans was significant. While this is deemed burdensome by many applicants, there was general consensus that all the activities were important for projects of this nature and no significant efficiencies could be made.

Despite the effort entailed to put it together, the collaboration agreement is valued by consortium partners as it supports the functionality and stability of the consortium. There is some evidence to suggest that, if it were not mandatory, some projects may have proceeded without having a full collaboration agreement in place which could provide a threat to the stability of the consortium. Moreover, it is unlikely that any projects would have proceeded on a collaborative basis, and hence not proceeded at all to the same scale or scope, without support from APC.

The Project Delivery Plan is an important document for Monitoring Officers and project managers. In general, this requires significant work for consortia in the contracting stage.

In general, our assessment is that there is limited scope to improve efficiency in the contracting stage. It is a lengthy and intensive process but the required tasks are all necessary. Allowing projects to start “at risk” helps to reduce the impact of the contracting process on project timescales as does encouraging consortia to develop their collaboration agreement earlier, but this can cause problems for consortia where some partners are unable to proceed before grant confirmation.

While the timescales for contracting appear to be appropriate, it is evident that this slows down the progress of some projects. It is recommended that sufficient time is allocated to the contracting process, and that applicants are made aware of these timescales in advance so that consortia can base their applications on realistic start dates, and there is reduced need for projects to start “at risk” before the grant is confirmed.

Recommendation

In recognition of the fact that contracting can be necessarily protracted, timescales for project start dates should be made realistic in published competition guidelines and timetables. Evidence from APC1 and APC2 suggests that in most cases the time allotted for contracting was overly optimistic. Allowing more time for the contracting process would ensure that applicants’ expectations are correct and business plans can be aligned with competition timescales.

Monitoring and performance management process

Examined collectively, the four first round (APC1) projects appear to have started well. An overall score of 3.4 against all criteria suggests that there is adequate performance overall.

In terms of expenditure, a number of projects have got off to a slow start although there are mitigating circumstances which are understood and accepted by the monitoring officer. However, caution should be exercised to ensure that project delays do not impact on the anticipated technological and economic outcomes.

The existing tools and processes used for technical and economic monitoring and risk management are satisfactory. Where gaps have been identified, monitoring officers have provided support and brought applicants in line with the requirements.

Innovate UK has selected a team of monitoring professionals who are able to demonstrate a high level of competency in supporting applicants to fulfil their monitoring duties. Moreover, added value is provided through advisory inputs that can lead to the generation of new ideas to strengthen project implementation. Barriers to engaging in the monitoring process are addressed through the provision of advice or flexible application of monitoring and/or contractual rules to support efficient project implementation. While many of the projects are in their early stages, it is positive to learn that monitoring officers have gained the confidence of project applicants.

However, monitoring officers should be wary of placing too much emphasis on the technical progress of projects and should ensure that project delivery takes full account of the impact on economic outcomes. This relates to the recommendation in the previous section that more stringent conditions could be applied to grants to ensure that projects actually achieve the economic outcomes set out in their application.

Quarterly meetings are essential for monitoring officers to guide applicants towards meeting their expenditure targets and addressing obstacles to this as they emerge. These are working well.

However, the approach to applying Technology Readiness Levels (TRLs) and Manufacturing Readiness Levels (MRLs) to projects is not entirely clear for some applicants. There appears to be some uncertainty about whether project milestones as defined in the Project Delivery Plans are appropriately positioned against the correct TRLs and MRLs. This is important to address as arguably the key indicator of performance is that the technology is progressing to the required TRLs and MRLs, as defined by the technology roadmaps, so that it is ready for mass production at the required time and is therefore on schedule to deliver the expected economic benefits.

Recommendation

Monitoring officers could provide clearer guidance to applicants on how key project milestones correlate with the MRLs and TRLs as defined by the APC. Given that applicants are contractually obliged to meet these standards, it is important for them to understand how projected project progress is correlated with these fixed targets. The introduction of a formalised system for technical monitoring in this area could help to clarify matters.

The economic monitoring process provides the evidence required by BIS to monitor the ongoing value for money of projects. However, from the point of view of the applicant, there is a degree of duplication in the information required by the technical and economic monitoring processes respectively. There is scope for improving efficiency by integrating the two processes.

Recommendation

Innovate UK and BIS, with support from APC UK Ltd, should work together to develop an integrated toolkit that enables consortia to submit a single set of monitoring data in each claim period. The existing monitoring officers, supported by BIS officials, would have the responsibility for ensuring applicants' compliance with providing all required monitoring data. However, the resource allocated to monitoring officers to enable them to undertake their duties effectively may have to be reviewed. It is noted that changes to the monitoring process, similar to that recommended, are currently being planned.

The approach to the management of risk by applicants appears to be appropriate. Large firms manage risks of a similar scale as a part of their usual business activities and have developed appropriate methods for doing so. While the obligation to monitor risks requires the collation of information to a more detailed level than is normally required, this appears reasonable to applicants.

However, without placing further requirements on applicants, clearer guidance to support applicants on Innovate UK's expectations around risk management may be useful in some cases.

Innovate UK's monitoring of risks appears to be appropriate and quarterly meetings provide the opportunity for monitoring officers to ensure that firms design and follow up appropriate mitigating actions. However, the profiling of risks seems to require some fine-tuning as under the existing framework projects may be categorised as high risk but in reality this may not be the case.

The cost per lead applicant of complying with monitoring requirements and submitting claims is significant. However, it is possible that some of this resource would be expended anyway to keep track of project progress, even without the monitoring requirements.

The ongoing updating of the Project Delivery Plans and work package documents do not seem to pose any major burdens on project applicants. Given that similar tools are used in industry as part of project management activities, managing such documents is regarded as a "business as usual activity".

There appears to be a barrier to the efficient reallocation of funds for applicants. Such barriers are not likely to exist for privately funded R&D activities and therefore the existing process appears bureaucratic. Innovate UK may wish to introduce a fixed threshold below which the reallocation of funds or expenditure on unforeseen activities is permitted without formal clearance. This system could rely upon assessment and approval by monitoring officers during quarterly meetings.

The claims process is working well and is perceived as sufficiently efficient. However, some inefficiencies have been identified including: applicants being transferred to multiple persons at Innovate UK to deal with queries; financial claims documents not permitting copy pasting and therefore being difficult to work with; and lead applicants needing to contact project collaborators to learn of the status of their claims.

Future evaluation

It should be noted that the APC competition is still very much in its infancy and this process evaluation covers not much more than the first year of its operation. Over this time, the process has continually evolved and improved, particularly as APC UK Ltd has become more established. The key APC UK Ltd team was not in place until the start of the APC3 competition, so a process evaluation focusing primarily on APC1 and APC2 does not fully reflect the issues going forward. Moreover, much work has been undertaken internally between the competition partners, and in consultation with industry, to identify where the process could be improved to make it more efficient. With that in mind, we recommend that, within the next 12-24 months, a further process evaluation be commissioned alongside or separately to the impact evaluation.

1.0 Introduction

This report outlines and evaluates the key steps in the process for delivering the Advanced Propulsion Centre (APC). The objective of this strand of the evaluation, as set out in the terms of reference, is to enable the Department for Business, Innovation and Skills (BIS) to understand if the processes work well, how they could be improved (in terms of reducing barriers to and costs of participation and increasing the number of applicants) and whether they are the best possible processes to deliver value for money for this kind of scheme. This assessment is based on case studies with successful and unsuccessful applicants, consultations with stakeholders internal and external to the process, and a review of programme documentation. A full description of the evaluation framework underpinning this process evaluation is set out in section 1.3 below.

1.1 Background

The APC emerged from the recommendations of the UK Automotive Council, a body that was established in 2009 and is chaired jointly by the Secretary of State for Business, Innovation and Skills (BIS) and an Industry Chair. Within the Automotive Council, the Technology working group provides advice to the Council on the key research and development (R&D) investment priorities for securing a stronger UK engineering, supply and manufacturing base. This has involved the development of a number of long-term technology roadmaps, representing the shared vision of UK manufacturers and suppliers. These roadmaps have been developed around five sticky technologies: electric machines and power electronics; internal combustion engines; energy storage and energy management; intelligent mobility; and lightweight vehicle and powertrain structures.

An Automotive Sector Strategy was published in 2013which identified three challenges currently faced by the UK automotive sector: lack of supply chain growth and investment; skills shortages for engineers and technicians; and the need to develop more intelligent, lower carbon and highly efficient mobility solutions in order to meet a future shift in global demand.

This strategy outlines specific actions that were to be undertaken collaboratively to secure the next stage in the growth of the sector. The strategy identified an opportunity to respond to the challenge of creating “tomorrow’s vehicles” as “by 2040 almost none of Europe's new cars will be powered solely by a traditional petrol or diesel engine. To deliver this the UK needs not only an increase in R&D investment, but also to capitalise on this by securing production in the UK. This requires innovative small and medium enterprises (SMEs) to be nurtured and investment by multinational companies.” The strategy also emphasised the opportunities relating to maintaining the strength in propulsion technologies and listed all committed companies that supported the idea of the Advanced Propulsion Centre. The strategy also addressed the need for better and more effective coordination between business and academia.

Overview of APC

The APC is the centrepiece of the joint industry and Government strategy for the automotive sector. This joint effort by the Government and automotive industry is set to run over ten years and represents total investment in the region of £1 billion directed at

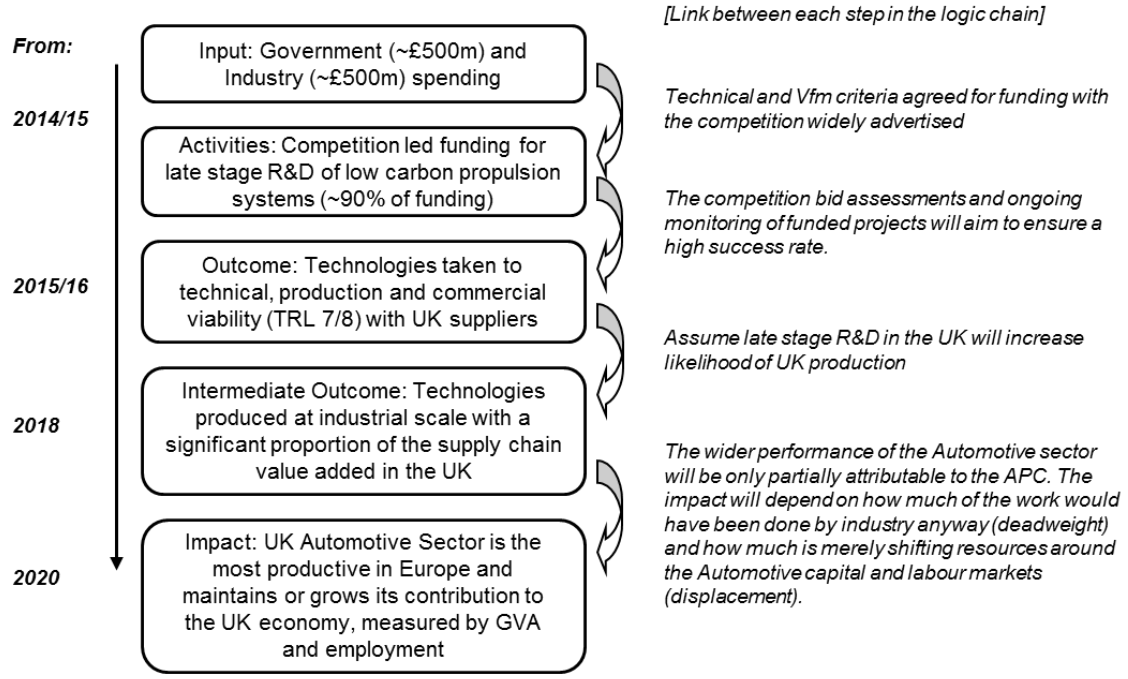
activities related to research, development and commercialisation of technologies for the vehicles of the future. The expected outcomes of the programme are to secure at least 30,000 jobs currently linked to producing engines, plus many more in the supply chain, and to put Britain ahead in the global race for the development of new low carbon propulsion technologies.

The overall aim of the APC is to build on the existing strengths of the UK automotive sector to achieve significant progress in developing low carbon propulsion technologies and products, and help secure its future in global manufacturing. The formally acknowledged intended impacts are to:

- Help achieve the government's emissions targets;
- Develop high value added manufacturing in the UK;
- Win an important share of future propulsion markets.

It is hoped that the achievement of these results will lead to improved trade performance (e.g. exports), productivity and wages. The policy objectives are summarised in the following policy logic model.

Figure 1.1: APC Process - Overview



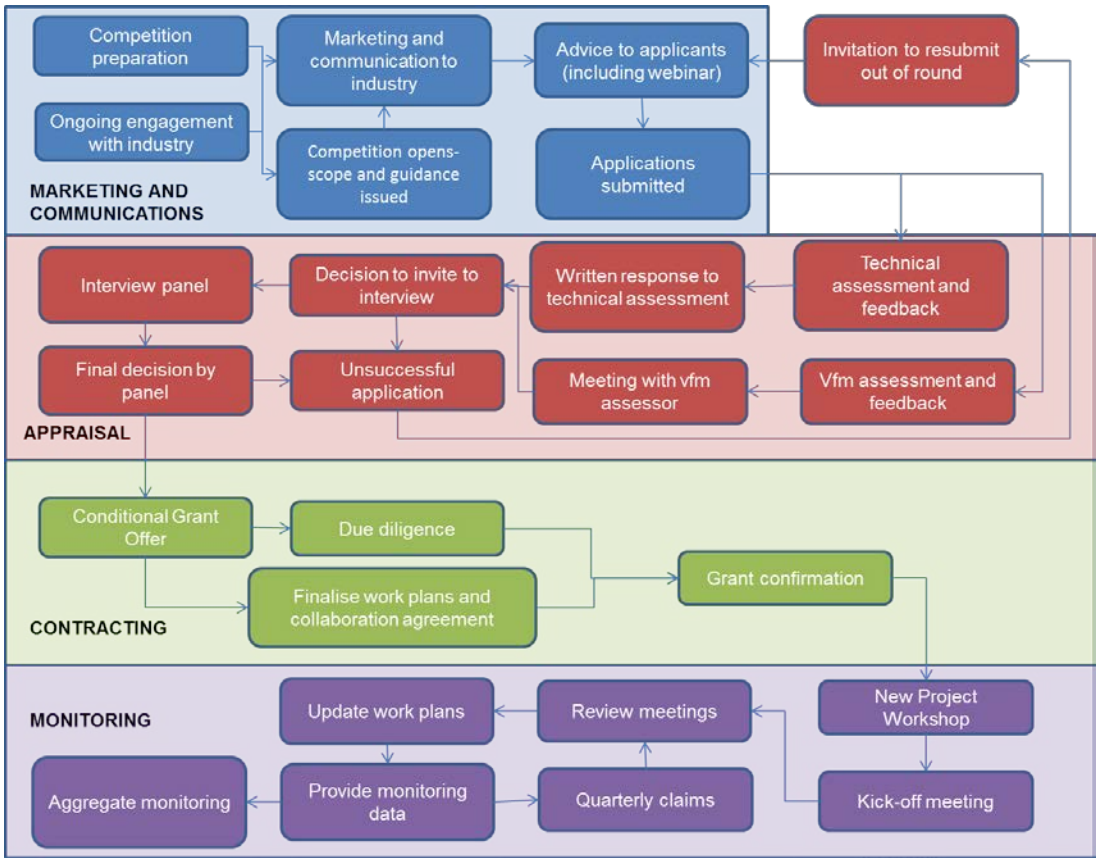
(Source: Evaluation and Monitoring Plan for the APC)

This objective is delivered through the provision of Government finance, in the form of grants to supply chain consortia, to support the development of advanced propulsion supply chain projects that would not otherwise go ahead.

The Government and the automotive industry have each committed to invest £500 million into APC research over the next ten years. The process for selecting projects to be supported involves a funding competition implemented over a sequence of successive funding rounds. At the time of this research, three rounds of projects (APC1, APC2 and APC3) have been allocated funding.

The following diagram summarises the main stages in the competition process:

Figure 1.2: APC Process - Overview



Management of APC Processes

The following bodies are involved in the management of APC processes:

- The Department for Business, Innovation and Skills (BIS) is the policy owner of APC and is responsible for supervising the bodies implementing the initiative and funding the programme. BIS also performs key tasks such as the value for money assessment of applications;
- APC UK Ltd is the company set up to manage and develop the APC, with a particular focus on marketing the competition, supporting consortia to develop bids, developing the pipeline of projects and supporting implementation, including commercialisation;
- Innovate UK (formerly known as the Technology Strategy Board) administers the competition process itself, including undertaking technical assessments, due diligence and monitoring.

The processes which the actors indicated above are responsible and are subject to evaluation include:

- Application process and communication and marketing (i.e. the pre-application submission stage);
- Appraisal and selection of bids (i.e. the post-application submission stage);

- Contracting and due diligence;
- Project monitoring.

The processes above are described in detail in the respective chapter.

1.2 Overview of applications

The APC has so far received 26 full applications, of which four were received in APC1, five in APC2, seven in APC3, eight in APC4 and two of which have been received and assessed outside of an official competition round (denoted eAPC or exceptional applications). These exceptional applications have been reviewed to allow for some flexibility and responsiveness of APC for proposals that may be constrained by time pressures.

As shown in the following tables, the applications received in APC1 and APC2 had a total value of £557 million (including £279 million of grant funding). The successful applications (noting that successful applicants in APC4 are yet to be announced) account for £177 million total investment (including £87 million of grant funding).

Table 1.1: All applications by round

Round	Applicants	Total value of grants	Total value of projects
APC1	4	£33,680,994	£61,995,304
APC2	5	£33,657,465	£64,394,616
APC 3	7	£124,864,577	£251,805,154
APC 4	8	£46,365,845	£95,347,129
eAPC	2	£40,580,991	£83,063,963

Source: APC application forms

Table 1.2: Successful applications by round

Round	Funded projects	Total value of grants	Total value of projects
APC1	4	£30,515,799	£61,995,304
APC2	1	£6,600,000	£11,262,589
APC 3	3	£33,523,616	£70,135,702
eAPC	2	£16,731,187	£33,345,119

Source: APC application forms

It should be noted that the two applications received out of competition are repeat applications from APC2. As such, there were only two projects in the first two rounds that have not been funded.

More detailed analysis was undertaken on the APC1, APC2 and eAPC projects.

Of the applications already received in the first two rounds (including eAPC), all but three relate to amendments or additions to an internal combustion engine (ICE). The sticky technologies identified by the Automotive Council and targeted by APC have been covered in full.

There are several projects that look to make use of flywheels to recover and store energy for an electric hybrid system. In all instances the technologies being used are already in use in motor vehicles. There are also examples of electric motors, hydrogen fuel cells and electronic engine control. The resulting carbon savings range from 10% to 25%.

There is some degree of crossover between technologies, where some applications look to develop several ideas in one project. This spread is preserved in the range of successful applicants, both in terms of technology and application.

Much of the work is innovative but incremental rather than step changes in technology. All the projects propose novel uses of, or amendments to, existing technologies. One project submitted was a fully zero emission vehicle project.

One of the stipulations of the APC programme is the level of development that a technology should have already achieved before applying to the competition. The level of development is defined by its Technology Readiness Level (TRL) or Manufacturing Readiness Level (MRL). These scales were developed to track progress in R&D work. Both scales run from 0 to 10 and track development from identification of scientific principles to a technologies inclusion into mainstream production, or production processes.[2] TRL5 to TRL8 – the stages of development targeted by APC – are often the problematic stages in the development process as the costs grow exponentially as production volumes increase.

In all cases the applications suggest that their technology is approximately at the TRL5 and MRL4. All but one application explicitly define the end point for their technology. For the majority the expected level for TRL will be 8 and MRL no lower than 6. The application that does not note these end levels does advise that the technology will be included in production vehicles, suggesting that their results will be consistent with those of the other applications.

Based on the reviewed application forms, the following table summarises the main technology and vehicle applications of APC1, APC2 and eAPC projects.

[2] See the following link for a helpful guide to TRL and MRL for the automotive sector http://www.apcuk.co.uk/how-we-can-help/services/technology-readiness-levels/

Table 1.3: Technologies and their applications

Technology / application	Passenger Car	Commercial	Public Transport	Off-highway Vehicles	Production Machines
Internal Combustion Engine Petrol	3				
Internal Combustion Engine Diesel		1	1	1	
Energy Storage and Energy Management	1	2	1	1	
Electric Machines		2			1

Source: APC application forms

The APC programme requires that applications are collaborative and must have an OEM or Tier 1 participant, so as to facilitate a route to market. Across all applications in APC1, APC2 and eAPC, there has been an average of slightly less than six collaborators per bid. Across all applications there have been applications from four OEMs.

There has also been significant involvement from universities with seven unique institutional involvements. Finally, as noted below, there have also been contributions from numerous SME firms, with at least one per application.

The make-up of lead applicants is predominantly large firms. Of nine unique applications there were three unique prime or OEM firms leading the consortium and two unique Tier 1 firms. There is a single bid from an SME firm. In total there are eight unique lead applicants.

There is also a single successful application from a consortium that does not have an OEM or Tier 1 firm but has a clear route to market via a firm who will use the technology in their fleet of commercial vehicles.

Table 1.4: Profile of consortia partners

Round	Applicants	Funded	Average collaborators	Unique OEM	Academics	SME
APC1	4	4	5	2	5	4
APC2	5	1	6.7	1	4	7
eAPC	2	2	6.5	1	0	4

Source: APC application forms

1.3 Process evaluation framework

The following table sets out the key evaluation questions that informed the data collection fieldwork. It should be noted that it was beyond scope of this study to evaluate the performance of APC UK Ltd, due to the infancy of this organisation. The table identifies the sources that were proposed to address each of the questions.

Table 1.5: All applications by round

Process objective	Research question	Evaluation methods
Marketing and communications		
To increase value for money through competition – raise awareness of APC and attract a sufficient volume of high quality applications	To what extent is APC support targeting the right kinds of projects, in terms how they align with Industrial Strategy and APC objectives?	• Consultations with stakeholders (in particular wider stakeholders in the industry, including the Automotive Council and the Automotive Investment Organisation) to test levels of awareness within the industry, including from overseas • Review of projects funded so far to assess their strategic alignment with policy objectives
	To what extent are marketing and communication activities effective in raising awareness of APC among potential applicants, including non-UK companies?	• Consultations with stakeholders (in particular wider stakeholders in the industry, including the Automotive Council and the Automotive Investment Organisation) to test levels of awareness within the industry, including from overseas • Consultations with non-applicants to assess awareness and opinions of APC
	To what extent are marketing and communication activities attracting a sufficient number of high quality applications?	• Scrutiny of application and appraisal data – how many applications have been received and what is the level of quality, according to the key metrics used (e.g. technical and VfM appraisal scores)? • Consultations with stakeholders to assess the extent to which the quantity, diversity and quality of submissions have been in line with expectations?
	How effective are marketing and communication activities in identifying fundable projects and building consortia?	• Consultations with stakeholders to assess the effectiveness of marketing and communication activities • Case studies with applicants to assess the effectiveness of the support provided to build consortia and identify projects
	How effective are marketing and communication activities in ensuring understanding of the scope and objectives of the competition, eligibility requirements and competition processes?	• Case studies with applicants to assess suitability of marketing and communication activities and materials to ensure understanding
To minimise barriers to applicants – Ensure that companies with high quality and fundable projects are not put off from applying	To what extent have eligible projects been identified but have not resulted in an application, and what were the reasons for this?	• Consultations with stakeholders involved in the consortia building process (e.g. APCUK Ltd.) or with insight into the sector more widely
	To what extent have potentially fundable projects been put off from applying due to the specific scope and criteria of the competition (e.g. technology readiness level, minimum	• Consultations with non-applicants and stakeholders to explore reasons for not applying • Case studies with applicants to explore barriers that were faced

Process objective	Research question	Evaluation methods
	project value)?	
	To what extent has consortia building been a barrier to potential applicants (e.g. not being able to collaborate with a UK-based prime manufacturer)?	• Consultations with non-applicants and stakeholders to explore reasons for not applying • Case studies with applicants to explore barriers that were faced
	Have any particular barriers to accessing the competition been faced by non-UK companies?	• Consultations with AIO and non-UK companies
To minimise the admin cost – Reduce any inefficiencies in the delivery of marketing and communication activities	What costs (including both internal resource costs and external expenditure) have been incurred by applicants and internal stakeholders to deliver and engage in marketing and communication activities, and to what extent are these costs deemed burdensome or disproportionate?	• Standard Cost Model assessment to be completed by applicants and stakeholders involved in the process • Consultations with stakeholders and case studies with applicants to assess the perceived level of administrative burden associated with different processes
	Can processes be improved in any way to increase efficiency?	• Consultations with stakeholders and case studies with applicants
Application process		
To increase value for money through competition – Ensure that the information made available to assessors is accurate and comprehensive to support optimal allocation decisions	What has been the level of quality of the bids, in terms of their potential to deliver value for money and technological progress received to the APC competitions so far?	• Scrutiny of appraisal data to assess quality of bids • Consultations with stakeholders
	To what extent is the application form fit for purpose to provide the information required by assessors?	• Case studies with applicants and consultations with stakeholders (including assessors)
	To what extent are the other elements of the application process (e.g. verbal questions, interview panel) fit for purpose to provide the information required by assessors?	• Case studies with applicants and consultations with stakeholders (including assessors)
To minimise barriers to applicants – Minimise the extent to which the application process provides a disincentive to applicants	To what extent did the application process put off potential applicants from applying, and what were the reasons for this?	• Consultations with non-applicants and stakeholders to explore reasons for not applying
	What barriers were faced by applicants in undertaking the application process and how could these be resolved?	• Case studies with applicants to explore barriers that were faced
To minimise the admin costs – Reduce any inefficiencies in the application process	What costs have been incurred by applicants and internal stakeholders in the application process, and to what extent are these costs deemed burdensome or disproportionate?	• Standard Cost Model assessment to be completed by applicants and stakeholders involved in the process • Consultations with stakeholders and case studies with applicants to assess the perceived level of administrative burden associated

Process objective	Research question	Evaluation methods
		with different processes
	Can processes be improved in any way to increase efficiency?	• Consultations with stakeholders and case studies with applicants
Appraisal		
To increase value for money through competition – Ensure that the appraisal process correctly identifies and approves the projects with the potential to deliver the best value for money and the technologies required to secure the future sustainability and growth of the UK automotive industry and supply chains	How effective is the assessment of gateway and criteria questions in identifying bids that are in scope?	• Consultations with stakeholders (primarily Innovate UK competitions team)
	To what extent is the technical assessment effective at identifying whether proposed projects are technically feasible and will progress relevant technologies to manufacturing readiness?	• Consultations with stakeholders (including technical assessors)
	To what extent is the technical assessment effective at highlighting technical and commercial risks associated with proposed projects (e.g. particularly in the context of wider investments and developments in the industry)?	• Consultations with stakeholders (including technical assessors and wider stakeholders with a knowledge of the industry – how does the scoring reflect the technology roadmaps and wider industry strategy?)
	To what extent is the value for money assessment effective at identifying projects offering the best value for money?	• Consultations with stakeholders (including VfM assessors and BIS economists)
	How useful is the feedback provided from the technical and VfM assessments to enhance the quality of projects or provide guidance for future applications?	• Case studies with applicants (successful and unsuccessful)
	How effective is the interview process for addressing any questions raised in the assessments and enhancing the technical strength and value for money of projects?	• Case studies with applicants invited to interview • Consultations with stakeholders (including interview panel members)
To minimise the admin costs – Reduce any inefficiencies in the process to reduce costs for applicants and stakeholders without limiting the robustness of the appraisal processes	What costs have been incurred by applicants and internal and external stakeholders (including external assessors) in the appraisal process, and to what extent are these costs deemed burdensome or disproportionate?	• Standard Cost Model assessment to be completed by applicants and stakeholders involved in the process • Consultations with stakeholders and case studies with applicants to assess the perceived level of administrative burden associated with different processes
	Can processes be improved in any way to increase efficiency?	• Consultations with stakeholders and case studies with applicants

Process objective	Research question	Evaluation methods
Contracting and due diligence		
To increase value for money through competition – Protect the value for money of funding commitments through ensuring the financial viability of projects and partners and ensuring State Aid compliance	How effective was the financial viability assessment and to what extent did this lead to changes to consortia, funding levels or project plans?	• If appropriate, review of Offer Letters and financial due diligence documentation • Consultations with stakeholders (including due diligence officers) • Case studies with successful applicants
	How effective was the State Aid due diligence process and to what extent did this lead to changes to consortia, funding levels or project plans?	• If appropriate, review of Offer Letters and State Aid due diligence documentation • Consultations with stakeholders (including due diligence officers) • Case studies with successful applicants
	How effective were the Conditional Offer Letters and Grant Confirmation Letters in setting out the scope and objectives of projects?	• Consultations with stakeholders (including due diligence officers) • Case studies with successful applicants
To minimise the admin costs – Reduce any inefficiencies in the process to reduce costs for applicants and stakeholders without limiting the robustness of the due diligence processes	What costs have been incurred by applicants and internal and external stakeholders (including external due diligence contractors) in the contracting and due diligence process, and to what extent are these costs deemed burdensome or disproportionate?	• Standard Cost Model assessment to be completed by applicants and stakeholders involved in the process • Consultations with stakeholders and case studies with applicants to assess the perceived level of administrative burden associated with different processes
	Can processes be improved in any way to increase efficiency?	• Consultations with stakeholders and case studies with applicants
Monitoring		
To increase value for money through competition – Ensure that projects remain on course to deliver expected R&D activities according to Offer Letters and project plans	What progress has been made so far by projects that have started?	• Review of project and programme level monitoring reports, although it is likely to be too early to make any substantive judgments
	How effective are the tools and systems for monitoring project level performance and risks?	• Review of monitoring tools and systems • Case studies with successful applicants • Consultations with stakeholders (including monitoring officers)
	How effective are the tools and systems for monitoring performance and risks at a programme level?	• Consultations with stakeholders (including monitoring officers)
To minimise the admin costs – Reduce any inefficiencies in the process to reduce costs for applicants and stakeholders without limiting the robustness of the monitoring processes	What costs have been incurred by applicants and internal and external stakeholders (including external monitoring officers) in the monitoring process, and to what extent are these costs deemed burdensome or disproportionate?	• Standard Cost Model assessment to be completed by applicants and stakeholders involved in the process • Consultations with stakeholders and case studies with applicants to assess the perceived level of administrative burden associated

Process objective	Research question	Evaluation methods
		with different processes
	To what extent are the processes for approving claims and making payments efficient?	• Consultations with stakeholders and case studies with applicants
	Can processes be improved in any way to increase efficiency?	• Consultations with stakeholders and case studies with applicants
	Monitoring and performance management - To what extent are monitoring and performance management processes suitable for achieving its objectives? How could processes be improved?	• Stakeholder consultations • Case studies with successful applicants

1.4 Methodology

The methodology has involved collecting and triangulating evidence from a variety of sources including:

- Eleven in-depth case study interviews with lead applicants and partners from eight successful and unsuccessful projects;
- Four interviews with automotive firms that have not applied to APC;
- Fourteen consultations with stakeholders internal and external to the APC process; and,
- Review of process documentation (including submitted applications, appraisal forms and monitoring forms) and wider literature.

To examine in-depth the perception of APC processes by applicants and to gain understanding of the issues around additionality and project impacts, **eight projects** were selected for case study research. The case studies selected included all but one of the applicants (both successful and unsuccessful) to the first two rounds of the competition (APC1 and APC2). For each case study, the project manager from the lead organisation was interviewed. Three project partners were also interviewed, again with the main lead on the project chosen as the person to be interviewed. In most cases, the project lead had been involved in the project throughout the entire process and was therefore able to respond to all questions. In a few instances, however, the interviewee had been less involved in earlier stages (e.g. they were managing the delivery of the project but had not been highly involved in the application) so were not able to comment fully on all aspects of the process. To account for this, one lead applicant interview involved two respondents, one that managed the proposal and the other that is currently managing the project.

The case studies mainly centred on qualitative interviews, within which a small number of quantitative questions (asking interviewees to rate their satisfaction with particular parts of the process) were also asked. The interviews were conducted on a semi-structured basis using a detailed topic guide to enable the interview to direct the conversation towards addressing the key questions and issues of interest. The interviewer recorded detailed notes of the interview and wrote these up into a case study report of about three to four pages. These reports were then assessed thematically alongside write-ups from the stakeholder and non-applicant interviews to provide a rounded qualitative assessment of each aspect of the competition process.

The majority of interviews with lead applicants were conducted face-to-face while all interviews with project partners were conducted by telephone.

Respondents were also asked separately to complete a spreadsheet detailing the costs incurred by applicants in different parts of the process. However, only two completed cost breakdowns were returned to the evaluation team for analysis.[3] The study team also reviewed process documentation relating to each applicant, including application form, appraisal documentation and monitoring information.

[3] The reason that more applicants did not complete the Standard Cost Model assessment appears to be related to the fact that project managers did not have the necessary cost data readily to hand. There were also perceptions that the template was too complex and this may have discouraged some applicants from completing it.

In order to understand the wider perceptions and awareness of APC, and the extent to which there may have been barriers inhibiting companies from applying, four non-applicants were also consulted by telephone as part of this study. These non-applicants were sampled from firms that had shown an interest in the APC competition (for example by registering for the competition or attending a webinar) but have not as yet submitted an application. The study team were aiming to consult with a larger number of non-applicants, but had difficulty gaining access to a sufficient number of contacts. As such, it should be noted that the views of the non-applicants interviewed may not be representative of firms within the automotive industry at large.

A total of 14 in-depth telephone interviews were conducted with stakeholders responsible for APC processes (this included the communication and application, appraisal, contracting and due diligence and monitoring processes). To ensure sufficient coverage of these processes, interviews were held with stakeholders from BIS, APC UK Ltd and Innovate UK as well as independent consultants working as technical assessors, interview panel members and monitoring officers. Two interviews were also conducted with stakeholders involved in the automotive industry but external to the process.

These interviews provided insight into the workings of APC processes from an internal and external perspective. Interviewees were requested to explain how key processes developed over time and to make a judgement on their performance. However, it should be stressed that as a far as possible, the key findings from these interviews have been triangulated with the interview data collected from applicants. This is to ensure that information received from stakeholders is examined in an appropriate context taking into account the views of those external to APC. The analysis of data supported the identification of key findings and development of recommendations where issues for improvement have been identified.

1.5 Structure of this Report

The structure of this report is based around examination of major processes by chapter. In each chapter, an explanation of the process is provided initially. Subsequently, the data collected from stakeholders and applicants are presented and analysed. At the end of each chapter, a summary of the results is presented against the main process evaluation questions, including a number of recommendations. The structure of the report is as follows:

- Chapter 2: Programme overview;
- Chapter 3: Marketing and communications and the application process;
- Chapter 4: Appraisal and Selection;
- Chapter 5: Contracting and Due Diligence;
- Chapter 6: Monitoring and Project Performance;
- Chapter 7: Conclusions and Recommendations.
- Annex: Analysis of Standard Cost Model data

2.0 Programme overview

This section provides an overview of the APC programme and assesses the extent to which the competition is an effective mechanism for generating value for money for the UK economy. We focus on rationale, strategic fit, comparison to other programmes and evidence for additionality.

2.1 Rationale and strategic fit

As outlined in the previous chapter, APC came about from the UK Automotive Council and the previous Coalition Government's industrial strategy. Due to global climate change targets, a clear shift in demand towards low emission vehicles was identified requiring industry to respond by developing products to ensure that future vehicle supply meets these criteria. This provides an opportunity for the UK to enhance its comparative advantage in advanced propulsion technologies to enable it to sustain and expand its future global market share.

It also presents a threat, due to the potential destabilising impact on existing supply chains. This transition requires R&D investment across the supply chain. While the UK automotive sector has a relative strength in manufacturing high value components, there are relatively few OEMs or Tier 1 manufacturers (e.g. the UK produces more engines than it does vehicles) so without support there may be a tendency for much of this collaborative R&D, as well as subsequent new manufacturing lines, to take place overseas. Overseas Governments have also been active in providing subsidies for development of these types of technology (including large scale public support provided by the Chinese Government). To the extent that these subsidies are effective in developing clusters of technical expertise, these tendencies will exacerbate the competitive threat to the UK.

While there are clear incentives for UK-based OEMs and suppliers to invest in R&D on low carbon propulsion systems to exploit future market opportunities without the support of public sector subsidy, there are also a number of market failures that may lead to sub-optimal investment. An important market failure relates to network externalities. The commercial success of new vehicles will depend on the existence of adequate supporting infrastructure, particularly for refuelling or recharging. As such infrastructure is not yet in place on a large scale, and there is uncertainty about which technologies will be supported by the infrastructure, there is a significant disincentive for manufacturers to make the investment required to move technology from low-scale early stage development to high-scale production (at least until there is greater clarity on the likely future course of technological development). Related to this is the issue of technological "lock-in", where there is an incentive for manufacturers to free-ride on the pioneering investments of others and wait for more clarity on emerging technical standards before investing themselves. As with all R&D programmes, a further market failure is the risk of non-innovating firms free-riding on any investment made by innovators, due to knowledge spill-overs and the imperfection of the patent system to protect intellectual property.

However, an important feature of the APC competition is that it requires the formation of collaborative industrial projects. Propulsion systems involve a diverse mix of components and systems that need to be integrated together and fitted into specific vehicles, and thus a close collaborative relationship between engineers of different specialisms has

significant benefits. This collaborative approach also has the benefit of establishing and strengthening supply chains to manufacture the new vehicle ranges developed. However, there are a number of market failures that may prevent collaborations from forming naturally and provide a rationale for centralised support and control.

- **Free-riding** – There is an incentive for partners not to contribute the necessary effort and investment, if they are able to appropriate the benefits of collaboration without making a proportionate contribution. APC can help to reduce this free-riding incentive by introducing strict monitoring requirements to ensure that each partner fulfils their contracted obligations, including expenditure, progress against work plan and outputs (e.g. jobs).

- **Incomplete contracts** – As R&D projects entail risks and uncertainties about the expected outcomes, it can be difficult to draft complete contracts that define the pay-offs under all eventualities. This suggests that the collaboration agreement (which is an obligatory part of the APC contracting process) is vital to ensuring the stability of consortia. Evidence from the case studies suggests that, without APC, many projects would not have undertaken the effort required to establish a collaboration agreement.

- **Uneven distribution of returns** – Linked to the above points, it is also important to mention that the returns from a collaborative project to a given partner may not be in proportion to the investment made, and this can also reduce the incentive for key partners to enter into collaborative arrangements. Again, the structure and conditions imposed by the APC programme (in terms of contracting and monitoring) should ensure that the costs and benefits accruing to each partner are more closely defined and monitored.

It should be noted that many APC projects do not involve new collaboration, as partners have been working together already on the early stage innovation relating to the technology. However, as they move to higher levels of TRL and MRL, the levels of financial commitment and risks rise significantly, threatening to break down the collaborative effort.

Another key feature of the APC, which perhaps sets it apart from other competitions with a wider scope such as AMSCI and RGF, is that it is industry led. While the Government has articulated a desire to address market failures inhibiting the global competitiveness of the automotive industry, the industry itself has set out the roadmap for the technology that will be required to meet future demand. These technology roadmaps inform the objectives of the scheme and set out the criteria for the assessment process. The roadmaps are owned by APC UK Ltd. and can be updated over time. As such, while the APC is a grant competition, it also forms part of a wider strategic initiative. The APC has similar features to other Industrial Policy programmes (e.g. Low Impact Building Innovation Programme), insofar as it is “technology pull” rather than “technology push”. In other words, APC has a mission oriented nature, primarily responding to demand for technology from the market rather than the technological capacity of the supply chain.

A more detailed assessment of the strategic and economic rationale for the APC is provided in the Impact and Economic Evaluation Scoping Study.

2.2 Programme design

The programme is designed on the basis of a competition for funding. This is an important aspect for value for money as it provides a sorting mechanism to ensure that, subject to the effectiveness of the appraisal processes, the projects offering the best value for money are selected for funding. Once selected, project partners are contracted to a set of delivery requirements as a condition for the grant, and progress against delivery is monitored closely over the duration of the project. Grants are provided in arrears following the agreed investment and funds may be withheld if agreed outputs are not achieved.

As discussed above, collaboration is a mandatory feature of all funded projects, ensuring that the R&D benefits are maximised. The requirement for OEM involvement ensures that there is a clear route to market for the proposed technologies, and a commitment to integrate these technologies into future vehicle models.

2.3 Comparison to other programmes

UK Programmes

The APC appears to complement rather than duplicate the support offered under Innovate UK's Low Carbon Vehicle Innovation Platform (LCV-IP). This innovation platform has involved a number of competitions of the Integrated Delivery Programme (IDP), sometimes co-funded by the Engineering and Physical Sciences Research Council (EPSRC). Compared to the APC, these competitions have funded smaller scale projects with a focus on early stage innovation into low carbon vehicle technologies, although some IDP competitions have funded innovation up to TRL8. Many projects put forward to APC had already been supported by Innovate UK through the IDP. Having reached the required Technology Readiness Level (TRL) and Manufacturing Readiness Level (MRL), the APC provides the support required for the technology to bridge the "valley of death"[4] towards market exploitation. Another programme supporting the development of low emission vehicles, again mainly focused on early stage development, is an £11 million fund provided by the Office for Low Emission Vehicles (OLEV) to support 15 projects involving 50 organisations ranging from small businesses to major universities. The EPSRC also has its own funding competitions to support relevant research in UK universities.

The Catapult Centres have more of a focus on transforming ideas into new products and services. The most relevant Catapult is the Warwick Manufacturing Group (WMG) centre High Value Manufacturing (HVM) Catapult based at the same university campus as APC UK Ltd. Also, the Catapult Centre has a very different format to APC, as it involves a physical centre bringing together academia and industry to facilitate technological development and technology transfer, rather than a funding competition.

A similar scheme to APC was the Advanced Manufacturing Supply Chain Initiative (AMSCI), developed to improve the global competitiveness of UK manufacturing supply chains. The scheme was developed as a competitive fund, providing public subsidies for capital investment, R&D, and skills and training projects involving collaboration between manufacturers within the supply chain of Tier 1 manufacturers or Primes. As such, it had

[4] This term refers to the difficulty of progressing early stage innovation to developing products for the market, due to the levels of investment involved and the high risk of failure.

many similarities to the APC albeit with a much broader scope, and with no overt technological focus. Though the scheme was initially focused on the automotive sector in the West Midlands, it was subsequently expanded to a national scheme through successive rounds of funding to cover all manufacturing sectors (with £245m made available over six rounds). AMSCI does not duplicate APC as it is not designed to address the specific market failures associated with bringing new technology to manufacturing readiness within the technological uncertainties of the automotive sector.

The APC draws on both the processes used by Innovate UK to assess and monitor the technological appropriateness of early stage research projects and the processes used by BIS for the AMSCI and RGF schemes to assess and monitor economic impact. Similarly to Innovate UK competitions, APC is designed as a competitive process to select the projects most in line with the technological scope required by industry. However, the fact that APC has a clear focus on developing technologies to manufacturing readiness sets it apart from most Innovate UK competitions and requires that the competition also takes account of the project's potential to increase investment and sales in the UK automotive industry over the longer term. This provides the rationale for including a stronger value for money assessment as part of the competition criteria, as provided by the BIS economic model. The mandatory involvement of OEMs in applicant consortia is designed to ensure that a clear route to market is identified and that the proposed R&D is supported by realistic exploitation plans.

There is strong evidence from the case studies and stakeholder consultations that the APC is viewed by industry and Government as having a unique position in the funding landscape. The majority of lead applicants in APC1 and APC2 felt that the competition was a perfect fit for their project, and none reported that they would have otherwise submitted a similar project to another funding competition. Even among unsuccessful applicants and some non-applicants, there was a plan to submit their project to future rounds of APC rather than to seek out other opportunities.

International Programmes

The Governments of other major developed economies have also recognised the opportunity to invest public funds into the development of low carbon vehicle technologies[5].

The Advanced Technology Vehicle Manufacturing programme in the US provides low cost loans to manufacturers of advanced technology vehicles (defined as a light-duty vehicle that delivers a 25% improvement in fuel economy from 2005 model year baseline) or manufacturers of components that are designed for advanced technology vehicles (including improved aerodynamics, light-weighting technologies, fuel efficient tyres, electronics, advanced engine technologies and advanced powertrain technologies). The loans are not focused on R&D and can be used for capital investment in manufacturing facilities. Also there is no requirement for collaboration.

The Department of Energy in the US also delivers the Clean Energy Manufacturing Initiative, providing funding to manufacturing R&D, with the goal of growing the clean

[5] BIS has commissioned an international benchmarking study to assess the relative competitiveness of the R&D capabilities of the UK automotive industry.

energy manufacturing industry in the country. As part of this initiative the first year budget (2013) provided $500 million for electronics and light weight vehicles, plus a further $200 million for research supporting advanced manufacturing.

In the EU, the European Green Vehicles Initiative will announce three rounds of biennial calls for proposals in the period 2014-2020 as part of the Horizon 2020 programme. The scheme welcomes collaborative projects carried out by consortia in different countries. The funding opportunities do not have a specific manufacturing or product development focus and require low levels of leverage from industry, suggesting a focus on early stage research and innovation.

In 2009, €500 million was made available for German industry to become a market leader in electric vehicles and associated systems; more recently that was increased by a further €1 billion – this is known as the National Electromobility Development Plan. Funding includes a €130 million package of support to pilot regions to support R&D in integrated vehicle technology and supporting infrastructure.

State-funded R&D support for the development of New Energy Vehicles has also been a key feature of recent five-year plans in China, including implementing three “vertical” R&D strategies (whole car technologies for Hybrid Electric Vehicles, Electric Vehicles and Fuel Cell Electric Vehicles) and three “horizontal” strategies, focused on the key technologies of Multi-Power Drivetrain Control System, Drive Motor and Power Battery.[6]

2.4 Additionality

The case study research explored the extent to which projects would have gone ahead anyway, or similar results would have been achieved, if support from the APC had not been available. It is emphasised that the analysis provided in this section is based solely on qualitative reports from the small number of applicants in APC1 and APC2, and as such provides merely an early indication of the potential additionality of APC and is subject to a high degree of response bias. Proposals for making a robust assessment of the counterfactual are set out in the Impact and Economic Evaluation Scoping Study.

Additionality relative to other state funding programmes

As stated above, there was a general opinion among APC applicants and non-applicants that their particular projects were not suited to any other funding schemes. None of the firms interviewed had submitted their project to any other competition or were intending to do so. There was a general understanding among applicants that APC was designed to support projects at a higher level of technological maturity than other Innovate UK schemes currently offered on the LCV-IP. In several cases APC projects directly followed on from successful IDP funded projects and there is clear complementarity between IDP and APC as technologies progress from early stage development towards manufacturing readiness.

The case study research found that unsuccessful applicants from the first two rounds, as well as those who had a potential project but had decided not to apply, were not

[6] http://steps-centre.org/publication/low-carbon-innovation-chinese-urban-mobility-prospects-politics-practices/

considering putting their project forward for any other competition. In the majority of cases, the intention was to revise the bid (including the composition of the consortium) and resubmit to a later round of APC.

Additionality relative to private finance

There was a case to suggest that private finance was an alternative to APC funding for many of the lead applicants interviewed in the case studies although in all cases, the respondent claimed that the project would not have otherwise proceeded in the same way. In the absence of APC, some lead applicants would have progressed their projects but at lower scale and scope, over a more prolonged timescale, outside of the UK or without a formal collaborative approach, which would have been less effective.

Project would have progressed at a lower scale and scope

A common finding among the case studies was that late stage R&D investment would have been made anyway by applicant companies, but this would have been at a reduced scale and scope due to the risks involved.

For example, one lead applicant's progress towards development of their new engine would have been made anyway but at a lower scale which was acceptable to the company. The company had identified a number of low carbon propulsion technologies in the "grey zone" that had the potential to be progressed to higher levels of TRL and MRL but, due to the risks involved, they would not have been able to explore all of these technologies without APC providing funding and therefore reducing the risk.

Similarly, another respondent reported that, in the absence of Government support, the company would have focused investment on lower risk technologies where the results were less uncertain.

Project would have progressed over a longer timescale

The lead applicant for another project, however, said that the company did have plans to use private finance to progress the project in full. However, this investment would not have been made straight away. The successful application to APC significantly accelerated the process through reducing the investment risk and incentivising the company board to bring forward their plans, ensuring that the opportunity was not lost to another competitor in the interim.

Project would have progressed outside of the UK

In one case study, the project manager indicated that without APC some of the technology would not have been developed in the UK, although this was not mentioned by any of the other respondents.

Project would have progressed without a collaboration

Several lead applicants said that they would not have been able to sustain a collaboration without APC and the different elements of their product development would have progressed in isolation through bilateral supplier contracts, which involve lower risk and are easier to administer. APC makes a difference by enforcing a collaborative approach as a condition of funding and providing a lever for supply chain partners to invest their own funds in the project. This finding is reflected particularly where the consortia were large and the project constituted a high number of diverse work packages.

2.5 Overall assessment of programme

The overall assessment of the programme at this early stage is based solely on the views and opinions of the small number of applicants and stakeholders that have so far been involved in the programme. Therefore, the conclusions presented here, particularly in relation to the perceived additionality of the programme, should be treated with caution.

There is a general consensus among applicants and stakeholders, including external industry stakeholders, that the APC is the right approach to provide a catalyst for the necessary product development in the UK automotive industry. The competition is complementary to the LCV-IP and provides funding for projects that would not be suitable for any other Innovate UK scheme.

It is possible that many APC projects would be in scope for other BIS competitions, including AMSCI and RGF. However, as of March 2015, no further funding is expected to be available from AMSCI while the last round of RGF closed in September 2014, although firms can apply for the Exceptional RGF or to RGF national or regional programmes that are still operating. Moreover, these competitions are much broader in scope and are not mission oriented, which means that they are not set up to ensure that selected projects are in line with the technology roadmaps identified by the UK Automotive Council.

The UK's major competitors in the automotive sector, including Germany, France, China and the US, have all identified the development of low emission vehicles as being important for the future growth of the sector, and the governments of these countries have made significant investment in relevant capacity building.

The evidence from case study interviews suggests that the APC is providing an additional catalyst for projects that were in the pipeline anyway. Some projects would have progressed with private finance in the absence of APC but at a slower pace or on a smaller scale (e.g. in bilateral partnerships).

In particular, the APC has been necessary for the development of collaborations, helping the industry to reap the benefits of working collaboratively while minimising the risks and disincentives of doing so. Due to the complexity of the technologies involved and the need for diverse specialist expertise, most of the projects funded by APC would not proceed to the same scale or scope except through vertical collaboration.

3.0 Marketing, Communications, and Application Process

This section reviews the extent to which the marketing, communications, and applications process has supported the APC in meeting its objectives to date. The section details the activities undertaken by BIS, Innovate UK, and APC UK Ltd in promoting the programme to the pool of potential applicants. It also reviews the "market-making" activities undertaken by APC UK Ltd to create a pipeline of potential projects, as well as the effectiveness of guidance and materials in helping applicants to prepare their proposals. The primary function of these activities is to generate sufficient volumes of high quality applications to the APC to enable the programme to progress towards its objectives of stimulating the development of low carbon propulsion technologies in the UK and safeguarding the automotive industry in the longer term.

3.1 Objectives for marketing and communications activities

The primary objectives of APC's marketing and communication materials are to generate a sufficient volume of high quality applications for each funding round. This is needed to deliver a robust selection process and to optimise the returns on public sector investment. Marketing and communications activities can deliver this through three routes. Marketing and communications activities should raise awareness of the APC amongst the pool of firms and academic researchers operating (or with the potential to operate) within this technology area. Marketing activity should catalyse the development of new projects or collaborations to provide a pipeline of new projects that might receive funding in the future. Finally, these activities should also help to optimise the efficiency of project selection processes. This can be achieved by effectively communicating the scope of the fund and helping applicants to understand what a good bid looks like, so firms are able to provide the relevant information in their bids.

Responsibility for marketing and communications with respect to the APC lies with APC UK Ltd. However, as APC UK Ltd was only formally established in July 2014 (with expansions in staffing beginning from early 2015), a range of bodies were involved with the development of marketing and communication activities in the first rounds of the programme.

- Innovate UK regularly mails out bulletins to subscribers detailing the funding opportunities – targeted by sector, and making use of knowledge transfer networks (KTNs).
- The Automotive Council has conducted briefings and promotional activities with member and related groups. This information has also been disseminated via the Society of Motor Manufacturers and Traders (SMMT).
- Finally, the programme has been promoted by representatives of the Automotive Investment Organisation (AIO) as part of promoting the UK as a destination for future investments.

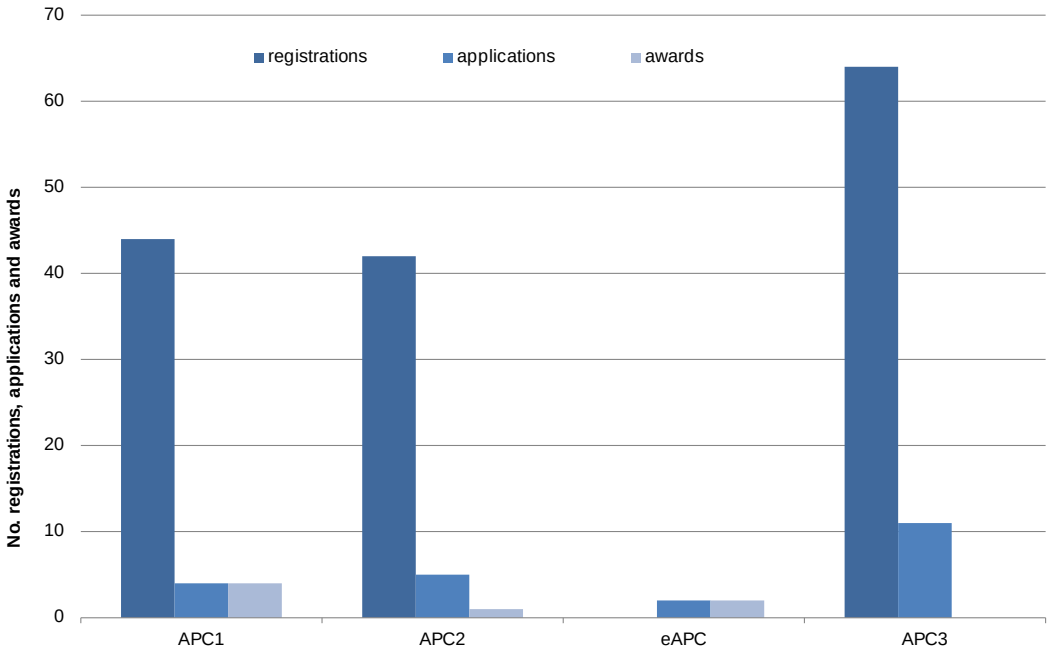
APC UK Ltd has since its inception undertaken a range of further supplementary activities. This activity has included: making direct contact with individuals using available databases (e.g. from Automotive Council); attending events where the industry is present to generate

further contacts; and working through partner organisations such as AIO, Innovate UK and the Engineering and Physical Sciences Research Council (EPSRC) to leverage knowledge (for example, through Innovate UK to identify early stage prototypes that have been funded through other programmes, that may at some point be ready to be carried forward to APC). A more structured approach was planned moving forwards, though as highlighted in the preceding section, an assessment of the effectiveness of this activity was considered out of scope in the terms of reference for the study owing to the early stage of APC UK Ltd activity at the time of the research.

3.2 Awareness and Interest in the APC

A limited range of objective indicators are available indicating increasing awareness of the APC, though there is evidence that provides an indication of the level of interest. At the time of the research, there had been three formal competition rounds for which 22 applications had been received. On each occasion Innovate UK has provided a briefing webinar for registrants. For the first two rounds (APC1 and APC2) there were 44 and 42 registrations to the funding competitions respectively. For APC3 there were a further 64 registrations, from which it might be inferred that interest in the APC has broadened. The number of applications has also risen from 4 and 5 in APC1 and APC2 respectively to 11 in APC3. This suggests wider interest has been converted into more applications, though overall application volumes remain low (potential barriers faced by non-applicants are examined below). Two applications were received outside of the formal competitions process.

Figure 3.1: Competition registrations, applications and awards



Source: Innovate UK competition registrations and BIS appraisal data

The views of applicants and non-applicants[7] consulted were broadly positive in terms of the effectiveness of communication activities in raising awareness of the APC and its competitions. Most interviewees felt that there is a high level of awareness of the APC, and its aims and objectives, among large firms and universities. Most also felt that the type of project eligible for funding was clear.

Several firms identified the Innovate UK bulletins as the initial point of contact. Other companies contacted as part of this research had learned about the APC in advance of its launch due to involvement with the Automotive Council or contacts related to this body and Innovate UK. This aligns with the design of the scheme as a demand-led initiative, part owned by industry, and to some extent a high level of awareness amongst what is a small community of interest might be expected. Additionally, the APC UK Ltd website is now fully operational. It contains details on the competition rounds as well as APC's promotional events (which will have the potential to be effective in reaching wider audiences in the future).

At this stage, it is difficult to evaluate the levels of awareness amongst firms outside the UK. There has been significant activity conducted by the AIO in promoting the programme abroad, with trade delegations briefing firms on the opportunities available. Encouragingly, the views of stakeholders suggest that the levels of funding available to firms are "*enough to move the dial*" for foreign firms and thus generate interest. The scope of the programme is such that any non-UK firm must make a commitment to locate and sustain significant R&D activities into the UK to be able to access APC funding. International location decisions are not necessarily a quick process, and firms may often only review the location of their operations on a periodic basis tied in with their business planning cycles. As such, it will be necessary for time to elapse before assessing how far awareness amongst foreign investors will translate into applications to the programme.

However companies contacted did raise the following concerns:

- **Branding:** A number of firms suggested that the APC did not develop a distinctive brand in the early stages of the competition, in that applicants did not fully appreciate the central focus on higher TRL and MRL stages compared to other Innovate UK competitions. One firm also suggested that the programme name was somewhat misleading; they believed that it did not make clear that the APC was a programme of R&D subsidies (as opposed to a physical research centre) and as such suggested that levels (or at least clarity) of understanding in the industry were lower than indicated by the majority of firms. Such issues may be resolved now APC UK Ltd is fully operational.

- **Number of agencies involved:** There was also some concern that communications were confusing due to the number of agencies involved in the programme. Interviewees referred to another funding scheme they had accessed via Innovate UK, stating that it was far simpler to navigate as only one organisation was involved in the communications and application process.

[7] It should be noted, however, that the non-applicants consulted had generally had some engagement with APC (e.g. registrants or webinar attendees) so awareness will clearly be higher than for firms with no level of engagement.

- **Low awareness amongst SMEs:** This generally positive picture of awareness does not necessarily permeate the full supply chain, and there may be opportunities to raise awareness amongst the smaller firms that make up a high proportion of the active enterprises in the sector. A number of interviewees suggested that levels of awareness are less strong in the lower tiers of the supply chain (companies which are further removed from OEMs and Tier 1 suppliers and are typically smaller). Many interviewees felt that the SME community was particularly poorly informed about the APC and its objectives. As articulated by one stakeholder, this includes some SMEs that had received early stage innovation funding through the LCV-IP.

3.3 Penetration of the Automotive Industry

As noted above, five projects were approved over the first two rounds of the APC from the nine applications received, and two projects were approved outside the competitions process. These awards have led to the commitment of £58 million in grant expenditure to projects with a total value of £108 million (around 10 to 15 percent of the overall budget for the APC). A number of stakeholders highlighted that higher application volumes may be needed to commit the overall budget for the programme over its 10 year time horizon.

The extent to which higher application volumes can be supported by the automotive industry is in part dependent on its scale. The table below provides figures on the structure of the automotive manufacturing industry (number of enterprises by employee size-band and sub-sector). As suggested in the table, there were around 2,400 enterprises active in the automotive manufacturing sector in England in 2014. However, the number of firms active in relevant subsectors (i.e. manufacture of motor vehicles or associated electrical and electronic equipment) is substantially smaller (at around 800). If the scale of subsidies involved is likely to inhibit the involvement of micro-businesses,[8] then the primary community of interest might fall as low as 140 firms. In this latter scenario, given the number of different firms involved in the early round applications, the APC may have already penetrated a high proportion the firms in this community.

As a consequence, the extent to which it is feasible to expand application volumes will be in part contingent on the willingness of firms to pursue multiple large scale R&D projects. It should be noted, however, that a lower volume of applications in the future is not in itself a problem as long as the projects put forward to APC are of sufficient quality.

[8] Analysis of application forms finds that the majority of consortia members in APC1 and APC 2 were large firms. As shown in Table 1.4, there was an average of 1-2 SMEs involved in each consortium suggesting relatively low involvement among smaller businesses.

Table 3.1 Number of Enterprises by Employee Size-Band and Sub-Sector: Automotive Manufacturing Industry, England, 2014

Employee Size-band	Manufacture of motor vehicles	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	Manufacture of electrical and electronic equipment for motor vehicles	Manufacture of other parts and accessories for motor vehicles
Micro (0 to 9)	545	440	95	600
Small (10 to 49)	55	135	30	190
Medium-sized (50 to 249)	20	45	15	115
Large (250+)	20	10	0	45
Column Total	**645**	**630**	**140**	**950**

Source: UK Business Counts, Office for National Statistics

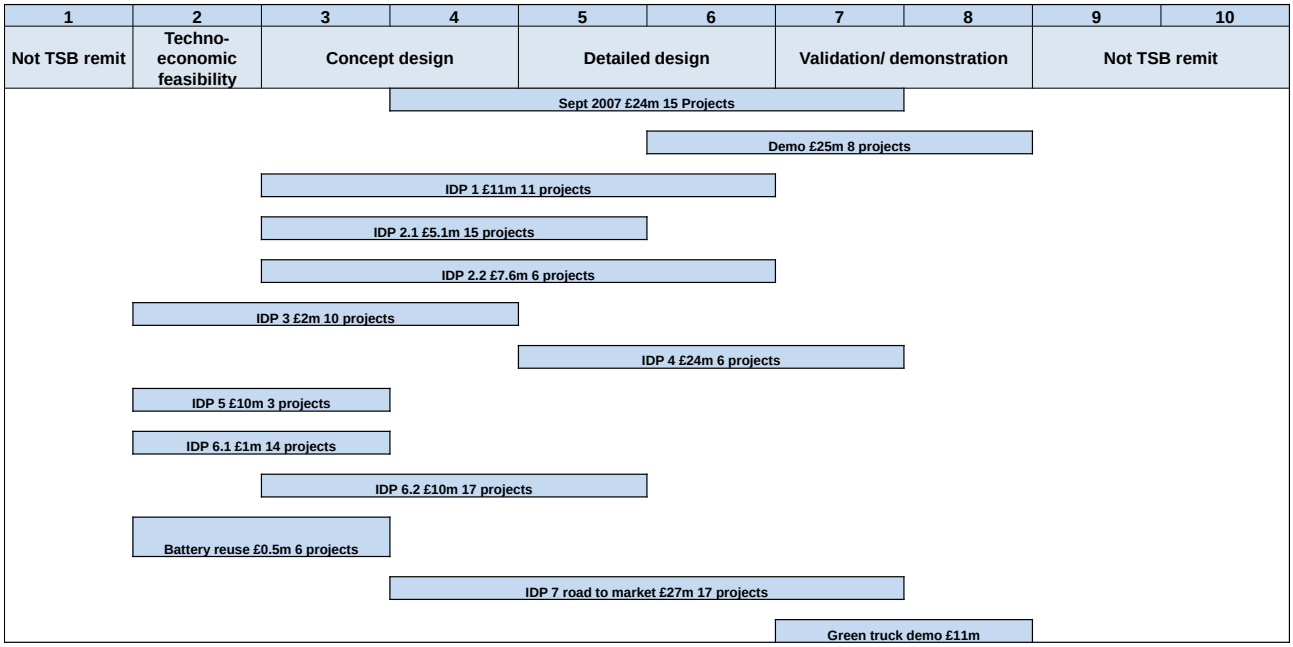
3.4 Size of the Project Pipeline

Equally, the extent to which higher volumes of applications might be expected or will be achievable will be dependent on the size of the potential pipeline of new projects at an appropriate stage of technical development. Clearly, obtaining comprehensive data on the number of relevant R&D projects underway or stalled across the technology area is challenging (and more intelligence on the number and range of relevant projects may aid promotion effects).

Nevertheless, a past evaluation of the Low Carbon Vehicle Innovation Platform[9] suggested that there were 60 successful applications to the first three rounds of the Integrated Delivery Platform and a further competition round for the Ultra Low Carbon Vehicle Demonstration (in comparison to 22 applications received by the APC over three rounds). The figure below provides an overview of the total number of projects funded through the LCV-IP (taken from the APC Business Case), which suggests over 120 potentially relevant projects have been funded over the lifetime of the LCV-IP at varying baseline stages of technical development.

[9] LCV-IP; How the programme is forecast to boost economic activity and growth; Research survey and results; PACEC (Jan 2013)

Figure 3.2: LCV-IP award rounds and details



Source: BIS APC business case report (Innovate UK diagram)

Clearly, there is a limit to how informative these figures might be. As can be seen, these projects were generally at earlier stages of technical development. LCV-IP projects are also of a substantially smaller scale (and risk) than the projects funded through the APC. For example, the most recent two competitions launched by the LCV-IP[10] each involved total funding of £20 million, with individual projects expected to be less than £5 million (the minimum threshold for APC projects). As such, lower volumes of applications to the APC might be expected (particularly as some early stage projects will likely be aborted where the underlying engineering challenges prove intractable). It is important to note here that many of these projects began some time ago, and some may have found other pathways into mainstream development since support began (while other projects may not yet be complete). At the same time, it may instead imply that a share of LCV-IP projects have failed to convert into applications to the APC, indicating the possibility of latent demand for subsidies that is not currently being exploited. These findings are somewhat ambiguous: the difference between the volume of projects funded through the LCV-IP and the APC are not so large or small that a firm conclusion can be drawn on this point.

3.5 Barriers to applications

As is highlighted in Figure 3.1 the number of applications received for each round was significantly lower than the number of registrants for the webinar.[11] Applications to the APC do not appear to have increased in volume in line with awareness, and the implication is such that there may be other barriers holding back applications amongst non-applicants. The need to generate sufficient applications requires that there are no unnecessary barriers to firms submitting applications. From the evidence gathered from applicant and

[10] IDP12 and Developing Advanced Lightweight Vehicles

[11] It should be noted that: not all registrations were unique (some firms had several attendees to the webinars); projects must be collaborative meaning that some of the attendees could have been partners; and the webinars are not a mandatory pre-requirement of the application process.

non-applicant firms, there may be several barriers that are being encountered by firms wishing to apply to the APC.

Competition timing

The most common barrier to applying cited firms related to the short length of competition windows given the time requirements involved with preparing an application. The opening and closing dates for APC rounds 1, 2 and 3 are set out in the table below. Typically, applicants were given around two to two and half months to develop and submit their applications (or between 42 and 50 working days, as illustrated in the table overleaf). The announcement of the competitions was made two or three weeks in advance of the opening date.

Table 3.2 APC competition dates

Round	Announcement	Opening date	Closing date	Duration
APC1	-	02/12/13	05/02/14	50 working days
APC2	23/04/14	08/05/14	02/07/14	47 working days
APC3	06/11/14	13/11/14	14/01/15	42 working days

Source: APCUK & Innovate UK website

Specific issues highlighted by applicants included:

- **Time required to develop an application:** Applicants reported that substantial time was involved in the preparation of an application. Evidence submitted by two lead firms suggest that from beginning to end, their application process took over 200 person days to prepare[12] (and clearly, such an investment requires substantial resource planning). Firms suggested that the competition windows were short given the amount of time needed to generate a quality bid for submission. To mitigate for this timing issue, two non-applicants suggested that they would conduct some preparatory work in-between rounds in the hope that the scope did not fundamentally change (highlighting possible issues that applicants perceive some uncertainty with respect to the scope). This issue can also be linked to cost, as discussed below.
- **Timing of competition calls:** Several firms took issue with the timing of rounds one and three, given that the submission date was soon after the Christmas period (and the associated impact on the availability of staff to be involved).
- **Lack of advanced notice:** A number of businesses interviewed suggested that the length of calls to the competition could be a suitable window for preparing submissions if it was made clear in advance what the dates and general area for the call would be.

Cost of completing applications

Feedback from most applicants was that the process of application was costly, specifically with respect to time as noted above. This may create barriers for smaller firms with fewer staff, as was reported by some SME firms consulted as part of the study. This issue may be difficult to balance given the information requirements necessary for sound assessments to be made, as well as the complexity that is implicit in applications of this nature. It may be that the programme would have sight of more projects with the inclusion

[12] These estimations were generated as part of a recent process mapping workshop conducted by APCUK ltd. Further detail is provided in the Annex.

of an “outline bid” or expression of interest stage, to help give confidence to potential applicants. Furthermore, assessors would be able to give earlier guidance to applicants on scope should this be necessary.

Formation of collaborations

A related issue highlighted by the research was the challenges associated with the formation of collaborations. The most significant issues here related to sharing commercially sensitive information, as well as the costs and the lengthy timelines involved with identifying and recruiting partners and then preparing submissions jointly. The interviews with applicants suggest that many would arrange non-disclosure agreements (NDAs) with potential partners in advance of any conversations, as a standard procedure (aligning with standard practices in the industry).

This need for confidentiality could, and in some cases has, caused issues for firms wishing to apply to APC. In particular, arranging collaborations will take time and this may impact on the project timetable or the availability of funding (public or private). One applicant suggested that it might typically take two months for an OEM to decide regarding a partnership and that this process was difficult to start before a call was announced, or at least until the OEM had confidence that it was coming.

Additionally, one of the key roles of APC UK Ltd is to help catalyse collaborative relationships. However, while the research has identified a small number of firms who have been assisted to identify viable projects and find partners, the evidence gathered from applicants and non-applicants suggests that many of the consortia from the first two rounds of competition were formed from pre-existing relationships. Consultations suggest that the issues with commercial confidentiality highlighted above are likely to substantially restrain the ability of APC UK Ltd to take an active role in supporting this process. However, it should be noted again that, due to APC UK Ltd still being in its infancy at the time of the research, it is difficult for this assumption to be tested.

While this partly validates some of the market failure arguments put forward in support of the justification of the programme, more consideration is needed in exploring how APC UK Ltd might support the creation of a pipeline of new projects for APC support. For example, efforts might be usefully targeted at earlier stages of the technical development process (e.g. identifying opportunities to support technology transfer from academic institutions), which may pay-off at later stages (which might, for example, initially be supported through the LCV-IP). Additionally, some consideration might be given to how far APC UK Ltd have sufficient information from the monitoring of LCV-IP projects by Innovate UK – or relevant projects being developed under other competitions such as the Energy Catalyst - to target projects on the cusp of being ready for APC funding.

Competition Eligibility Rules

Overall, competition scope appears not to have acted as a major barrier for applicants. In particular, rules regarding the technical readiness of projects were not regarded as a substantial issue by applicants. In general there was a high level of support for the programme scope and technology focus. When speaking with firms (both applicants and non-applicants), ten of the 12 we spoke to agreed that the objectives appeared logical; several also stated that the programme was a “good idea”.

However, the requirement for OEM or Tier One involvement in the collaboration appears to have substantially restricted the pool of eligible applications (particularly from SMEs) and

leads to a situation where SMEs secure only a small percentage of the overall funding available. One stakeholder described the issues created by this restriction. They suggested that for an SME to secure the necessary collaborative partners, it would be likely that their idea would need to align with the R&D activities or strategies of the target OEM or Tier One firm. If this was feasible, it would be likely that the OEM or Tier One would have already identified the SME (and if they were not aligned there would be little incentive for the OEM to participate). As such, they felt this would make it almost impossible for an SME to lead an APC project. This highlights the importance of APC UK Ltd's role in supporting collaboration to challenge the status quo in terms of existing supply chain relationships.

Given the number of OEMs and Tier One automotive manufacturers in the UK, this will clearly place limits on the number of project applications received by the APC (as well as limiting the extent to which the project might directly facilitate technological spill-overs from sectors outside the automotive industry). APC UK Ltd has identified this as a potential issue and has begun investigating the viability of a ring-fenced fund with fewer requirements with respect to scope.

3.6 Guidance on Completion of Applications

The resources available to potential applicants to the APC are important to ensure that firms are able to provide the required details for assessments of their projects to be made. Furthermore, the application forms and appendices themselves should make the application process as straightforward as possible so as to allow applicants to fully express both the engineering and commercial rationale for their project, provide a clear plan for executing their project, and illustrate how their project has been structured to optimise the potential benefits to the UK. Finally, good guidance should reduce the costs of application for firms.

Application forms and appendices

The feedback given by most applicants was that the resources provided as part of the programme did not prove to be helpful to applicants in preparing an application. Most firms were already familiar with Innovate UK competitions so felt that the application form itself was fit for purpose and asked the relevant questions. Several firms were broadly satisfied with the application process, rating the Innovate UK form favourably with respect to its relevance. However, most highlighted common issues around the structure of how the information was collected for APC. The main issues raised were:

- **Appendices did not follow a logical order** – some felt there was duplication of information which made the process harder. Several found this to be the hardest aspect of the process and spent significant time preparing their own guides to ensure no information was missed.
- **Application form formatting -** almost all firms identified the formatting of the main application as an issue for them. The word document has some properties that restrict formatting, making it hard to complete (for example it is not possible to spellcheck the live document).[13] Most firms reported spending some time on working out how best to complete the form

[13] Though a solution to this issue would be to prepare the text for the application form in a standard word processing package, this did not appear obvious to applicants.

One stakeholder suggested that the present form does not give sufficient space to detail the engineering challenges that might be encountered in moving from the assembly of prototypes at a laboratory scale to assembly line production at scale. This is a particular concern given the focus on addressing manufacturing challenges through the APC. This issue is picked up in more depth in the following section.

VfM assessment

One particular aspect of the process where there was a lack of understanding among applicants was the Value for Money (VfM) element of the application process. Most applicants to the programme felt that it asked for details that were outside of the scope of their normal knowledge base as commercial firms. For example, one firm advised that an earlier report by an economic consultancy had been their source of data, without which they would have struggled to generate meaningful numbers. Others suggested that it was not a concept at all familiar to them as a business and so struggled with the information required. One firm stated they wished to have a better understanding as to *"what the VfM questions were trying to get at".* Another firm felt that the long term nature of the projections required from applicants made answering questions on jobs very difficult.

Almost all applicants to the programme reported finding the VfM stage of the application particularly difficult. Several firms said it appeared to be "hidden" at the end of the process (being the last documents alphabetically) and was not at all signposted as a key element of a successful application. This may also relate to the perceptions of applicants, believing APC competitions to be identical in format to Innovate UK competitions. Both these factors appear to have combined, creating uncertainty for applicants.

This feedback has already been taken on board and a VfM specific webinar has been provided so as to improve the understanding among applicants. Furthermore, materials on the VfM assessment are also being revised. Some care will be needed on how this additional guidance is prepared: supporting applicants to structure their projects such that they optimise the benefits of APC projects to the UK economy (such as maximising the proportion of R&D projects delivered within the UK) will likely be beneficial, though too much transparency on the calculations underlying the VFM assessment could lead to strategic behaviour (such as providing optimistic sales forecasts). It may also be beneficial for example VfM forms to be supplied to applicants, so that they can see clear demonstrations of its use, including some of the more common sources of benefits that can be included.

Moreover, changes to the APC4 marketing and communications activities have been designed to help applicants to understand the VfM aspects of the application process. The roadshows now include a presentation and one-to-one consultations with potential applicants, conducted by a VfM assessor from BIS. These sessions are designed to help potential applicants to think about how their project will deliver value for money for the economy, so that they are more equipped to complete the application effectively. BIS officials are, however, cautious not to provide "coaching" for applicants on how to put together a model application which is likely to pass the VfM assessment.

Application quality

It is difficult to draw conclusions from the nine unique applications that have been subject to full appraisal to date. However, from the first two rounds all but one passed the minimum requirement score for the technical aspects of the projects. However, three bids

failed the VfM assessment (with a further three only passing the VfM criteria following negotiations on the overall scale of public grant to be offered).

Only three out of seven APC3 applications were successful, supporting anecdotal evidence from stakeholders that the most recent round has yielded a greater number of lower quality applications. These quality concerns have been driven both by submissions being received that were not at an appropriate level of technical development or targeted out-of-scope technical objectives, and issues with the clarity with which proposals were expressed.

3.7 Conclusions

Key Evaluation question	Findings
To what extent are marketing and communication activities effective in raising awareness of APC among potential applicants, including non-UK companies?	The evidence suggests that awareness levels are high amongst OEMs and other large firms and low amongst SMEs (though it should be acknowledged that a marketing strategy has only recently be put in place) and potentially successful applicants to the competitions funded through the Low Carbon Vehicle Innovation Platform (which might represent a possible pipeline of projects). Levels of international awareness have proven more difficult to gauge, though the view of stakeholders was that the scale of subsidies available were sufficiently large to be influential. **Recommendation:** It is recommended that monitoring information on the progress of LCV-IP projects is fed back in some way to APC UK Ltd to allow them to have some oversight of the pipeline of projects coming through, and target their marketing more effectively (subject to appropriate information sharing agreements being signed).
To what extent are marketing and communication activities attracting a sufficient number of high quality applications?	Concerns have been raised around the number of applications being received by the APC, which appear low relative to LCV-IP. Quality over the first two rounds was high, with all but one passing minimum technical standards. However, the quality of applications fell in Round 3 (including projects at an insufficient stage of technical development). A range of barriers are highlighted below, though branding issues were raised as an issue (with the APC evocative of a physical research facility rather than a subsidy programme). **Recommendation:** There may be benefits in reviewing how the APC is branded to make it more obvious to applicants what the scheme involves, and how it is fundamentally different to competitions funded through Innovate UK. More strategically, alignment of the early stage funding available from Innovate UK with the late stage funding provided through APC could also minimise resources wasted and simplify the landscape for applicants. If applications were made through a more general gateway, BIS and Innovate UK could route the application through to the appropriate competitions (rather than relying on the applicant to do so themselves). Note that this would involve some alignment of the marketing and communications and application processes, but other parts of the process can be managed independently by Innovate UK and APC UK Ltd respectively.
How effective are marketing and communication activities in identifying fundable projects and building consortia?	There was little evidence that marketing and communications activity had produced any new collaborations (with projects largely based on pre-existing relationships), with APC UK Ltd facing substantial constraints in their ability to actively intervene owing to commercial confidentiality issues. There was no evidence that any application emerged as a consequence of

Key Evaluation question	Findings
	being directly targeted by marketing and communications. **Recommendation:** Again, greater integration or information sharing between early and late stage funding could be beneficial in allowing APC UK Ltd to take a more pro-active role in identifying fundable projects, as well as allowing them to more actively intervene in catalysing new partnerships at earlier stages of technical development (which may not lead to an immediate pay-off in the form of new APC applications, but could support the creation of a pipeline of fundable projects).
How effective are marketing and communication activities in ensuring understanding of the scope and objectives of the competition, eligibility requirements and competition processes?	No major concerns were raised about the clarity of programme scope and eligibility criteria. However, applicants appeared ill prepared for the VfM aspects of the appraisal process, an issue for which corrective action has already been taken in the form of improved guidance on the VfM appraisal process. Care will be needed to avoid making the VfM calculations too transparent to applicants, though clearly advising applicants on how to structure the delivery of their projects so as to maximise economic benefits to the UK will be potentially beneficial.
To what extent have eligible projects been identified but have not resulted in an application, and what were the reasons for this?	A number of issues were highlighted in this review that may be inhibiting applications. These include the timing of application rounds and their duration, the cost of preparing an application, and the requirement for OEM or Tier One involvement. The latter two points are picked up below, but applicants stressed the time required to build a consortia as well as to prepare a written submission as substantial (and the windows allowed may not be sufficient to secure the involvement of an OEM, who may take two months to decide on whether to participate). **Recommendation:** A timetable of future rounds should be published on the APC website to give potential applicants confidence that future funding will be available, and the flexibility to prepare applications over longer timescales if required.
To what extent have potentially fundable projects been put off from applying due to the specific scope and criteria of the competition (e.g. technology readiness level, minimum project value)?	The requirement for OEM or Tier One involvement was also raised as a substantial issue that may exclude many SMEs from applying. In particular, those SMEs that are strategically aligned to an OEM would likely take a junior role in a partnership. Those that do not have existing relationships would struggle to secure involvement as there would be no incentive for the OEM to commit resources. As such, this criteria will likely limit applications to the APC. **Recommendation:** While the removal of requirements for OEM involvement may increase applications, there is a clear rationale for these restrictions in that this involvement will be required to reach consumers in large quantities (and bids without the involvement of OEMs may be of a much higher risk). Consideration of the potential for a smaller funding round, aimed at testing the commercial potential for bids without OEM involvement, could be one way of testing whether such risks are acceptable. Alternatively, such a constraint could be relaxed by requiring a letter of support from an OEM rather than a financial commitment to the project (to provide some evidence of commercial potential).
To what extent has consortia building been a barrier to potential applicants (e.g. not being able to collaborate with a UK-based prime manufacturer)?	The main issues associated with formation of consortia are described above.

Key Evaluation question	Findings
Can processes be improved in any way to increase efficiency?	An expression of interest (EOI) process, allowing applicants to submit an outline bid in advance of a full application, could encourage higher application volumes. Whilst expression of interest meetings provide an opportunity for early feedback. This would also offer an opportunity for BIS or Innovate UK to provide more detailed feedback that could enhance the quality of full applications.

4.0 Appraisal and Selection

This chapter provides an evaluation of the appraisal and selection process for applications.

4.1 Overview of the appraisal and selection process

Once all bids have been received and the competition has closed, the application documents, including all appendices, are sent both to the technical assessors allocated to the project and the value for money (VfM) assessors in BIS. The two processes operate in parallel and in isolation. The technical assessment follows established processes for Innovate UK competitions, while the VfM assessment follows a similar process and uses a similar model to other BIS competitions, namely RGF and AMSCI.

- Technical assessment - Each application is reviewed by five independent technical assessors, appointed by the Lead Technologist in Innovate UK. Each assessor independently gives a score to the project against each of the ten questions[14] on the technical assessment part of the application document. This is followed by a moderation panel, where all the technical assessors meet together to discuss each project and revise their scores. The panel provides combined feedback to the applicant and, if selected for interview, the applicant is asked to provide response to this feedback in the form of a ten page document.

- VfM appraisal - The application is allocated to a BIS official (usually an economist) who uses the information provided to populate a VfM model.[15] This is peer reviewed by another member of the VfM team and then quality assured again by a panel of senior economists. Where it is felt that more information or clarification is required to provide an accurate VfM assessment, questions are submitted back to the client and these are discussed in a subsequent telephone meeting. The results of this supplementary data gathering exercise are used to revise the model. The main quantitative output of the VfM appraisal is the benefit-cost ratio (BCR) and the threshold for an application passing the VfM assessment. However, the BCR is presented alongside a narrative assessment of VfM.

Applicants passing the technical and VfM assessments are subsequently invited to an interview panel in Swindon. This can be attended by up to nine people, so typically involves most, if not all, partners in the consortium. The consortium must prepare a 30 minute presentation, the slides for which must be submitted to Innovate UK in advance. Following the delivery of the presentation, the technical assessors ask some additional

[14] These questions are: 1. What is the business opportunity that this project addresses?; 2. What is the size of the market opportunity that this project might open up?; 3. How will the results of this project be exploited and disseminated?; 4. What economic, social and environmental benefits is the project expected to deliver to those inside and outside of the consortium, and over what timescale?; 5. What technical approach will be adopted and how will the project be managed?; 6. What is innovative about this project?; 7. What are the risks (technical, commercial, managerial and environmental) to project success? What is the project's risk management strategy?; 8. Does the project team have the right skills and experience and access to facilities to deliver the identified benefits?; 9. What is the financial commitment required for the project?; 10. How does financial support from Innovate UK and its funding collaborators add value?

[15] It should be noted that it was beyond the scope of this study to evaluate the suitability of the VfM model

questions (most of which have been prepared in advance). An economist from BIS has also participated in this interview process from APC3.

A final decision on whether or not to make a conditional offer to the consortium is made by the panel following the interview.

4.2 Analysis of appraisal results

Panel sheets reviewed from APC1 and APC2 show that, in the technical assessment, all applications scored over 70% (the minimum required threshold) in the initial assessment. The average overall score was 76%. However opinions of the assessors differed greatly. For all but two applications, the assessment score had a spread of results of over 10 percentage points while for half it was over 20 percentage points.

Assessor scores are moderated for all projects before a decision is reached, and it was at this point that four projects from APC2 were failed. Three of these projects also failed on the VfM assessments, having been scored a BCR of less than 2.0 after the feedback and review process.

Due to the small number of applications to date the VfM appraisal was conducted as an iterative process. In all but two applications the second VfM score was higher than the initial assessment; however, this did not always result in a passing score. Of the five projects that were successful at the first attempt in APC1 and APC2, all but one were assessed as having a BCR of just over the threshold (2.1).

The VfM assessments also reveal that there was significant variation in the level of additionality and risk from the projects. Gross additionality was assessed as being under 45% on average.

The seven applications in APC3 had a varying degree of quality, and a significantly lower average quality than in previous rounds. From all of the applications, there were three successful bids which had an average a technical score of 72.40% and an average BCR of 2.4. It was also felt by stakeholders that some applicants had simply not read the guidance properly in advance of applying.

However, it should also be noted that APC3 applicants were invited to demonstrate appetite for the programme in advance of the changing administration in Government, so this accounts for some more speculative bids and does not necessarily reflect the likely quality of applications in future rounds.

4.3 Scope check

This section assesses the effectiveness of the process for identifying bids that are in scope.

There is no formal scope check for APC projects prior to applications being passed on the technical and VfM assessors. Technical assessors are tasked with making an assessment of whether or not an application is in scope. Due to the relatively small number of bids received to APC in each round (11 bids were received in APC3, the highest volume so far), this appears to work well. However, if the quantity of applications is expected to increase significantly in future rounds, there may be a case for introducing a scope check to filter out ineligible applications before the documents get passed on to the assessors. Consultations with assessors suggest that a number of APC3 bids were out of scope, so

an initial scope check, potentially to be undertaken by APC UK Ltd staff, may help to reduce the workload of assessors in future rounds.

Alternatively, as discussed in the previous chapter, introducing an expression of interest (EOI) stage prior to the full application would have the same effect of reducing any wasted effort due to assessors looking at unsuitable applications. This will also create efficiency savings for applicants as only projects that fit the criteria would go through the full application process. There is a risk that this additional stage, and the lengthening of the overall duration of the application process, may be an unwelcome delay for applicants. However, we do not envisage that this would present a major problem as long as applicants are made aware of timescales in advance and these published timescales are adhered to by the programme partners and assessors, which is currently the case.

4.4 Technical assessment

The technical assessment is judged according to its effectiveness for identifying whether proposed projects are technically feasible and will progress relevant technologies to manufacturing readiness and for highlighting technical and commercial risks associated with the proposed projects. This section also considers the usefulness of feedback from the technical assessment and the extent to which there are inefficiencies or administrative burdens in the process.

Assessors

It is standard practice for Innovate UK competitions to employ on a contractual basis experienced engineers with an industry background to conduct the technical assessments. The Lead Technologist in Innovate UK maintains a pool of technical assessors from a business and/or research background, and the panel is selected on the basis of knowledge of the competition theme, as well as availability. This process ensures that assessment is conducted independently of the funding body and on the basis of relevant experience and expertise. The use of a panel rather than a single assessor, although more costly, is considered to be value for money as it reduces the risk of poor selection decisions.

Evidence from the stakeholder consultations suggests that the APC benefits from a very strong pool of technical assessors, in terms of technical and industry knowledge and experience. The technical assessors have typically held senior R&D roles in the UK automotive industry in the past, have been contracted as assessors for several other Innovate UK (and, prior to that, Department for Trade and Industry) competitions and have specialist expertise of direct relevance to the APC (e.g. powertrain, lightweighting, electric motors and emissions). One stakeholder from Innovate UK said that several of the APC's assessors were among "the top ten assessors in the UK".

The assessors not only appear to have good technical knowledge, in terms of knowing whether an idea is worth pursuing technologically, but claim also to have a wide industry knowledge. Assessors can judge whether there is likely to be a sufficient market for the end products and can test the viability of projects to progress to commercialisation. Assessors also have knowledge about whether other companies or supply chains are also pursuing similar projects. Unlike R&D competitions which focus on early stage development, this market knowledge is of particular importance for APC as a key success factor of the projects is that they will lead to the development of commercially viable products for mass manufacture. However, it is too early to make an objective assessment

of whether the industry knowledge of the technical assessors has been effective at identifying commercially viable projects.

Due to the relatively specialist nature of the APC competition, and the narrow professional field that it entails, the technical assessors tend to know each other well and also have professional relationships with many of the applicants. This may present risks to the objectivity and impartiality of the process, and potential conflicts of interest may emerge. However, due to the specialist knowledge required to understand and assess the technical aspects of projects, it appears that this risk is unavoidable. It would not be possible for individuals from outside of the sector, for example, to appraise the technical merits of projects relating to automotive powertrain.

Moreover, the assessors emphasise that their existing relationships do not affect the integrity of the competition in any way, as assessors approach their role with a high degree of professionalism and impartiality, and can provide an objective judgment. They also have to declare any conflict of interest prior to assessing a given application.

It should be noted that any concerns relate to perceptions about conflict of interest and reducing risk of conflict of interest in future, and there is no evidence whatsoever to suggest that there is any partiality in the assessment process currently.

Initial independent assessment

The assessment is structured according to previously used Innovate UK processes, involving a scorecard approach based on the standard ten questions used for all Innovate UK competitions. Among the four technical assessors interviewed, there is some disagreement about whether the application questions should be changed to be more bespoke for APC. One assessor felt that the questions did not adequately reflect manufacturing readiness level, which is an important aspect of APC, implying that the generic Innovate UK assessment questions may not be fit-for-purpose for a competition with a focus on late stage product development, or do not elicit the necessary level of technical detail.

There is also an acknowledgement among stakeholders more generally, as well as applicants, that there is duplication between the technical and VfM questions, and therefore there is scope to streamline the application. This issue is explored further in section 4.6 below.

Technical assessors are sent all application documents for each bid, including those primarily intended for the VfM assessment. One assessor mentioned that it is unclear which of these documents they are expected to review and therefore more specific guidance may help to focus the assessors' minds on the key information and reduce the time taken to assess applications.

Related to this, technical assessors report that the actual time taken to review the applications to a satisfactory level of thoroughness is much higher than the amount of time for which they are paid, and therefore remuneration levels for the technical assessment are relatively low.

Moderation panel

The moderation panel is considered to be a very effective and vital part of the process as it is the first time that the technical assessors have the opportunity to discuss the merits of

each application with each other. It is important to note that, in the view of the technical assessors, a simple amalgamation of the assessors' individual scores without moderation would not accurately reflect their combined assessment. In some cases, an outlying score reflects the fact that one of the assessors knows something or spotted something that the others did not. In the moderation panel, the group as a whole is sometimes swayed towards the opinion of the "outlier" once the reasons for this score are discussed. While all the technical assessors interviewed felt that this was the best approach for making an effective assessment, there is a danger of single voice dominating rather than the overall assessment fully reflecting the combined opinions of all the assessors.

Although this was not something suggested by any of the consulted stakeholders, the moderation panel may provide an opportunity for BIS VfM assessors also to feed into discussions about the applications. While the VfM assessor would not be expected to have sufficient technical knowledge to judge the technical merits of each application, they may be able to provide expertise on the more economic aspects of the application, including market opportunities, wider benefits, commercial risk, investment plans and the need for government funds. Moreover, listening to the thoughts of the technical assessors may help the VfM assessor to understand the projects better, and provide additional information of relevance for the VfM assessment.

Feedback to applicants

The feedback to applicants and the opportunity for applicants to provide further information is also deemed by technical assessors to be a vital part of the process. This provides the opportunity for the assessors to test the evidence underpinning estimated benefits put forward in the application. For example, if in their original application the applicant claimed that the proposed technology is going to reduce fuel consumption by a stated amount, the assessors can use the feedback process to probe whether they have a coherent understanding and explanation of how this is going to be achieved.

The feedback also has value for applicants. In most cases, the feedback from the technical assessment did not lead to changes in the scope of the project but rather enabled them to enhance the explanation of the project. One lead applicant said that this was a very useful process and helped the project team to communicate the proposals more effectively even outside of the competition process, for example to the company's own Board. However, the same applicant felt that the time taken to respond to feedback was significant, and this may prove to be a barrier for SMEs that have limited resource.

One stakeholder from Innovate UK suggested that some applicants are happy to put in a bid in the expectation of being unsuccessful in order to obtain the benefits of the feedback which they can use to strengthen their project (effectively free consultancy). Therefore, feedback can be important in developing the future pipeline of projects and enhancing awareness and understanding of the competition and its requirements.

Although specific examples were not given, two lead applicants felt that the feedback questions from the technical assessors were asking for information that had not been requested in the initial application. This was the source of some frustration, as there was a feeling that the guidance should have been clearer with regard to the information that they were expected to provide. Moreover, one unsuccessful applicant felt that the formal feedback from their application was of limited use, and a more informal discussion that took place outside of the competition process at a later date was much more useful.

Seven lead applicants and three partners rated their satisfaction with the feedback received (incorporating both the technical and value for money feedback) on a scale of 1 to 5. The lowest score was 2 and the highest score was 4, with an average (mean) of 3.2.

4.5 Value for money assessment

This section evaluates the effectiveness of the VfM assessment in identifying projects offering the best value for money. This section also considers the usefulness of feedback from the VfM assessment and the extent to which there are inefficiencies or administrative burdens in the process.

Appraisal model

The VfM assessment is conducted using a framework that was based on the same principles as those for RGF and AMSCI. In the view of the assessors, this consistency is important to ensure that the required quality of applications is consistent across schemes. For example, a project that is unsuccessful in AMSCI cannot subsequently apply to APC and then be successful. Moreover, it is important to maintain the integrity of the VfM process by making it consistent with processes used for other business investment schemes and appraisers become experienced through using a similar model for different schemes. It is beyond the scope of this evaluation to assess the appropriateness of the VfM framework itself but it should be noted that the VfM tool has undergone internal quality assurance prior to APC4 as part of BIS's quality assurance process of all business critical models.

The appraisals are predominantly undertaken by BIS economists (with a quality assurance and moderation process used to ensure consistency) although, from APC3, the appraisal team has also included the appraisal team's automotive sector business analyst who can provide more technical and market insights to help assess whether the claims made by applicants about the potential exploitation of, and wider benefits of the proposed technology are realistic. Although not representative of all applicants, one APC2 lead applicant was critical of the fact that the VfM assessors did not have sufficient engineering knowledge so it does seem appropriate to have more of a balance of specialisms within the appraisal team.

Feedback to applicants

In general, VfM assessors feel that allowing the opportunity for applicants to provide supplementary information and clarification is helpful for the appraisal process as it provides more accurate and complete data for the model, and should help to improve the accuracy of the BCR. However, one BIS stakeholder said that this iterative process was only feasible due to the small number of applications currently submitted to the competition. If the volume of bids were to increase in future rounds, it may be appropriate only to request further information from marginal applications (which are neither a clear pass nor a clear fail), as is the case in AMSCI. It was also suggested by a VfM assessor that there should be a strict "cut off" regarding further information that can be submitted so that the process does not involve an indefinite series of iterations, as has been the case for a minority of APC applications.

Most applicants were satisfied with the VfM feedback although there were some sources of dissatisfaction. For example, one lead applicant felt that it would be helpful if the feedback provided contextual comments as well as questions (as is provided in the

technical feedback), as this would help them to understand what BIS was actually looking for. However, as mentioned in the previous chapter, it is important that the information requested from applicants elicits accurate and realistic data, rather than encouraging applicants to strategically provide figures that will help increase their BCR.

Another lead applicant expressed a preference for a written response (again similarly to the technical feedback) rather than a verbal discussion, while another lead applicant reported that they had not been expecting the BIS feedback and meeting, suggesting that they had not read or understood the guidance prior to applying. This process was mentioned in the APC1 guidance but may have been easy to miss on a quick read.

In general, these comments reflect the fact that the majority of applicants are much more used to the technical assessment process, due to taking part in other Innovate UK competitions in the past, but were unfamiliar and less comfortable with the VfM assessment process.

As discussed in the previous chapter, however, improvements made to marketing and communication processes for APC4 have been designed to address this observed lack of understanding among applicants, and might be expected to improve applicants' satisfaction with the VfM appraisal process.

4.6 Areas of duplication between technical and VfM assessments

There is an acknowledgement among stakeholders, as well as applicants, that there is duplication between the technical and VfM questions, and therefore there is scope to streamline the application. This finding was one of the main outcomes of an APC Competition Process Optimisation Workshop in early 2015, attended by stakeholders from APC UK Ltd, Innovate UK and BIS, as well as some representatives from successful applicants. This workshop identified that the application and appraisal process has been designed to provide inputs to two separate Government bodies (BIS and Innovate UK) and that the two processes had been simply "bolted together" to accommodate the APC1 competition launch date rather than being fully integrated. To respond to this problem, a further workshop has taken place to develop solutions to ensure that: BIS and Innovate UK continue to receive the information they require to undertake the technical and VfM assessments but without the need for duplicate entry work by the applicant; the application forms are harmonised to provide a common integrated competition form without reducing the integrity of the questions; and duplication within the forms and guidelines are identified and eliminated.

It should be noted, however, that there is some reluctance from technical assessors to see a change in the questions. Two technical assessors interviewed said that they do not think the technical questions should be changed, as they have a proven track record for Innovate UK competitions and help to provide calibration with other competitions.

Similarly to the technical assessors, the VfM assessors were also divided about whether the application form needs to be changed to assist the appraisal process. One of the assessors interviewed felt that the application form should remain unchanged, but the other two favoured more integration between the technical and VfM aspects of the application. It was felt that some of the technical questions "strayed into value for money territory" and there was significant overlap. As recommended in the previous chapter, a

more integrated application, with fewer questions, would provide a more streamlined process for applicants and potentially reduce the time taken to complete the application.

The following table identifies some questions where there is potentially overlap between the information sought by the technical assessment and the information sought by the VfM assessment. It is suggested that it should be possible to modify the application forms such as the questions on each row of the table are asked only once, thus providing cost savings for applicants and possibly reducing barriers to applying.

Table 4.1: Duplicate questions in the APC application form

Technical assessment question	VfM assessment question
Q1: What is the business opportunity that this project addresses? And Q2: What is the size of the market opportunity that this project might open up?	App F Q1: What is the timescale of the project and what is the size of the potential market opportunity?
Q4: What economic, social and environmental benefits is the project expected to deliver to those inside and outside of the consortium, and over what timescale?	App E Q1: How will the project lead to job creation and safeguarding? And App E Q3: What other wider economic, social and environmental benefits is the project expected to deliver to those inside and outside of the supply chain and over what timescale?
Q7: What are the risks (technical, commercial and environmental) to project success? What is the project's risk management strategy?	App E Q4: What are the risks (technical, commercial and environmental) to project success and how will they be managed to ensure successful project delivery?
Q9: What is the financial commitment required for the project? And Finance Summary Table	App E Q2: What is the proposed investment in the project on R&D, capital, skills and training?
Q10: How does financial support from APC and its funding collaborators add value?	App F Q3: Why is government funding required for this project?

Source: APC application forms

It is noted that substantial work has been undertaken between APC3 and APC4 to provide a more integrated application form. The APC4 application form is still based around the ten technical assessment questions but the information required for the VfM assessment is now integrated into these questions rather than being "bolted on" in the application appendices. For example, while the wording for Q4 remains the same in APC4 as in previous application forms, the guidance accompanying this question makes explicit reference to the types of benefits that will be assessed in the VfM assessment, linking this question to the quantitative evidence requested in Section 4 of the application.

There is also an argument to suggest that the technical assessment questions could have a greater emphasis on the technical rather than the commercial aspects of the project. Arguably, only Q5 (What technical approach will be adopted and how will the project be managed?) and Q6 (What is innovative about this project?) out of the ten current questions elicit information specifically focused on the technical aspects of the project.

Similarly, it was suggested by one BIS stakeholder that more could be done to integrate the feedback provided to applicants. This finding was also reflected in the comments of one lead applicant, who said that they would prefer to have a single point of contact

through the appraisal process. Currently the feedback processes relating to the technical assessment and the VfM assessment respectively are conducted separately. Again, the applicant experience could be enhanced and the costs to applicants reduced if this process were integrated, although most case study respondents did not mention this as a particular source of frustration or confusion.

The appraisal and feedback process has been made more integrated in APC4. While the technical and VfM assessments are still undertaken separately and two separate sets of feedback are provided to applicants, the technical and VfM assessors now have sight of each other's work to ensure that there is coherence and consistency in the assessment and the feedback provided to applicants. Moreover, the VfM assessment process has been made more structured in line with the technical assessment. In APC4, applicants have just one telephone call to enable VfM assessors to clarify aspects of their bid, but there is no longer an iterative process between applicants and assessors as the VfM appraisal is refined.

4.7 Interview

This section focuses on the effectiveness of the interview process for addressing any questions raised in the assessments and enhancing the technical strength and value for money of projects. This section also considers the extent to which there are inefficiencies or administrative burdens in the interview process.

The majority of stakeholders and applicants are generally positive about the interview panel and feel that it is a worthwhile exercise and an appropriate part of the assessment process for the size of grants involved. The vast majority of APC1 and APC2 applicants interviewed as part of the case study analysis were very happy to attend an interview and were satisfied with the process. Applicants tended to see the interview as a good opportunity to sell their project and highlight the key aspects and benefits that they wanted to get across. They respected the experience and expertise of the panel, and felt that the questions were appropriate and intelligent.

Similarly to the point made in section 4.4 above, there is a question about the impartiality of the interview panel. Due to the specialist nature of APC it is appropriate for projects to be assessed by individuals with sufficient knowledge of powertrain technologies. However, there is a case for suggesting that some balance might be provided by including on the panel one or two industry experts from other parts of the automotive sector, or from other sectors altogether. These individuals might not be expected to understand all of the technical aspects of projects but could ask more general questions, and provide a more independent perspective to complement the opinions of the technical assessors.

However, one stakeholder from BIS suggested that it is not necessary to interview all applicants that pass the initial VfM and technical assessments, merely those that are marginal cases. Alternatively, the interview panel could be reduced in scale so that fewer people (from both the side of the applicant and the assessors) are expected to attend. This corresponds with the comments of one lead applicant, questioning the need to have so many silent observers present at the interview. While this appears to be a minority view, this may be something to consider to reduce costs particularly if the volume of applicants increases significantly in future rounds.

When attending the interview, one applicant got the impression that the decision about their project had already been made and the interview would not make any difference, again adding some support to the suggestion that an interview may not be necessary for all projects, where they are already either a clear pass or a clear fail.

The technical assessors, however, counter this argument and feel that it is necessary to conduct interviews even with applicants that have put together a very strong case on paper. When applicants come to the interview, the funding is “theirs to lose” and on occasions this is exactly what happens. The applicant may fail to answer a particular question adequately or say something which is a cause for concern, and this can cause them to be unsuccessful even when their previous appraisal scores were good.

The structure of the interviews works well, according to the stakeholders involved. Technical assessors agree prior to the interview the questions they will ask (and who asks each question), although there is flexibility to ask further questions if issues come up in the presentation. The presentation itself is kept to a strict time limit, with no opportunity for interruption from the panel, which ensures the process is fair and transparent. Both assessors and applicants felt that the time provided for the interview was about right. One technical assessor felt that the process could be made to feel more informal, in light of the fact that people on opposite sides of the table know each other well from within the industry. Equally, however, this could be a reason to retain the strict structure and formality to ensure that impartiality is maintained.

After the question and answer session, the applicants are asked to leave the room while the assessors deliberate. The process allows for the opportunity for applicants to be brought back in for further questions, but this is seldom required suggesting that the presentation and initial questioning is sufficient for the assessors to make a conclusive judgement about the application.

In general, stakeholders and assessors feel that the practice of having a BIS economist at the interview adds value. As stated by one technical assessor, there is clear complementarity between the formulaic approach to VfM assessment undertaken by BIS and the opportunity to challenge market assumptions and explore the broader view through the interview.

It should be noted that, in APC 3 and APC4, VfM assessors take a more pro-active role in the interviews. The interview is now used as the primary method for eliciting further information from applicants for both the technical and VfM appraisals, as part of the drive to provide a more integrated appraisal process.

Six lead applicants that attended interview rated their satisfaction with the interview process on a scale of 1 to 5. The lowest score was 3 and the highest score was 5, with an average (mean) of 4.3.

4.8 Conclusion

Key Evaluation question	Findings
How effective is the assessment of gateway and criteria questions in identifying bids that are in scope?	There is currently no formal scope check for APC. Having this additional step may improve the efficiency of the process, by ensuring that VfM and technical assessors are only asked to look at bids which are within scope. Alternatively, this problem could be addressed through the introduction of a formal EOI prior to full submission. **Recommendation:** The introduction of an EOI stage into the application process would improve the efficiency of the appraisal process by requiring assessors only to look at those bids that pass a minimum threshold of quality.
To what extent is the technical assessment effective at identifying whether proposed projects are technically feasible and will progress relevant technologies to manufacturing readiness?	The technical assessors are highly experienced and have in-depth technical knowledge of relevant technologies and how they fit into technology road maps. The moderation process ensures that any specialist knowledge of a particular assessor is given sufficient weight, while the feedback and interview process allows the assessors to understand fully all project proposals, and ensure their questions are answered. However, the fact that most assessors are in the same professional networks as many of the applicants could expose the appraisal process to perceptions of conflict of interest. Moreover, the time allotted to technical assessors to appraise the bids appears to be inadequate relative to the task involved. **Recommendation:** Innovate UK may wish to consider whether the remuneration to technical assessors could be reviewed, to ensure that the thoroughness of the technical assessment is not compromised.
To what extent is the technical assessment effective at highlighting technical and commercial risks associated with proposed projects (e.g. particularly in the context of wider investments and developments in the industry)?	As well as technical expertise, the technical assessors also have a wider industry and market knowledge and are best placed to judge whether a given project proposal has commercial viability. While a certain degree of commercial risk is inevitable for R&D projects, and itself provides a rationale for state subsidy, it appears that the process does enable these risks to be understood fully.
To what extent is the value for money assessment effective at identifying projects offering the best value for money?	The process for generating additional information and clarification from applicants enhances the accuracy of the assessment but there is a question as to whether this is necessary for all but marginal applications. Additionally, there is a case for suggesting that more support could be given to applicants on the information required for the VfM assessment, and the process by which that information will be assessed, without “giving away too much” and encouraging strategic behaviour from applicants.
How useful is the feedback provided from the technical and VfM assessments to enhance the quality of projects or provide guidance for future applications?	In general, both successful and unsuccessful applicants find the feedback from the technical assessment to be very helpful for enhancing their bid, although mainly to help them better explain their project rather than make substantial changes. Opinions of the VfM feedback were more mixed, however. The process could be made more streamlined by providing a single piece of feedback and a single point of contact for applicants during the appraisal stage. **Recommendation:** The guidance for the VfM assessment could be reviewed to ensure that applicants provide comprehensive and accurate data on economic benefits and additionality minimising the need for further

Key Evaluation question	Findings
	iterations. It is noted, however, that improvements to the guidance have been made for APC4.
How effective is the interview process for addressing any questions raised in the assessments and enhancing the technical strength and value for money of projects?	The interview is felt by both applicants and technical assessors to be a very important part of the process and ensures that the technical assessors are completely happy that the project is fundable. While cost savings could be made by limiting the number of attendees and/or inviting only more marginal projects to interview, the risk to decision-making from making efficiencies from this process are deemed to be significant. To reduce any risk of bias or conflict of interest in the panel's decisions, including one or more panel member from outside of the industry may help the panel to be perceived as more impartial and independent. **Recommendation:** The interview panel could be expanded to include one or more industry experts from outside the automotive sector to provide an alternative perspective alongside the technical assessors. This individual could also take part in the moderation process, to reduce any perceived bias among the technical assessors.
What costs have been incurred by applicants and internal and external stakeholders (including external assessors) in the appraisal process, and to what extent are these costs deemed burdensome or disproportionate?	Lead applicants spend significant resource engaging with the appraisal process, although generally they do not feel that this is disproportionate relative to the funds involved. An entire appraisal process involves about 1,400 hours of APCUK Ltd., Innovate UK and BIS time (including external assessors). There is also significant time involved from technical and VfM assessors. In particular, technical assessors report that the amount of time they spend appraising each project is significantly higher than the consultancy time allocated by Innovate UK.
Can processes be improved in any way to increase efficiency?	Efficiency could be improved by: • Filtering out inappropriate applications prior to appraisal through an EOI or scope check • Providing improved guidance to applicants for the VfM assessment • Streamlining the appraisal process to ensure that applicants get a single piece of feedback and engage with a single contact. There is also scope for a fuller integration of the VfM and technical aspects of the appraisal process, both in terms of reducing duplication in the application form and providing a more integrated customer journey with a single point of contact throughout the process. **Recommendation:** The appraisal process could be more integrated so that applicants get a single set of feedback and work through a single main contact. This has now been implemented in APC4. We also recommend reducing the number of questions in the application form by identifying duplication between the VfM and technical questions, and recognise that substantial improvements have been made for the APC4 application form.

5.0 Contracting and Due Diligence

5.1 Overview of the contracting and due diligence process

Applicants that are successful after the interview stage are initially sent a brief communication stating that they have been successful and are then sent a Conditional Grant Offer Letter. This is a detailed document, running to about 30 pages, following a standard template used by all Innovate UK funding competitions. The Conditional Grant Offer Letter sets out the provisional terms of the contract and requests the applicant to submit a number of further documents to support the contracting / due diligence process, including:

- Collaboration agreement, signed by all partners
- Initial financial forecast for each consortium member, showing the anticipated spend of the project broken down into quarter year periods throughout the life of the project, and divided into cost categories (e.g. labour, overheads, materials, capital equipment)
- Detailed Project Plan, splitting the original proposal into work packages with assigned estimates of the resources and timescales needed to achieve each of them
- A Milestone and Risk Register
- Exploitation Plan, setting out how the project team will exploit the results of the project to increase the economic growth and quality of life of the UK

After submission of the Conditional Grant Offer Letter, Innovate UK undertakes financial checks on each of the project participants. This involves:

- Cost reviews – Review of project costs to ensure they comply with the rules of the APC Competition and State Aid
- Financial viability checks – This will be undertaken by Innovate UK on all consortium members, based on the latest accounts filed at Companies House, although additional information may also be required from the organisations themselves.

External due diligence services are not used for the APC competition, and applicants are not expected to pay for due diligence reports.

Once due diligence is completed and the consortium has provided all documentation to the satisfaction of Innovate UK and the Monitoring Officer, then a Grant Confirmation Letter is issued and the project can start. In some cases, however, projects in APC1 and APC2 have proceeded “at risk” prior to the contracting process being complete. This has involved consortia starting some or more work packages on the basis of the conditional offer, accepting the risk that the grant offer has yet to be confirmed and they are not able to start making claims.

5.2 Conditional offer letter

The Conditional Grant Offer Letter is a legal document that aims to set out the conditions of the grant to each partner and communicate clearly the requirements for projects during the contracting stage.

The key deliverables of the project, in terms of contractual obligations, are set out in the project plan and exploitation plan. It seems that projects have an obligation to deliver on planned expenditure and direct project outputs as a condition of receiving grant although projects do not appear to be directly contracted against wider outcomes including jobs created and CO_2 savings achieved. These aims would be included in the exploitation plan which applicants are expected to deliver. However, there may be a case for the Conditional Offer Letter to include explicitly some of the outcomes that were set out in the application and provided the basis for the VfM assessment. Offer letters for other similar BIS programmes, including RGF and AMSCI, do specify economic outcomes (in particular jobs created and safeguarded) as a condition of the grant, and hence becomes a clear focus for the monitoring. As APC is essentially an R&D rather than a capital investment scheme, however, this change should be applied with caution as many of the longer term economic outcomes are contingent on the technology being successfully exploited, which may be outside the direct control of the consortium.

It may also be possible to tie the grant to a series of pre-defined engineering or technical milestones, as opposed to project delivery milestones. For example, while a project delivery milestone might include testing the propulsion system in a laboratory environment, the engineering milestone would be based on the results of those tests (e.g. total energy consumption of the system, weight, power density etc.). Therefore, if the test results do not meet these technical specifications, then this allows for the flexibility to withdraw further funding from the project if it does not look likely to deliver on the intended outcomes. This is similar to the way in which the Research Councils manage their funding for translational research.

The case study interviews suggested that there were few issues with the Conditional Grant Offer Letter. It was considered to be thorough and clear about requirements, although three out of five lead applicants found errors in the letter which were not resolved as quickly as they would expect.

According to the competition guidance, the time allowed between submission of application and receiving a decision was about two months for APC1 and APC2. Evidence from the case studies suggests that these timescales were kept, to the satisfaction of applicants. One lead applicant said that, having worked hard to meet the tight timescales for submitting the application, it would have been frustrating if Innovate UK and partners had failed to keep to their own timetable. However, two lead applicants expressed dissatisfaction about the timescale for receiving feedback from the interview and receiving the Conditional Grant Offer Letter, leading to a delay to the start of the project.

It should be noted that a change to the Grant Offer Letters will now be implemented for APC4, having been trialled with one project in APC3. The documents will now contain a more explicit reference to economic outcomes, although failure to achieve these outcomes will not result in clawback of funds. There has also been agreement to continue monitoring economic outcomes after the completion of projects.

5.3 Due diligence

This section assesses the effectiveness of the due diligence activities to ensure the financial viability and State Aid compliance of projects, as well as the extent to which these processes led to changes to consortia, funding levels or project plans.

From the point of view of the applicants, the due diligence procedure itself appeared to be very light touch. Applicants were not expected to commission their own due diligence reports and did not generally have to provide additional financial information to due diligence officers.

Due diligence for APC follows the same process as for all other funding competitions operated by Innovate UK. The process is undertaken internally by the finance team in Innovate UK, without the use of specialist accountants or State Aid lawyers. For each application, the team scrutinises the project costs as set out in the application and assesses whether the costs are allowable and seem reasonable given the scope of the project. All items of expenditure are expected to be quoted “at cost” (for example, staff time should be valued at actual labour cost not commercial day rates, which incorporate profit). This process sometimes leads to costs being reduced to certain partners and hence a reduction in the grant.

Innovate UK also carries out solvency checks on smaller firms or other partners with which they are less familiar. These checks also assess whether the information provided by the partner is accurate, for example the legal status of the firm or whether it passes the SME test.

As part of this process, the finance team also checks State Aid compliance. Notification has been provided by the European Commission to allow Innovate UK to assess State Aid compliance for its funding activities. No problems or challenges have been encountered in relation to any grant recipient, and Innovate UK is happy that the current process is rigorous in ensuring that its competitions are State Aid compliant.

In only one case did the composition of the consortium change during the contracting period. In this case, a new partner was found in order to ensure State Aid compliance.

5.4 Collaboration agreement

As discussed in Chapter 2, the collaboration agreement is a vital document to protect the interests of all partners and ensure that the consortium is stable and effective. The collaboration agreement can help to define how the outcomes of the project, both in terms of intellectual property and future production contracts, will be shared under different eventualities. By signing the agreement, individual partners are accepting that their private risk and expected returns are commensurate to their investment in the project.

The majority of lead applicants interviewed in the case studies revealed that drawing up the collaboration agreement was the most time-consuming and burdensome aspect of the contracting process. This is unsurprising, particularly for large consortia, due to the inevitable negotiations and iterations involved to ensure that all partners were content to sign.

However, applicants felt that it was necessary to have a collaboration agreement in place. The value of collaboration to advanced propulsion systems is set out in Chapter 2. Due to the vertical disintegration of the industry, R&D of this scale simply cannot be delivered by an OEM in-house. One lead applicant said that, if it were not for the APC requirement for a collaboration agreement, they would have proceeded with a non-disclosure agreement instead. While this would have reduced the cost of the process, he recognised that this would have been a weaker arrangement and felt that it was useful for a collaboration agreement to be mandatory. A non-disclosure agreement simply restricts the sharing of information outside of the signatory parties, and is thus helpful in protecting intellectual property. However, a collaboration agreement also stipulates the inputs, outputs and benefits accruing to each partner, protecting the wider interests of each consortium member.

One lead applicant reported that, in any future bids requiring a collaboration agreement, he would ensure that this was in place before submitting the application, in order to reduce timescales and accelerate the start of the project. This was also suggested by a stakeholder from Innovate UK as a means of reducing the length of the contracting process. Guidance on developing a collaboration agreement is provided to consortia in advance of applying, so starting this process early may be an efficient option for some applicants. Other lead applicants interviewed, however, felt that this was not a realistic option as it would require partners to invest time and energy into a process when there was no guarantee that the project would be funded.

5.5 Project planning

As discussed in Chapter 6, the project delivery plan is a key document for monitoring and is actively scrutinised by the monitoring officer on a regular basis, to assess whether the project is progressing according to agreed work plans and outputs. It is made up of a series of work package plans that direct the work on each work package. As such, the work undertaken in the contracting phase is deemed effective to provide a suitable framework for monitoring.

The amount of time invested in project planning varied considerably between consortia. One lead applicant reported that they had intentionally tried to get the project plan right during the application stage, so that it was agreed and understood by all partners from the outset, and this subsequently saved them time in the contracting stage.

For other consortia, however, there was a requirement to put a lot more work into the project plan following the conditional grant offer. One lead applicant reported that the consortium partners were much more willing to put time into the process once they knew that the application had been successful.

A number of projects started “at risk” before the grant confirmation had been signed. In general, lead applicants were happy to proceed on this basis as this ensured that the start dates were not delayed and helped projects to keep to overall timescales. However, one university partner expressed concern that they felt under pressure to start early, including recruiting staff to the project before confirmation of the grant, but the university was not prepared to make these commitments. Another applicant stated that starting the project “at risk” made it difficult to finalise the project delivery plan as the plan was already continually changing as a result of progress made or challenges encountered on the work packages.

5.6 Overall timescales for contracting process

As alluded to in the above discussion, the overall time taken to complete the contracting process has been identified as an issue by both stakeholders and applicants. While applicants generally expressed satisfaction with the time taken between submitting their initial application and receiving their Conditional Offer Letter (with assessors adhering rigidly to the published timetable), there was less satisfaction with the time taken to complete the contracting process.

The activity that takes up the most time is completion of the collaboration agreement. As discussed above, this time could be reduced by encouraging consortia to work on their collaboration agreement prior to receiving a conditional offer, but this risks wasted effort on the part of partners if the bid is unsuccessful. An alternative solution is to encourage projects to commence “at risk” so that timescales remain on schedule. This has worked for some projects in the early rounds but not all partners are content to accept this risk.

Therefore, a key recommendation is to ensure that the published competition timetable allows sufficient contingency for a protracted contracting process and applicants can plan their projects and project outputs accordingly.

5.7 Overall satisfaction with contracting process

Four lead applicants and two partners that had experienced the contracting process were asked to rate their satisfaction on a scale of 1 to 5. There was a wide spread in responses, ranging from 2 to 5, with an average (mean) score of 3.7.

5.8 Conclusion

Key Evaluation question	Findings
How effective was the financial viability assessment and to what extent did this lead to changes to consortia, funding levels or project plans?	Due diligence is a key part of the process to ensure that project partners are financially sound and the grants are State Aid compliant. For APC, the process is evidently light touch with minimal administrative burden on applicants. While there is no indication that the due diligence process is insufficiently rigorous, it should be noted that the grant size for APC is significantly higher than for most other Innovate UK competitions, and therefore the risks associated with these payments are substantially higher. The due diligence requirements for other BIS programmes, including RGF and AMSCI, are substantially higher than for APC, involving external expertise and requiring significant input from applicants. While these requirements created an additional burden for applicants, the process evaluations for both of these programmes did not deem it appropriate to reduce the thoroughness of either the financial or State Aid due diligence processes. There is no indication that the financial viability assessment led to any changes in consortia, funding levels or project plans. The process was light touch and required little involvement from applicants.
How effective was the State Aid due diligence process and to what extent did this lead to changes to consortia, funding	Only one project that has gone through the contracting stage so far has modified its consortia post-application in order to meet State Aid requirements.

Key Evaluation question	Findings
levels or project plans?	
How effective were the Conditional Offer Letters and Grant Confirmation Letters in setting out the scope and objectives of projects?	There were no major issues with Conditional Offer Letters and Grant Confirmation Letters although the efficiency of the process could be enhanced by minimising errors in the Conditional Offer Letter. However, Conditional Offer Letters and Grant Confirmation Letters do not currently commit applicants to any outcomes except to make the agreed expenditure and progress the project. **Recommendation:** The competition partners may consider including reference to other outcomes in the Conditional Offer Letter, in particular key performance indicators that were included in the application and upon which the project was appraised. This could be done in such a way that applicants are held to account for their economic impact without being forced to commit to uncertain outcomes beyond the control of the applicant, given the nature of the R&D. This may include integrating technical or engineering milestones upon which payments are conditional. This would allow BIS the option to consider aborting the project, if the early testing and development is not meeting pre-defined technical standards, and recycle the funds into more promising proposals. We recommend that any changes are applied only to future rounds and not applied retrospectively to projects that are already in the process. It is expected that some changes to the conditions of the grant will be introduced as standard in APC4.
What costs have been incurred by applicants and internal and external stakeholders (including external due diligence contractors) in the contracting and due diligence process, and to what extent are these costs deemed burdensome or disproportionate?	In spite of the due diligence itself being light touch, the amount of resource required from applicants to draw up the collaboration agreement and finalise project plans was significant. While this is deemed burdensome by many applicants, there was general consensus that all the activities were important for projects of this nature and no significant efficiencies could be made. Despite the effort entailed to put it together, the collaboration agreement is valued by consortium partners as it supports the functionality and stability of the consortium. There is some evidence to suggest that, if it were not mandatory, some projects may have proceeded without having a full collaboration agreement in place which could provide a threat to the stability of the consortium. Moreover, as stated in Chapter 2, it is unlikely that any projects would have proceeded on a collaborative basis without support from APC. As reported in Chapter 6, the project delivery plan is an important document for Monitoring Officers and project managers. In general, this requires significant work for consortia in the contracting stage.
Can processes be improved in any way to increase efficiency?	In general, our assessment is that there is limited scope to improve efficiency in the contracting stage. It is a lengthy and intensive process but the required tasks are all necessary. Allowing projects to start “at risk” helps to reduce the impact of the contracting process on project timescales as does encouraging consortia to develop their collaboration agreement earlier, but this can cause problems for consortia where some partners are unable to proceed before grant confirmation. While the timescales for contracting appear to be appropriate, it is evident that this slows down the progress of some projects. It is recommended that

Key Evaluation question	Findings
	sufficient time is allocated to the contracting process, and that applicants are made aware of these timescales in advance so that consortia can base their applications on realistic start dates, and there is reduced need for projects to start “at risk” before the grant is confirmed. **Recommendation:** In recognition of the fact that contracting can be necessarily protracted, timescales for project start dates should be made realistic in published competition guidelines and timetables. Evidence from APC1 and APC2 suggests that in most cases the time allotted for contracting was overly optimistic. Allowing more time for the contracting process would ensure that applicants’ expectations are correct and business plans can be aligned with competition timescales.

6.0 Monitoring and Performance Management

After the contracting process has been finalised, project delivery is initiated and managed on the basis of a predefined monitoring and performance management process. This chapter examines the effectiveness and efficiency of the monitoring process in ensuring that the programme delivers value for money.

6.1 Overview of the monitoring process

The general objective of the monitoring process is to ensure that projects are successful in meeting their specified aims and that public money is appropriately invested in project activities. The monitoring process is based on a number of steps that aim to:

- prepare applicants for the implementation of their projects in line with their contractual obligations;
- support the submission of financial and project data to enable the payment of claims and assessment of project performance and risks.

The monitoring process is largely based on the standard processes used in other Innovate UK funding competitions. Key elements of the process include:

- *New Project Workshops*: these provide an official launch to the project and are attended by key stakeholders and applicants. The monitoring process is presented to applicants and project plans are reviewed.

- *Kick-off meetings*: these are more in-depth meetings between applicants and monitoring officers to discuss the strategic direction and finer details of the project plan and the approach to project management going forward.

- *Quarterly meetings*: monitoring officers meet with applicants on a quarterly basis to review performance against project plans and exploitation plans and to provide advice on how to strengthen the implementation of their projects. Monitoring officers make an assessment of project performance against six domains (project scope, timescales, costs, exploitation, risk and progress), scoring each domain on a scale of 1 to 5, and provide a narrative assessment of performance and key issues.

- *Quarterly claims*: project applicants are expected to provide evidence of eligible expenditure on a quarterly basis to receive grant payments relating to the costs incurred.

Applicants commented that the overall framework of the monitoring and performance management process provides a suitable approach for supporting engagement with Innovate UK and fulfilment of their contractual obligations. While specific issues were mentioned (as discussed in more detail below) the overall system is regarded as suitable.

In particular, quarterly meetings with monitoring officers were seen as providing added value to project delivery given the advice received. It was mentioned by applicants that the approach used is similar to that of other Innovate UK programmes and is based on tried and tested methods.

The following sections 6.2 to 6.6 provide an assessment of the extent to which the various tools and systems used in the monitoring process (including scheduled meetings, support from the monitoring officer and the processes for complying with monitoring and risk management requirements) are effective for monitoring performance and risk at both project and programme level. The analysis also focuses on the costs that have been incurred and the extent to which processes could be made more efficient.

6.2 New Project Workshop, kick-off meeting and quarterly meeting

New project meetings and kick-off meetings

Initial meetings take place between applicants and stakeholders prior to projects commencing, in order to ensure that applicants are aware of their monitoring obligations and to examine issues around project implementation. A New Project Workshop takes place initially to launch the project formally and this is followed-up by the kick-off meeting which provides the opportunity to go into details associated with project implementation and the monitoring process.

One applicant with previous experience of Innovate UK projects commented that the initial meetings were effective. They provided the opportunity to meet the monitoring officer and the monitoring process was clearly presented.

Another applicant mentioned that the New Project Workshop was actually a good marketing publicity tool for APC as it was a high profile meeting and a number of stakeholders were in attendance. It was useful to have the monitoring processes reiterated but the applicants were familiar with the process already from previous projects.

However, one lead applicant who had no previous experience of monitoring activities mentioned that he was not entirely clear on the process to be followed after participating in the meetings. A general understanding was gained but it was not clear what specific actions needed to be taken. However, subsequent telephone calls with the monitoring officer were sufficient to fill the gaps.

A monitoring officer commented that the New Project Workshops were not as well attended by project collaborators as they should be. While lead applicants normally attend, their project partners may not in some cases. However, another monitoring officer suggested that organisations that are familiar with the monitoring process may not learn much from the New Project Workshop although it remains essential for them to attend the kick-off meeting.

Quarterly meetings

The quarterly meetings are a core element of the monitoring process. These are attended by the monitoring officer and consortia members and can take place over two days. More recently, quarterly meetings have also been attended by project associates from APC UK Ltd in order to help them to attain closer oversight of the technical progress of APC

projects and to provide support to projects. The discussions focus on the technical progress of each work package and the implications on project finances and risks. The meeting is necessary for the monitoring officer to review the evidence supporting quarterly claims.

Applicants commented that quarterly meetings are a beneficial aspect of the process given that issues can be discussed face to face with monitoring officers who have a good understanding of the problems they experience. Agreements can be reached with monitoring officers during the meetings that can help to resolve problems and improve the project.

Monitoring officers underlined the importance of quarterly meetings as part of the monitoring process as they are the main vehicle through which Innovate UK learns of project progress and wider concerns. It was suggested that the meetings can be very effective in terms of identifying obstacles and proposing solutions. They also suggested that the quarterly meetings provided the opportunity for monitoring officers to coach applicants to meet their monitoring obligations and generate new thinking on technical issues, although they needed to resist the temptation to give prescriptive advice.

In addition, monitoring officers also mentioned that quarterly meetings encourage team working between applicants with a view to strengthening project cohesiveness. Partners focused on a particular work package are given the opportunity through the quarterly meetings to see how their work fits into the wider project. As such, the meetings are deemed useful for reviewing and planning the project internally, even if the monitoring officer were not present.

Monitoring officers also commented that meetings with applicants prevent the monitoring process from becoming a “tick box exercise”, as they are useful for making substantive improvements to the project.

It should be noted that, in some cases, monitoring meetings are held on a monthly basis, thus providing monitoring officers with more control over projects.

Resources available to monitoring officers

A problem identified by monitoring officers is that the time required to provide monitoring support at regular intervals exceeds their contracted number of days. Monitoring officers are contracted for 1.5 days per meeting and this was said not to cover the full amount of time required, including preparation, travel, reporting and any support required between meetings.

6.3 Relationship with monitoring officers

Innovate UK provides each project with a monitoring officer, contracted by Innovate UK, who is responsible for reviewing all aspects of project performance and providing advisory inputs. The current pool of monitoring officers all have relevant technical expertise in automotive R&D, gained from many years’ experience in the industry and through acting as monitoring officers for other Innovate UK programmes, in particular the competitions funded by the LCV-IP. For this reason, the monitoring officers already often have an established relationship with some of the companies and individuals. The monitoring

officers for APC are all also employed as technical assessors and interview panel members.

Overall, the relationship with monitoring officers is considered by applicants to be working well. In fact, some applicants commented that the most beneficial feature of the monitoring process is the advice received from monitoring officers.

A key reason for this outlook is that applicants find it useful to have external persons who are experienced in R&D project delivery to review project performance. This can lead to the generation of alternative ideas that have the aim of strengthening project results. Applicants appreciated the fact that monitoring officers have a background in industry as opposed to Government for this reason.

A further observation is that monitoring officers sometimes agree to flexible interpretations of monitoring / contractual rules to ensure that projects can progress efficiently. For example, on one project, the monitoring officer approved the allocation of project funds for unforeseen activities without subjecting the applicant to an arduous administrative process.

In addition to this, monitoring officers were often said to provide a professional service in terms of effectively dealing with applicants' queries as they emerge often in short time-frames.

Another applicant commented that even though their project has yet to commence, they are already working with their monitoring officer to make the necessary preparations and the inputs to date have been appreciated.

Similar feedback was provided from the interviews with the monitoring officers. They see their role as aiming to resolve any problems associated with the projects, providing support on planning activities, ensuring that any proposed changes are well-executed, and championing the project with Innovate UK and other stakeholders.

The monitoring process for APC tends to follow established Innovate UK processes, as the infrastructure is already in place. All monitoring officers come from a technical background which, as discussed above, seems appropriate for a scheme of this kind. This contrasts to AMSCI, for example, where monitoring officers come from a business or finance background. It was mentioned by one stakeholder from APC UK Ltd that the more technical focus of monitoring officers employed by Innovate UK may present a risk to the effective monitoring of economic outcomes.

6.4 Technical monitoring

Technical monitoring is a key part of the monitoring process. This requires applicants to update their Project Delivery Plans which are used to provide an overview of the implementation of the project according to key milestones (the plans are broken down into work packages that require updating individually as the project progresses). Project data on progress against TRLs and MRLs are also collected on the basis of self-declarations, rather than specific evidence of results. This latter requirement was introduced specifically for the APC programme, and is not a standard monitoring requirement for other Innovate UK programmes.

Technical monitoring is supported by applicants' internal monitoring processes and quarterly meetings attended by the monitoring officer.

Applicant systems for the monitoring process

Applicants indicated that they have established appropriate systems to comply with the technical monitoring requirements. Typically, the monitoring of work packages would be undertaken for projects of this nature anyway. The only additional requirement is to pull these work packages together to ensure the Project Delivery Plan is updated for the monitoring officer's benefit. Projects are overseen at lead applicant level by a project manager with project collaborators designating their own project managers for the specific tasks allocated to their organisation.

Monitoring officers commented that the efficiency by which applicants establish systems suitable for the monitoring process largely depends on their experience of Innovate UK R&D programmes. However, it was mentioned that support is provided where gaps in experience exist and applicants can be quickly brought up to speed. In relation to current projects, the approach established by applicants is regarded by monitoring officers as adequate and frequent meetings are said to be a useful discipline for supporting project management activities. Moreover, one monitoring officer commented that as soon as applicants understand the process, project managers can be very effective in their roles.

Project Delivery Plan

In terms of the effectiveness of the Project Delivery Plan (PDP) in supporting project management activities, applicants generally considered it useful for supporting project planning as long as it is frequently updated (which may require some investment of time in encouraging project collaborators to complete their tasks). As stated above, such activities were not considered burdensome as the use of such tools normally features in project management activities.

One lead applicant commented that the PDP is useful in establishing key milestones and providing a technical update on project delivery. Another applicant commented that on the basis of frequent updates, the PDP with supporting work package plans provide an immediate overview of emerging activities, allocation of tasks and targets to be met. However, this organisation commented that significant effort went into preparing the document at the contracting phase so that it could be used for project delivery. It was mentioned that if PDPs are prepared for the purpose of satisfying the needs of the contracting phase alone then it would be unlikely that they would be useful going forward.

Other applicants mentioned that PDPs are not the driving documents for their projects. In such cases, other internal documents are used to guide the project and information is collected from these to update the PDP. However, this approach was not viewed as burdensome.

Understanding of the application of TRLs and MRLs

Applicants are required to fill out a self-declaration document to indicate the progress of their project against mandated TRL and MRL targets. However, a monitoring officer mentioned that it may be more helpful to introduce a formalised system whereby

applicants receive clear guidance and support on how the progression of their project relates to these criteria. This could be specified clearly in the Conditional Offer Letter.

An applicant pointed out that to support the monitoring of their project they have linked the milestones in their PDPs to their TRL and MRL targets. However, the applicant suggested that further support from monitoring officers would be useful to ensure that there is a clear and common understanding about how their project's progress and outputs fit into the various levels defined in the framework of the TRLs and MRLs.

In relation to the recommendation in Chapter 5 that Grant Offer Letters could make grant payments conditional on meeting pre-defined technical milestones, there is clearly a role for monitoring officers to identify and monitor performance against these milestones. This was not discussed explicitly in the research interviews, but this would involve an enhanced responsibility for monitoring officers to report where projects have failed to reach engineering or technical milestones, for a decision to be made by Innovate UK and BIS whether to abort the project.

6.5 Financial monitoring

Provision of financial data

Applicants were asked to comment on their processes around financial monitoring. Given that collection of financial data is normally performed on R&D projects, this exercise was not perceived by applicants as particularly arduous. One applicant commented that budgeting and financial forecasting are conducted as standard and the information that they would normally collect is adapted to fit the Innovate UK format. Another applicant commented that the firm has existing systems in place from which they collect data. One applicant did mention that the forecasting part was an additional activity but that it was not overly difficult to complete.

However, it was mentioned by several lead applicants that managing the consortium to collate and submit all the necessary financial information from all project partners is sometimes time consuming.

Examining the performance of project expenditure

A monitoring officer mentioned that the quarterly review meetings are vital to examining whether applicants are slipping in terms of their expenditure targets. As problems are identified, applicants are requested to focus on ensuring that solutions are proposed and implemented. Moreover, applicants are encouraged to ensure that they are going to spend their allocated budgets in the coming quarters as originally intended.

Furthermore, one monitoring officer mentioned that they ensure that the allocation of funds between project partners is carried out as planned. For example, there have been cases where attempts have been made by larger members of the consortia to reduce project activities initially designated for SMEs and monitoring officers have stepped in to ensure that the interests of all partners are upheld.

Reallocation of funds

A problem identified by applicants is the reallocation of funds between budget lines or requesting expenditure on unforeseen activities. One applicant commented that they requested the use of a third party to provide testing services which was not originally envisaged. While this was approved by the monitoring officer without going through a lengthy administrative process, the applicant commented that a disproportionate amount of time was spent discussing this issue.

A monitoring officer mentioned that there should be more streamlined processes for requesting and approving budgetary changes. It was clarified that if projects reallocate any amount of funding from one budget line to another it requires official clearance (although in practice this is not often stipulated by monitoring officers).

6.6 Economic monitoring

A further monitoring requirement for applicants relates to the provision of economic data. Projects are expected to report progress on expenditure, employment (by job title), upskilling (by NVQ level), CO_2 savings and technological progress. Projects are expected to submit this information to BIS every six months and a spreadsheet based template, which includes the targets for each partner using forecasts provided in the application, is provided. Due to the relatively early stage of the APC1 projects, few consortia have had very much to report on economic monitoring to date, aside from expenditure data and jobs directly related to the R&D activities, although this requirement will increase over time.

One issue that was raised by a BIS stakeholder is that many of the economic outcomes (e.g. CO_2 savings and jobs in the manufacturing supply chain) will effectively be realised long after the project has completed and all funds have been defrayed. This may affect the programme's ability to elicit longer term economic monitoring information without systematic post-completion monitoring, which has been recommended in the impact and economic evaluation scoping study.

Another stakeholder suggested that applicants may start to "grumble" if asked to provide two sets of monitoring data. This suggestion is corroborated by a case study applicant who felt that future economic monitoring requirements would result in the overall process being less "light touch" and more burdensome for applicants.

This generates the question as to whether more could be done to integrate the monitoring requirements of BIS and Innovate UK respectively to reduce administrative costs. For example, information on project expenditure is required for both the claims process (administered through the Innovate UK monitoring process) and the economic monitoring. Moreover, both the technical and economic monitoring processes require data on project and technological progress.

While it is understood that monitoring information is required by Innovate UK and BIS respectively for different purposes, from the point of view of the applicant it is more efficient to submit this information just once. Therefore, it is recommended that monitoring officers are given a wider remit of ensuring and supporting applicants' compliance with economic monitoring requirements. This would involve the monitoring officer passing on to BIS expenditure and work package progress information in an agreed format, as well as

supporting applicants to provide the additional information required by the economic monitoring (e.g. jobs, skills, CO_2 savings etc.). This would require some work from BIS and Innovate UK, with support from APCUK Ltd, to adapt and merge the technical and economic monitoring toolkits to ensure information is collected in a consistent format, fulfilling the data requirements of both processes. This work to streamline monitoring requirements in order to minimise the burden on applicants is currently underway.

Monitoring officers would not be expected to have significant expertise on economic outcomes or value for money. BIS economists would still be responsible for developing the data collection template and tools, and for analysing and interpreting the submitted returns. The monitoring officer would primarily have a coordination role in relation to economic monitoring, liaising with the applicant to ensure compliance, in addition to the specialist role of supporting and reporting on the technical progress of the project. However, this would have the benefit of helping monitoring officers to have a wider appreciation of the economic outcomes, so that day-to-day monitoring is not purely focused on the technical outcomes.

To implement this recommendation, some consideration should be given to the resource made available to monitoring officers. While the integration of economic monitoring activities into the monitoring officer role is not likely to increase the resource requirement significantly (for example, this is likely to involve a six-monthly or annual collection of data mainly focused on job numbers which is quite straightforward), it should be noted from discussion in this chapter that some monitoring officers already feel that the budget allocated to them is insufficient to cover the actual amount of time taken to monitor and support a project effectively. There would also be a role for BIS to ensure that monitoring officers are sufficiently briefed and trained to collect this information effectively.

It was noted by stakeholders that compliance with economic monitoring requires lead applicants to acquire potentially commercially sensitive information from their consortium partners. However, the economic monitoring requirements do not ask for any data beyond that which is provided in the application form, so we do not envisage that this is a significant issue.

As APC is quite different to most other support programmes delivered by BIS, insofar as it is an R&D scheme focused on technological outcomes, which should ultimately lead to economic outcomes, so there are limitations to how comparisons or best practice can be drawn from other BIS programmes with a more direct focus on delivering economic outcomes.

6.7 Risk management

A key feature of the monitoring process is the management of risks. Applicants are expected to develop a risk plan as part of their contractual obligations to identify key risks and corresponding mitigating solutions and this is carried forward to the project implementation stage. In addition, risk registers are established to identify risks as they emerge along with suggested actions to address them. Moreover, Innovate UK has developed a colour coding system to rate projects against certain categories of risk on the basis of assessment of monitoring information. Project risks are also incorporated into the VfM assessment.

Monitoring information and risk ratings from projects are collated into a monthly dashboard, reviewed by BIS, Innovate UK and APC UK Ltd to identify issues with particular projects and make an assessment of the progress of the programme as a whole.

Risk management systems managed by applicants

Applicants commented that they have established systems to monitor risks in line with what is expected of them. It appears that lead applicants operate a risk register to detect risks at project level while project collaborators have introduced means to monitor risks for the activities for which they are responsible. Relevant information is frequently transferred to the lead applicant and project managers translate the data to determine overall project risks.

In terms of the effectiveness of risk plans and registers in identifying and managing risks, applicants mentioned that they are useful for this purpose up to a certain level. However, applicants generally commented that a line needs to be drawn with regard to the examination and documentation of risks as otherwise disproportionate resources would be invested in this activity.

Applicants mentioned that they do not normally monitor risks in a documentary format to the same degree for R&D activities (although risk management is a standard practice). However, it was confirmed by one lead firm that management of risks of a similar scale is a business as usual activity and that they would not have taken their project on board if the risks were perceived as excessive. It was stressed that further obligations should not be placed on applicants to account for risks as this would represent an unnecessary activity. The suggestion was made that applicants should be held accountable to their approach to project management within the existing framework. Another firm stressed that they have a risk averse approach to managing projects and therefore considered they had the expertise to manage their project successfully.

One applicant commented that the risk template provided by Innovate UK was not detailed enough in terms of the information requested. The firm was requested by Innovate UK to provide further information in relation to mitigating actions and dates when they should be carried out. Moreover, it was suggested that further clarity from Innovate UK on their expectations on how risks should be managed could be provided.

Monitoring officers commented that risk management issues are discussed in the quarterly meetings and that mitigating actions are generally followed-up by applicants where issues are identified.

Monitoring officers views on the risk monitoring system

Monitoring officers mentioned that the colour coding system to indicate the risk status of a project that is used as part of Innovate UK's monitoring framework is generally appropriate. However, there are instances where projects are categorised in high risks levels (i.e. with red flags) but the reality is that the projects are not in trouble.

For example, as is sometimes the case with R&D activities, expenditure can be unpredictable. If spending is 25% behind on the project this will generate a red flag on the system, but this does not necessarily mean the project is in trouble. In relation to one

project, the OEM has introduced new timescales for the introduction of their engine and this has impacted on the timeline of the project. This project is marked with a red flag but the project is not facing serious issues and the consortium is not to blame. Currently, such issues are not reflected in the monitoring scorecard.

6.8 Overall satisfaction with monitoring process

Four lead applicants and two partners rated their satisfaction with the monitoring process, on a scale of 1 to 5. The lowest score was 3 and the highest score was 5, with an average (mean) score of 4.2.

6.9 Claims process

This section assesses the extent to which the process for approving claims and making payments is efficient.

The claims process enables applicants to prepare invoices to be submitted to Innovate UK in line with their quarterly expenditure. Monitoring officers ensure claims are appropriate and can direct applicants to Innovate UK if they require further advice.

Overall, applicants are satisfied with the claims process and they believe the system for payments is sufficiently efficient. The process for preparing the financial claim is not overly burdensome but does require some time to prepare.

Three lead applicants and two partners rated their satisfaction with the claims process, on a scale of 1 to 5. The lowest score was 3 and the highest score was 5, with an average (mean) score of 4.0.

Some minor issues were identified with the process, including: applicants being transferred to multiple persons at Innovate UK to deal with queries; financial claims documents not permitting copy pasting making them difficult to work with; and lead applicants needing to contact project collaborators to learn of the status of their claims.

6.10 Progress of APC projects

To give an early assessment of the extent to which projects are actually delivering, or are on course to deliver, the expected value for money, this section reports on the progress that has been made by projects to date.

APC projects are still in a very early stage of delivery. Case study respondents that have so far started their projects (this relates to APC1) are generally happy with progress and, even where work packages are behind schedule, they are confident that projects will be delivered to specification and on time.

The following table summarises the latest monitoring information relating to the four APC1 projects which are currently underway.

Table 6.1: Summary of monitoring information from February 2015 (four APC1 projects) – scores out of 5 (1 = very poor 5 = excellent)

	Lowest	Highest	Average
Cost[16]	1	3	2.25
Exploitation[17]	3	5	4.00
Planning[18]	1	4	3.25
Risk[19]	3	4	3.75
Scope[20]	3	4	3.75
Timing[21]	2	4	3.50
Overall	**2.1**	**4**	**3.4**

According to the latest monitoring information, the main cause for concern around progress so far relates to cost. All four projects have an underspend against their budget so far, with one project having an underspend of significantly more than 25%, resulting in it being flagged with the lowest score of 1. In this case, however, the monitoring officer feels that the consortium members have offered plausible and realistic explanations for this underspend and it is not felt that this will impact on overall delivery. It should be noted, however, that APC1 projects typically started in mid to late 2014, and were no more than two quarters into delivery at the time of this research.

In the area of planning, there is an issue with one project where progress has been deemed "unacceptable" (score of 1). This relates to slippage on a number of work packages that have not been reflected in an updated work plan, resulting in the consortium working with an out-of-date project delivery plan. However, this issue has been linked by the monitoring officer to changes in the company wide timescales for rolling-out its new engine range. Therefore the project does not appear to be at risk in terms of its successful completion.

One project got off to a slow start given issues with identifying appropriate engineering skills. However, according to the lead applicant and monitoring officer, the project is progressing satisfactorily (and has been given a score of 4 in terms of planning). A similar issue emerged with another project which started slowly as an appropriate project manager could not be identified at first (but similarly this project has been given a 4 against the planning criterion).

On other elements, all four projects are deemed to be at least satisfactory (scoring 3 or above). The highest score on exploitation is 5, where one project is "exceeding expectations" in terms of its expected ability to exploit its technologies commercially.

[16] The extent to which projects are overspending or underspending against profile
[17] The extent to which projects are progressing against their exploitation plan
[18] The effectiveness of project management and planning
[19] The effectiveness of risk management
[20] The extent to which the project is on course to achieve its planned objectives
[21] The extent to which the project is meeting its planned timetable

6.11 Conclusion

Key Evaluation question	Findings
What progress has been made so far by projects that have started?	Examined collectively, the four APC1 projects appear to have started well. An overall score of 3.4 against all criteria suggests that there is adequate performance overall. In terms of expenditure, a number of projects have got off to a slow start although there are mitigating circumstances which are understood and accepted by the monitoring officer. However, caution should be exercised to ensure that project delays do not impact on the anticipated technological and economic outcomes.
How effective are the tools and systems for monitoring project level performance and risks?	The existing tools and processes used for technical and economic monitoring and risk management are generally satisfactory generally. Where gaps in such aspects have been identified, monitoring officers have provided support and brought applicants in line with the requirements expected of them. Innovate UK has selected a team of monitoring professionals who are able to demonstrate a high level of competency in supporting applicants to fulfil their monitoring duties. Moreover, added value is provided through advisory inputs that can lead to the generation of new ideas to strengthen project implementation. Barriers to engaging in the monitoring process are addressed through the provision of advice or flexible application of monitoring and/or contractual rules to support efficient project implementation. While many of the projects are in their early stages, it is positive to learn that monitoring officers have gained the confidence of project applicants. However, monitoring officers should be wary of placing too much emphasis on the technical progress of projects and should ensure that project delivery takes full account of the impact on economic outcomes. Quarterly meetings are essential for monitoring officers to guide applicants towards meeting their expenditure targets and addressing obstacles to this as they emerge. These seem to be working well. However, the level of understanding around the TRLs and MRLs is not entirely clear for some applicants. There appears to be some uncertainty about whether project milestones as defined in the Project Delivery Plans are appropriately positioned against the correct TRLs and MRLs. This is important to address as arguably the key indicator of performance is that the technology is progressing to the required TRLs and MRLs, as defined by the technology roadmaps, so that it is ready for mass production at the required time and is therefore on schedule to deliver the expected economic benefits. **Recommendation:** Monitoring officers could provide clearer guidance to applicants on how key project milestones correlate with the MRLs and TRLs as defined by the APC. Given that applicants are contractually obliged to meet these standards, it is important for them to understand how projected project progress is correlated with these fixed targets. The introduction of a formalised system for technical monitoring in this area could help to clarify matters. The economic monitoring process provides the evidence required by BIS to monitor the ongoing value for money of projects. However, from the point of view of the applicant, there is a degree of duplication in the

Key Evaluation question	Findings
	information required by the technical and economic monitoring processes respectively. There is scope for improving efficiency by integrating the two processes. **Recommendation:** Innovate UK and BIS, with support from APC UK Ltd, should work together to develop an integrated toolkit that enables consortia to submit a single set of monitoring data in each claim period. The existing monitoring officers, supported by BIS officials, would have the responsibility for ensuring applicants' compliance with providing all required monitoring data. However, the resource allocated to monitoring officers to enable them to undertake their duties effectively may have to be reviewed. It is noted that changes to the monitoring process, similar to that recommended, are currently being planned. The approach to the management of risk by applicants appears to be appropriate. Large firms manage risks of a similar scale as a part of their business as usual activities and have developed appropriate methods for doing so. While the obligation to monitor risks requires the collation of information to a more detailed level than is normally required, this appears reasonable to applicants. However, without placing further requirements on applicants, clearer guidance to support applicants on Innovate UK's expectations around risk management may be useful in some cases. Innovate UK's monitoring of risks appears to be appropriate and quarterly meetings provide the opportunity for monitoring officers to ensure that firms design and follow up appropriate mitigating actions. However, the profiling of risks seems to require some fine-tuning as under the existing framework projects may be categorised as high risk but in reality this may not be the case.
What costs have been incurred by applicants and internal and external stakeholders (including external monitoring officers) in the monitoring process, and to what extent are these costs deemed burdensome or disproportionate?	The quarterly cost per lead applicant of complying with monitoring requirements and submitting claims is significant. However, it is possible that some of this resource would be expended anyway to keep track of project progress, even without the monitoring requirements. The ongoing updating of the Project Delivery Plans and work package documents do not seem to pose any major burdens on project applicants. Given that similar tools are used in industry as part of project management activities, managing such documents is regarded as a "business as usual activity".
To what extent are the processes for approving claims and making payments efficient? Can processes be improved in any way to increase efficiency?	There appears to be a barrier to the efficient reallocation of funds for applicants. Such barriers are not likely to exist for privately funded R&D activities and therefore the existing process appears bureaucratic. Innovate UK may wish to introduce a fixed threshold below which the reallocation of funds or expenditure on unforeseen activities is permitted without formal clearance. This system could rely upon assessment and approval by monitoring officers during quarterly meetings. The claims process is working well and is perceived as sufficiently efficient. However, some inefficiencies have been identified including applicants being transferred to multiple persons at Innovate UK to deal with queries, financial claims documents not permitting copy pasting making them difficult to work with and lead applicants needing to contact project collaborators to learn of the status of their claims.

7.0 Conclusions

7.1 Programme overview

There is a general consensus among applicants and stakeholders, including external industry stakeholders, that the APC is the right approach to provide a catalyst for the necessary product development in the UK automotive industry. The competition is complementary to the Low Carbon Vehicle Innovation Platform (LCV-IP) and provides funding for projects that would not be suitable for any other Innovate UK scheme.

Although based on anecdotal and self-reported findings, the evidence from the case study interviews suggests that the APC is providing an additional catalyst for projects that were in the pipeline anyway, but would have progressed at a slower pace or on a smaller scale if funded privately. In particular, the APC has been necessary for the development of collaborations, helping the industry to reap the benefits of working collaboratively while minimising the risks and disincentives of doing so.

7.2 Marketing, communication and application process

The evidence suggests that awareness of APC is high amongst OEMs and other large firms but low amongst SMEs, and concerns have been raised about the low number of applications received. As there is a clear pipeline of projects from the LCV-IP, there is an opportunity for more targeted marketing to attract appropriate applications.

A number of issues were highlighted in this review that may be inhibiting application volumes. These include the timing of application rounds and their duration, the cost of preparing an application, and the requirement for OEM or Tier One involvement. These barriers could be addressed by publishing a clear timetable for future rounds to aid business planning, providing opportunities for SMEs to access funding without OEM or Tier 1 involvement and introducing an EOI stage to filter out inappropriate projects at an earlier stage.

7.3 Appraisal and process

The technical assessors are highly experienced and have in-depth technical knowledge of relevant technologies and how they fit into technology road maps. The moderation process ensures that any specialist knowledge of a particular assessor is given sufficient weight, while the feedback and interview process allows the assessors to understand fully all project proposals, and ensure their questions are answered. However, the fact that most assessors are in the same professional networks as many of the applicants could expose the appraisal process to perceptions of conflict of interest. To reduce any risk of bias or conflict of interest in the panel's decisions, including one or more panel member from outside of the industry may help the panel to be perceived as more impartial and independent. These individuals might not be expected to understand all of the technical aspects of projects but could ask more general questions, and provide a more independent perspective to complement the opinions of the technical assessors.

There is scope for providing enhanced guidance on the VfM aspects of the appraisal process, as this tends to be the most challenging area for applicants. Moreover, significant

efficiencies could be achieved through better integration of the technical and VfM aspects of the process by removing duplicate questions in the application form and providing a single set of feedback during the appraisal process. It is noted, however, that some changes are already being made for APC4.

7. 4 Contracting and due diligence process

Due diligence is a key part of the process to ensure that project partners are financially sound and the grants are State Aid compliant. For APC, similar to other Innovate UK competitions but in contrast to some BIS programmes, the process is evidently light touch with minimal administrative burden on applicants. However, the amount of resource required from applicants to draw up the collaboration agreement and finalise project plans was significant. While this is deemed burdensome by many applicants, there was a general consensus that all the activities were important for projects of this nature and no significant efficiencies could be made.

It is noted that Conditional Offer Letters and Grant Confirmation Letters do not currently commit applicants to any outcomes except to make the agreed expenditure and progress the project. The competition partners may consider including reference to other outcomes in the Conditional Offer Letter, in such a way that applicants are held to account for their economic impact without being forced to commit to uncertain outcomes given the nature of the R&D.

7.5 Monitoring and performance management process

Examined collectively, the four APC1 projects appear to have started well although a key concern relates to progression against expenditure targets. A number of projects have got off to a slow start although there are mitigating circumstances which are understood and accepted by the monitoring officer

The existing tools and processes used for technical and economic monitoring and risk management are satisfactory. Innovate UK has selected a team of monitoring professionals who are able to demonstrate a high level of competency in supporting applicants to fulfil their monitoring duties. However, some improvements that could be made to the monitoring system include a clearer definition of TRL and MRL metrics and fuller integration of the Innovate UK and BIS monitoring requirements.

7.6 Future evaluation

It should be noted that the APC competition is still very much in its infancy and this process evaluation covers not much more than the first year of its operation. Over this time, the process has continually evolved and improved, particularly as APC UK Ltd has become more established. The key APC team was not in place until the start of the APC3 competition, so a process evaluation focusing primarily on APC1 and APC2 does not fully reflect the issues going forward. Moreover, much work has been undertaken internally between the competition partners, and in consultation with industry, to identify where the process could be improved to make it more efficient. With that in mind, we recommend that a further process evaluation be commissioned in the next 12-24 months alongside or separately to the impact evaluation.

Annex 1 – Costs to applicants

As discussed in the main body of the report, all lead applicants submitting a project proposal in APC1 and APC2 were asked, as part of the process evaluation, to complete a template based on the Standard Cost Model, to provide estimates of the costs incurred by the organisation at different stages of the process. Unfortunately, only two applicants returned data so, due to this small sample size, it was deemed inappropriate to report these costs in the main body of the report. However, the results of this analysis are reported here.

Application

The following table, derived from data inputted by applicants into the Standard Cost Model, suggests that, on average, the cost incurred by a lead applicant from engaging with the application process (including marketing and communication activities, consortium building and additional project development) is about £60,000. However, this figure is derived from the average of just two applicants (with quite large disparities between them) so should be treated with caution.

Table A.1: Average costs incurred by lead applicants in the application process (average of 2 respondents)

Activity	Number of hours	Staff costs	External costs / expenses	Total cost
Attending APC events	47	£2,800	£100	£2,900
Receiving advice from APC / similar advisors on how to prepare applications	40	£2,400	-	£2,400
Reviewing the APC guidance / familiarisation with the requirements	81	£4,500	-	£4,500
Building a consortium / establishing agreements with partners	180	£10,400	-	£10,400
Project design – additional time spent getting the project ready for application that had not been incurred anyway	78	£4,000	£19,500[22]	£23,500
Preparing and submitting the application form	303	£16,800	-	£16,800
Total	**729**	**£40,900**	**£19,600**	**£60,500**

Source: Standard Cost Model assessment

These results do contrast somewhat to the emerging findings from a process optimisation workshop, hosted by APC UK Ltd and attended by two lead applicants. Through this exercise, it was estimated that a lead partner would spend over 1,600 person hours engaging with APC up to the point of submission. However, note that over half of this time is deemed to be "wasted" time that is not adding value to the application, suggesting the potential for significant efficiency improvements.

[22] One of the two lead applicants providing a response employed an external consultant for this process, costing £39,000

Table A.2: Time resource expended by industry partners in application process per round

Activity	Number of hours
Identify project and obtain internal approval	280
Identify consortia partners and agree on working agreement	204
Develop internal business plan	161
Develop coalition agreement	472
Create external business plans including financial plan	168
Complete and submit competition documents	325
Total	**1,610**

Source: APCUK Competition Launch to Offer Workshop 2

Appraisal

The following table, derived from data inputted by applicants into the Standard Cost Model, suggests that, on average, the cost incurred by a lead applicant from engaging with the appraisal process (including responding to feedback and attending the interview panel) is about £12,000. However, this figure is derived from the average of just two applicants (with quite large disparities between them) so should be treated with caution.

Table A.3: Average costs incurred by lead applicants in the appraisal process (average of 2 respondents)

Activity	Number of hours	Staff costs	External costs / expenses	Total cost
Providing additional information to satisfy needs of the written assessment	37	£2,200	-	£2,200
Providing additional information to satisfy needs of the VfM assessment	58	£2,900	-	£2,900
Preparing and participating in the interview panel meeting	124	£6,900	£80	£7,000
Total	**219**	**£12,000**	**£80**	**£12,100**

Source: Standard Cost Model assessment

These results do contrast somewhat to the emerging findings from a process optimisation workshop, hosted by APCUK Ltd. and attended by two lead applicants. Through this exercise, it was estimated that a lead partner would spend 28 person hours responding to questions from Innovate UK and BIS (lower than the averages suggested in the table above) and 117 person hours preparing for and participating in the interview (similar to the average suggested above).

The process workshop also provided estimates of the amount of time spent by officers within APC UK Ltd., Innovate UK and BIS (including contracted assessors) on appraisal activities. As shown in the following table, it is estimated almost 1,400 person hours are involved per round. From the data we have, it is not possible to assess how this compares to other similar programmes and whether this time is proportionate to the size of the scheme and the amount of funding involved.

Table A.4: Time and staff resource expended by APCUK Ltd., Innovate UK and BIS in appraisal process per round

Activity	Number of hours	Number of staff
Application scoring and questions of clarification	774	22
Continued assessment, feedback and invitations sent for interviews	294	26
Review interview presentations	45	19
Conduct interviews	94	6
Decision provided by Innovate UK	150	7
Total	**1,357**	

Source: APCUK Competition Launch to Offer Workshop 2

Contracting

The following table, derived from data inputted by applicants into the Standard Cost Model, suggests that, on average, the cost incurred by a lead applicant from engaging with the contracting process is about £24,000. However, this figure is derived from the average of just two applicants (with quite large disparities between them), one of which had still not completed contracting, so should be treated with caution.

Table A.5: Average costs incurred by lead applicants in the contracting process (average of 2 respondents)

Activity	Number of hours	Staff costs	External costs / expenses	Total cost
Discussions / negotiations with Innovate UK	86	£5,000	-	£5,000
Developing project plan	141	£7,600	-	£7,600
Ensuring compliance with financial due diligence	27	£1,200	-	£1,200
Ensuring compliance with State Aid due diligence	5	£300	-	£300
Collaboration agreement	160	£9,500	-	£9,500
Total	**419**	**£23,500**	**-**	**£23,500**

Monitoring

The following table, derived from data inputted by applicants into the Standard Cost Model, suggests that, on average, the quarterly cost incurred by a lead applicant from engaging with the monitoring process is about £13,000. However, this figure is derived from the average of just two applicants (with quite large disparities between them), one of which had still not completed contracting, so should be treated with caution.

Table A.6: Average costs incurred by lead applicants per quarter in the monitoring process (average of 2 respondents)

Activity	Number of hours	Staff costs	External costs / expenses	Total cost
Performing project monitoring duties	231	£11,200	-	£11,200
Preparing financial claims	45	£2,000	-	£2,000
Total	**276**	**£13,200**	**-**	**£13,200**

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