Department for Business, Energy & Industrial Strategy

BEIS AREAS OF RESEARCH INTEREST

Interim Update 2020

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INDUSTRIAL STRATEGY

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BEIS Areas of Research Interest (ARI)

Introduction

The Department for Business, Energy and Industrial Strategy (BEIS) was created in July 2016. Our department is at the heart of the government's commitment to build an economy that works for everyone, with great places across the UK for people to work and for businesses to invest, innovate and grow.

Our priorities are:

- Getting businesses ready for Brexit and the opportunities beyond

- Leading the world in tackling climate change

- Solving the Grand Challenges facing our society

- Making the UK the best place to work and grow a business

To meet its priorities BEIS is strongly committed to using robust analysis and evidence to support development, implementation and evaluation of our policies. Whilst considerable analysis is conducted within BEIS, external research is still required when expertise is needed.

Our research needs are driven by immediate evidence priorities, research cycles, and long-term requirements. The timescales involved in prioritising, planning and completing new research often make it more suitable for addressing long-term requirements. However, we are also aware that there is a wealth of existing expertise and knowledge that may be suitable to address our more immediate needs. We are interested in both encouraging new relevant research and in engaging in longer-term programmes of new research.

The department currently spends over £15m per year on external research; over 100 projects are normally commissioned in any given year. This document seeks to meet the evidence needs required and to bolster the evidence under several departmental priority areas by outlining our research requirements for the next 6 months (see Section B) and the longer-term research questions (Section C) BEIS seeks to address. It also highlights recent research publications (Section D) where the department has worked with the research community to answer those questions. This has been developed to inform those who fund and provide research about some of the most important research questions and challenges facing BEIS. By clearly setting out our research interests we hope to stimulate dialogue about opportunities for aligning priorities, and ultimately delivering impact.

Contents

This document outlines the BEIS's strategy to addressing our research questions under three departmental priorities: solving the Grand Challenges facing our society,

making the UK the best place to work and grow a business, and leading the world in tackling climate change.

Firstly, the activities the department conducts to answer our primary research questions is addressed (Section A). This consists of collaboration with the research community, utilising data science techniques to make research used more effectively, collecting data to evidence the future direction of research and its conclusions and finally, focusing on how we monitor and evaluate the projects and programmes we deliver.

Secondly, it summarises what research questions best help the department deliver on its priorities over the next six months (Section B). This outlines the policy area with the evidence requirement, the key research questions, the expected duration of research and issue date, followed by suggested requirements of a potential supplier.

We then outline long-term research questions for BEIS over the next five years are outlined under the departmental priorities, followed by recent published research funded by BEIS which illustrates the standard we require from our suppliers (Sections C and D).

Guidelines on the Government Social Research principles of publishing research and analysis in government are provided for supplier's reference, alongside information on future procurement routes and key contacts on this document (Sections E and F).

Section A: BEIS Research Activities

This ARI will outline many of the research questions BEIS wants to explore in order to design and implement the best policies for reaching its objectives. In addition to this the department is conducting cross-cutting activities to address how BEIS can answer our longer-term questions quickly and effectively, by leveraging assets and expertise within and outside of the department.

Three of the cross-cutting activities support research processes and output: Research Collaboration, Data Science, Surveys and Data Collection. BEIS aims to make each of these a catalysing force in answering its research questions. The final cross-cutting activity for BEIS research is Monitoring and Evaluation of policies, which requires research inputs.

Research Collaboration: The department is taking steps to bring research expertise closer to the policy making process. Through increasingly engagement we plan to improve the Department's research strategy and build opportunities for research projects that have impact on decision making.

Data Science: BEIS is working to use its data science resource to ensure research in the Department is used most effectively and communicated clearly.

Surveys and Data Collection: We continue to invest in the collection and management of data and conducting surveys. The department is also taking steps to make the research community more aware of the data we have and how to access it. These efforts will allow us to answer our research questions more quickly.

Monitoring and Evaluation: Enhancing Monitoring and Evaluation is a strong focus for BEIS and other government departments. In order to analyse the effectiveness, impact and value for money of government spend, we require evidence. The Department's aim is to use BEIS research to strengthen this.

Section B: BEIS Research Requirements

This section sets out a summary of the research we expect to commission over the next six months with indicative timings. Over the course of the year, additional projects will be included, and some projects may be delayed or even postponed. Although this document aims to provide an indicative timeline of upcoming BEIS research, it is not a commitment to commissioning these projects within a specific timeframe.

Solving the Grand Challenges facing our society

BEIS plans to increase productivity and improve lives up and down the country by tackling our Grand Challenges in life sciences, artificial intelligence, automation and space. By backing ideas and supporting talent from home and abroad, BEIS aims to establish the UK as a science superpower at the forefront of global innovation and R&D. We plan to invest in innovation and R&D to drive discovery and unleash the great potential that can be found across the whole of the UK.

Policy Area	Project Title	The Evidence Gap	Key Research Questions	Issue Date (Estimate)	Duration (Estimate)	Expected Requirements from Potential Contractors
Business Sectors	Understanding spillovers in the automotive and aerospace sectors.	There is an evidence gap on spillovers of R&D as it is currently cross-sector, focused on the US and leakage[1] is difficult to disentangle. It may be difficult to ascertain a UK specific spillover rate, there is merit in exploring aerospace and automotive spillovers and	Calculate the most accurate rate of spillover benefits for the aerospace and the automotive sectors.	Winter 2019/20	6 months	Knowledge of policy areas, access to date and econometric analysis.

		the possibility for adjusting current estimates of leakage.				
Business Sectors	Supply chains bottlenecks and vulnerabilities	This project will deepen the departments existing understanding of supply chains bottlenecks / vulnerabilities in the UK.	What types of vulnerabilities and bottlenecks do UK businesses face, structured around four key areas: the source of vulnerability / bottlenecks, the consequence, the drivers, and potential mitigating strategies. Are there characteristics and factors that make a sector/supply more vulnerable to disruptions?	Winter 2019/20	9 months	Knowledge of supply chains, Access to suitable data, linking of data, knowledge of qualitative methods of research
Enterprise	The Economic Impact of Robotics and Automated systems in the UK.	This research builds our understanding of the future sectors of the economy and the evidence around the impact of intelligent robotics in the UK sectors.	What is the potential impact of intelligent robotics across UK sectors? (Including non-industrial)	Spring 2020	6 months	Access to suitable data, Economics knowledge

| Enterprise | Identifying commercialisa-tion opportunities for R&D intensive technologies in the UK. | There is an evidence gap in understanding the market growth potential of selected R&D intensive technologies. | Where are the biggest areas of market growth for R&D intensive technologies in the UK?

What are the commercialisation opportunities for R&D intensive technologies in the UK? | Spring 2020 | 3-6 months | Tech knowledge, Access to suitable data |
|---|---|---|---|---|---|---|
| Enterprise | Renewal of enhanced company intelligence source to understand emerging UK sectors | Evidence is required to understand emerging UK sectors in greater depth, through an analysis of company descriptions. | What does the current landscape of UK emerging sectors look like? | Spring 2020 | 12 months | Methods of collecting detailed information on company activities or descriptions |

Science, Technology and Innovation	University enterprise zone final evaluation	The evidence required builds upon the University Enterprise Zone interim evaluation by focusing on their impact, as opposed to the process by which they were delivered.	What has been the impact on the commercialisation on academic research, in high tech and R&D intensive areas, by the University Enterprise Zone?	Winter 2019/20	5 years	Annual monitoring reports and annual tenant surveys (telephone). Identifying a counterfactual and run regression analysis for comparison.
Science, Technology and Innovation	Literature Review: Understanding the Impacts of Open Science	Evidence is required on the social and economic impacts of Open Science and the barriers and risks to achieving its objectives.	Key research questions will be drawn out during the review.	Winter 2019/20	1 year	Literature review skills
Science, Technology and Innovation	The Impact of Incubators and accelerators in the UK	This research is seeking to build on evidence from the earlier directory of Incubators and Accelerators in the UK to establish what their impact has been.	What has been the impact of incubators and accelerators on the start-ups they support and the wider business ecosystems in which they exist in the UK?	Winter 2019/20	2 years	Regression discontinuity design, Survey of start-up businesses, accelerators and incubators Theory of change knowledge

Science, Technology and Innovation	Global Challenges Research Fund (GCRF): Main Evaluation	The evidence gap is to understand how GCRF has contributed to achieving the UN Sustainable Development Goals addressing global challenges through cutting edge research and capacity building.	Is GCRF relevant, fair, well targeted and managed? How are GCRF's investments working and what have they achieved? What outcomes has GCRF produced or contributed to?	Winter 2019/20	5 years	Evaluation, qualitative, quantitative skills Experience with Overseas Development assistance (ODA), Research and Innovation
Science, Technology and Innovation	More robust evidence around STEM Inspiration programmes	The impact of STEM Inspiration programmes funded by government, such as the CREST awards and STEM Ambassador programmes can be difficult to conclusively measure.	What impact are the STEM Inspiration programmes having on the desired outcomes (more confidence and uptake of STEM Subjects)? What are the most effective STEM Inspiration activities?	Winter 2019/20	3 years	Evaluation, qualitative, quantitative skills

Making the UK the best place to work and grow a business

BEIS is striving to create fairer, more inclusive and flexible workplaces so that everyone has the chance to succeed whilst balancing work and home life. By cutting burdens, we plan to unlock the power of enterprise and help businesses to start and grow. We will reform corporate governance and improve boardroom diversity, so that the top of UK businesses better serve and reflect the whole of society.

Policy Area	Project Title	The Evidence Gap	Key Research Questions	Issue Date (Estimate)	Duration (Estimate)	Expected Requirements from Potential Contractors
Better Regulation	Digital Regulation Navigator	There is additional evidence required on the demand for the Digital Regulation Navigator.	What are the business requirements of the government's digital regulatory landscape navigation offer?	Winter 2019/20	3 months	Qualitative research
Better Regulation	The use of emerging technologies by regulators	Additional evidence required to better understand how emerging technologies are being used by regulators.	What constitutes best practice in the use of emerging technologies by regulators to improve the efficiency or effectiveness of regulation?	Winter 2019/20	3 months	Literature review followed by exploration of case studies including interviews with regulators.

Better Regulation	Business Impact Target Call for Evidence	Additional evidence required concerning the specific actions or typologies of regulations that businesses find most challenging to comply with.	What specific regulatory actions are most burdensome for businesses? Are there specific types of regulation that businesses find most beneficial?	Spring 2020	3 months	Qualitive research and Case Studies
Better Regulation	Business Perception Survey 2020	Evidence of the extent of regulation in the UK since 2007	To what extent is regulation considered an obstacle to business success? What is business' experience with regulators? How much time businesses spend on complying with regulation? What are expectations of future regulatory burdens and the reasons?	Winter 2019/20	6 months	Telephone Survey

Business Frameworks	A comparative analysis of investment patterns of private and public (listed) UK companies	Evidence is required on the potential differences in investment behaviour of listed and private companies. This helps our understanding on the potential drivers of short-term(ist) decision making by companies. It would also help assess effectiveness of investment in private versus public companies.	Are companies listed on a stock exchange more likely to be short-termist, investing less, than private companies?	Winter 2019/20	3-6 months	Quantitative skills (Econometric analysis using HMRC data)
Regional Policy	An assessment of the drivers of disparities in spatial productivity	Evidence required to provide a more detailed understanding of the contribution of a range of factors in explaining observed differences in productivity across the country.	To update previous analysis of spatial productivity differentials and identify the possible drivers of these differences.	Summer 2020	6 months	Quantitative and econometric analysis techniques
Regional Policy	Towns: understanding their economic performance and the disparities that exist	Evidence required to understand the disparities between different towns (and other geographical areas), and the policy interventions that can be most effective at	How do we define a town? What different town types are there and how do their economic performances differ? What policy interventions are	Summer 2020	6 months	Quantitative analysis (including data science expertise) and research skills

		reducing these disparities	most effective at reducing disparities within and between towns?			
Enterprise	Growth Hub Evaluation	There is a lack of evidence on the performance of Growth Hubs across England since their inception in 2014.	Have Growth hub program activities been implemented as intended? Has the Growth hub programme affected the desired outcomes as intended?	Spring 2020	6 months	Evaluation skills on process and impact
Enterprise	SME Export Finance Research	A research to better understand the nature and significance of the role of access to finance in influencing exporting behaviour amongst UK SMEs.	Do SMEs use external (export) finance to grow internationally?	Winter 2019/20	9 months	Survey, analysis and report writing skills
Enterprise	SME resilience during external challenges	This builds our evidence of the wider SME environment and how businesses respond to external challenges.	How do SMEs plan for external challenges?	Spring 2020	6 months	Survey and case studies skills

Business Sectors	National Manufacturing Competitiveness Levels (NMCL)	Evidence is needed to determine the best way to monitor and evaluate the NMCL pilot for the recently approved supply chain programme.	What is the best way to monitor and evaluate the NMCL pilot? This will look at KPIs, a monitoring framework, developing a baseline to measure impact.	Winter 2019/20	6 months	Evaluation and monitoring skills (process, impact, economic impact)
Labour Market	Atypical worker insights	Understanding the attitudes and experiences of those engaged in atypical forms of work.	What are the costs and benefits to the worker of atypical work arrangements? Do we have the right balance of employer flexibility and worker protections?	Summer 2020	6 months	Multi-disciplinary team skillset, quantitative and qualitative elements
Labour Market	Employment law admin burdens survey	This is an update on the 2008 Employment Law Admin Burdens survey. Additional evidence will be collected this time about further compliance with new regulations to inform impact assessments and post-implementation reviews.	An update to the 2008 Employment law administrative burdens survey.	Spring 2020	6 months	Research survey skills, quantitative, qualitative

Labour Market	State enforcement of labour market regulations	The scale and sophistication of state enforcement has increased markedly in recent years, and we wish to learn more about the effectiveness of alternative mechanisms for driving compliance with labour regulations.	What are business perceptions/awareness of the compliance and enforcement regime? How do they respond? What is the deterrent effect?	Summer 2020	6 months	Research survey skills, quantitative, qualitative
Office for Product Safety and Standards	Ageing scoping study	There are many newer technologies that when incorporated into consumer products can help or disadvantage the elderly or other vulnerable groups. Further evidence is needed to understand which might require additional investigation.	What are the opportunities presented by new technologies in consumer products that can improve the safety of the elderly? What might be the problems caused by new technologies in consumer products that might make life less safe for the elderly?	Winter 2019/20	3-6 months	Literature / evidence review / Workshop skills

Office for Product Safety and Standards	Recycled materials in products and chemical risks	Further evidence is needed on what types of recycled materials are used in 'new' products. The issue of potential unknown chemical exposure from recycled materials requires greater understanding.	What recycled materials are used in what types of products? What chemicals are present in recycled goods and what are the associated exposure risks? How aware are manufacturers/suppliers of their supply chain and regulatory obligations?	Winter 2019/20	3-6 months	Literature/evidence review skills Manufacturer engagement/survey skills
Office for Product Safety and Standards	Safety of hair dye products in the UK	UK hair products have been flagged as a potential safety issue by other member states. Further evidence is needed on whether manufacturers are aware of requirements for these products or if additional chemical risks need to be taken into account during the safety assessment.	What are the chemical risks associated with hair dye products, how are hair dye products safety assessed in the UK and what are the rates of non-compliances for hair dye products in the UK?	Summer 2020	12 months	Literature/evidence review skills Design, undertaking and analysis of practical testing work. Stakeholder engagement skills

Office for Product Safety and Standards	Safety of used products - testing	Evidence is sought on the inspection and testing of used or end of life products and how changes in appliance characteristics over their lifetime might impact consumer safety.	What are the mechanisms for changes in appliance characteristics over their lifetime?	Winter 2019/20	18 months	Practical domestic equipment inspection and assessment experience
Office for Product Safety and Standards	Systems Analysis of the White Goods Regulatory System	A systems approach to understanding the effectiveness of the regulatory system in relation to the safety of white goods.	What are the actors and relationships between actors in the white goods regulatory system and does this current system offer adequate protection to both consumers and business?	Winter 2019/20	6 months	Systems approaches and analysis, rich picture development and analysis
Office for Product Safety and Standards	Product Safety Consumer Attitudes Tracker	Following on from recently completed research on consumer attitudes, this research would provide evidence on consumer attitudes, trust and confidence in relation to product safety on a regular basis.	To what extent is product safety a factor in consumer decisions and what awareness do consumers have of product registration and recalls? What is consumer awareness and attitudes towards	Winter 2019/20	18 months	Survey and analysis skills

			OPSS and any safety issues and campaigns that may be current to the time of fieldwork?			
Office for Product Safety and Standards	Age Accreditation of Toys and Food Imitation products	Evidence is sought on the safety risks associated with toys and food imitation products that are labelled as for children over 36 months but could be considered appealing to children under that age. Outcomes are likely to be guidance published to industry and a campaign aimed at parents.	Are toys and food imitation products labelled for children over 36 months being played with by children under that age? Are parents aware of the safety meaning of the over 36 months warning labelling? What data is present to indicate that children are being harmed by the current system?	Winter 2019/20	6 months	Management of parental focus groups, creation of a child focussed expert panel and review of literature and published data

Consumer and Competition Policy	Incidence of online price personalisation	Evidence is sought as to how price personalisation occurs across the economy, its incidence and the harm suffered by consumers.	Which sectors of the economy does online price personalisation occur? How is it done and who does it effect? What is the type of harm suffered?	Summer 2020	6 months	Data science, survey and other quantitative skills
Consumer and Competition Policy	Consumer Detriment research	Update of 2016 survey	What are the types of consumer harm suffered? What is the value of this harm? Where does this occur?	Spring 2020	3 months	Quantitative survey
Consumer and Competition Policy	Digital platform and business interactions	Research to understand how businesses use digital platforms and their exposure to harmful business practices	How do businesses use digital platforms? Are the exposed to harmful business practices? What is the extent of these and harm suffered?	Spring 2020	3 months	Quantitative survey

Leading the world in tackling climate change

BEIS has committed to achieving net zero greenhouse gas emissions and ending our contribution to global warming by 2050. Our drive towards cutting carbon and becoming a leader in green technologies and clean energy will fuel our economic growth, all while on the path to net zero. Our net zero target will accelerate climate action through strong global leadership.

Policy Area	Project Title	The Evidence Gap	Key Research Questions	Issue Date (Estimate)	Duration (Estimate)	Expected Requirements from Potential Contractors
Energy Research	Further analysis of Energy Follow Up Survey data	Understanding under-heating Understanding how low income households heat their homes.	What do daily temperature profiles tell us about which households and house types are unable to achieve set temperatures? What does combining high frequency (half hourly) temperature and energy consumption data tell us about how low income households heat their homes?	Summer 2020	6 months	Research mindset and expertise in data analysis and understanding of heat use in domestic buildings

Policy Area	Project Title	The Evidence Gap	Key Research Questions	Issue Date (Estimate)	Duration (Estimate)	Expected Requirements from Potential Contractors
Energy Research	Non-domestic energy efficiency evidence gathering	Evidence to support proposals for in-use energy monitoring and reporting. Sector specific deep dives on technical potential, barriers and options.	What is the most effective way to use energy monitoring to improve the energy efficiency of larger non-domestic buildings? What is he technical potential for energy efficiency in specific sectors and what are the technical barriers and options to overcome?	Summer 2020	18 months	Understanding of non-domestic energy use, survey capability, understanding of energy efficiency in non-domestic buildings
Energy Innovation	Evaluation of Modern Energy Partners innovation programme	The requirement is to gather evidence through a theory-based approach to a process and impact evaluation of the Modern Energy Partners programme.	Has the programme been implemented as intended? How has the programme affected the target outcomes?	Summer 2020	2 years	Expertise in theory-based evaluations, qualitative methods, understanding of innovation and public sector energy use
Energy Innovation	Evaluation of Boosting Access for SMEs to Energy Efficiency	The requirement is to gather evidence through a theory-based approach to a process	Have the projects demonstrated they can address known barriers to the uptake of energy efficiency	Spring 2020	2 years	Expertise in theory-based evaluations, economic evaluation, qualitative methods,

Policy Area	Project Title	The Evidence Gap	Key Research Questions	Issue Date (Estimate)	Duration (Estimate)	Expected Requirements from Potential Contractors
	(BASEE) programme	and impact evaluation of the BASEE programme.	measures for SMEs and lenders and EE providers? What insights can be gained to improve the design and delivery processes of the BASEE programme and other similar BEIS programmes?			understanding of energy efficiency financing
Energy Innovation	Evaluation of the Clean Growth Fund	The CGF is a new venture capital fund focussed on green technologies. We require evidence to improve the Department's understanding of investing into clean tech venture capital.	Does government stimulation of investment address the equity funding gap for pre-commercialised clean technologies?	Summer 2020	2 years with potential extension	Expertise in qualitative and quasi-experimental evaluation designs
Energy Innovation	Evaluation of innovation programmes for carbon capture, use and storage (CCUS)	The CCUS innovation programme funds various projects developing technical and process improvements in CCUS. A good understanding is	Have the investments led to cheaper, safer and better integrated CCUS technology? Have the investments led to the development of UK skills and further	Summer 2020	2 years with potential extension	Expertise in theory-based evaluation, qualitative methods; understanding of innovation

Policy Area	Project Title	The Evidence Gap	Key Research Questions	Issue Date (Estimate)	Duration (Estimate)	Expected Requirements from Potential Contractors
		required of the extent to which the funded projects achieved their objectives, if not why, and what the wider impact of the projects was on costs, skills, the CCUS market and potential CO2 emissions savings.	private sector investment? Are the investments contributing to lower CO2 emissions?			
Energy Innovation	Evaluation of innovation programmes for industrial fuel switching (IFS) and hydrogen supply (HS)	The IFS and HS innovation programmes fund projects developing technical and process improvements. A good understanding is required of the extent to which the funded projects achieved their objectives, if not why, and what the wider impact of the projects was on costs, skills, the CCUS market and potential CO2 emissions savings.	Have the investments led to cheaper, safer and better integrated technology? Have the investments led to the development of UK skills and further private sector investment? Are the investments contributing to lower CO2 emissions?	Summer 2020	2 years with potential extension	Expertise in theory-based evaluation, qualitative methods; understanding of innovation

BEIS Areas of Research Interest 2019 to 2020

Policy Area	Project Title	The Evidence Gap	Key Research Questions	Issue Date (Estimate)	Duration (Estimate)	Expected Requirements from Potential Contractors
Climate Science	Inclusion of concrete recarbonation in emissions inventories	Cement is known to absorb CO2 over its lifetime, although this effect is not currently included in national emissions inventories. To do so, a method needs to be developed in accordance with IPCC guidelines.	How could this process be incorporated into the UK emissions inventory? What is the best estimate of the impact on UK emissions? What data need to be collected to enable better estimates?	Spring 2020	6-9 months	Expertise in national emissions inventories and associated IPCC guidance; expertise in concrete chemistry and engineering, and UK data on concrete use

[1] The extent to which effects "leak out" of a target area into others e.g. workers commuting into other areas to take up new employment opportunities.

Section C: Long-term research questions

Section C outlines a summary of the long-term research questions from across BEIS that extend across the next five years and are outlined under the departmental priorities. We expect this list to evolve over time as our immediate research priorities change.

Solving the Grand Challenges facing our society

BEIS plans to boost productivity and improve lives by tackling society's Grand Challenges in life sciences, artificial intelligence, automation and space. By investing in R&D and innovation, we will unleash potential and work towards making the UK a science superpower. To do this, BEIS needs research to better understand:

Investment, Innovation and Skills

- Do UK firms underinvest? Why do UK firms not invest more? How can Government get them to invest more?

- What works in driving innovation diffusion to companies?

- How can governments successfully implement mission-oriented policy?

- How do we help people change career trajectory in response to economic shocks, automation, ageing population, technology etc.?

- On innovation diffusion, how do firms find out about, adopt, and embed new ideas, techniques, and technologies?

- What are the main barriers to employees investing in skills development?

- What are the benefits of blue skies / excellence-based research?

- How can the tangible and intangible benefits of blue skies/excellence-based research be quantified, and what is the best approach?

- What are the benefits of international collaboration for research and innovation?

- How can the tangible and intangible benefits of international collaboration be quantified, and what is the best approach?

- How can the impacts of research and innovation on UK productivity and competitiveness be demonstrated?

- What are the roles and responsibilities of different sectors (including Government, academia, industry) in driving a research and innovation culture that promotes and supports UK productivity and competitiveness for all regions?

- What factors attract and retain top research and innovation talent, and how could the UK adapt its approach in order to maintain its world leading position?

- Understanding the economic impact (direct and indirect) of major research infrastructures on their location.

- On place-based economic development, what ingredients are needed? What matters most? We are thinking particularly about regions reliant on a single industrial employer.

New technologies

- On global megatrends (e.g. digitalisation, decarbonisation, demographics, new modes of transport), how can we measure and monitor the impacts of new technologies and emerging industries? How can we identify persistent under-adoption of technologies?

- How are new technologies and emerging industries affecting market competition? (e.g. monopolies of data and new business models)

- In understanding the AI sector, what is the size and contribution of the AI business sector to the UK economy, what types of AI do these businesses specialise in developing, and what are their barriers to growth?

- In seeking to measure AI adoption, what is the current and expected level of AI adoption in the UK (including by sector/region), what are the potential economic and social impacts of AI adoption, and what are the obstacle hindering UK uptake?

- In understanding the value and use of data, what is the marginal value of open data? How much unused data is being collected nationally, and by whom?

- In understanding the existence and size of the AI skills gap, how many people are working in the AI sector, what is the structural and demographic breakdown, how has this changed over time?

- What are the labour market impacts of new technologies and emerging industries? What new skills and jobs will be needed, and what skills and jobs are potentially at risk (e.g. due to decarbonisation, automation)?

- What are the social and distributional impacts and implications of new technologies and emerging industries?

Productivity

- How can we measure productivity of emerging industries that cut across current sector definitions?

- What determines productivity differences within the UK; across firms, sectors and places? What can government do to change this, how should we go about changing this?

- What determines productivity within firms? This should go beyond management e.g. at employees, how firms interact with each other, diffusion of ideas, working practices, etc.

- Understanding the joint effect of the UK labour market (e.g. flexibility, mobility) and productivity on competition (within firms, between firms, and dynamically e.g. level of innovation)

Making the UK the best place to work and grow a business

BEIS is striving to create fairer, inclusive and flexible workplaces so that everyone has the change to succeed, whilst balancing home and work life. We will unlock enterprise and cut burdens to help businesses start and grow, while reforming corporate governance and improving boardroom diversity. To that end, BEIS needs research to better understand the following:

Enterprise

- How does new business creation impact on outcomes such as innovation, internationalisation, local competition, growth and productivity? What is a useful way of categorising new businesses and how can policy target different groups?

- What can be done to make enterprise more inclusive? How can we support entrepreneurship in underrepresented and disadvantaged communities?

- Better understanding the abilities, skills and practices of management that drive firm productivity. What can be done to encourage and support more businesses to adopt the technologies and management practices that drive productivity? How can we measure the diffusion and implementation of technology and best practice?

- Understanding the longitudinal dynamics of productivity growth? E.g. Is this episodic or continuous in most firms? What starts or shapes productivity growth episodes?

- Understanding the coherence of the business support landscape. E.g. How easy it is for businesses to find the right support at the right time?

- How can we encourage business to invest more heavily in the future, particularly in innovation activities and management training? How do we arrest declining business ambition? How can we reverse the downward trend in business advice, and increase the take up of strategic advice?

- What are the roles of local, regional and broader eco-system factors in driving competition, innovation, growth and productivity? How do we measure the health of entrepreneurial ecosystems using data? What policies would improve ecosystem health?

- What can SMEs do to make themselves more resilient? What are the relationships between the resilience of individual business leaders, firms and the wider business ecosystem?

- How can SMEs contribute to clean growth? How are SMEs adjusting to the pressures of climate change and low carbon? How are firms financing the transition to net-zero?

- Better understanding the determinants of firm growth, the longitudinal dynamics of high growth episodes and links between firm growth and other outcomes (including productivity).

Regional policy/local growth

- What are the key determinants of spatial disparities in economic performance across the UK?

- What evidence exists relating to the impact that devolution of powers and responsibilities has on productivity and a broad range of socio-economic outcomes?

- How do local infrastructure investments impact on an area's economic performance either in isolation or through complementarities with other investments such as housing or commercial property?

- What drives regional labour mobility and how does place impact upon individuals' life chances?

- What impact does investment in human capital, management practices and skills utilisation have on an area's economic prosperity?

Better Regulation

- How does the UK's agile approach to regulation influence business investment in the UK in the long run?

- How can we better understand the risks and rewards of various regulatory approaches, such as sandboxes, and design a system that balances the two?

- What types of data sharing between regulators and businesses would enable greater innovative activity in the UK?

- What are the ethical aspects of regulating future technology and how can these be incorporated into an anticipatory regulatory framework?

- What are the barriers to regulators taking up new and emerging technologies to make their regulatory practices more efficient and effective?

- Can we create an evaluation system specifically designed to help businesses and regulators monitor and evaluate the impacts of different regulatory approaches so as to create a coherent consistent library from which lessons can be learnt?

- How can UK design a flexible anticipatory approach to regulation while ensuring protection to consumers and environment? Are there successful case studies we can draw lessons from?

Corporate Governance and Company Law

- How might data from different countries' beneficial ownership and company registers be most effectively linked?

- What is the impact of greater transparency over beneficial ownership on corporate performance, crime and corruption?

- What is the relationship between executive renumeration and its components and investment?

- Does gender pay gap reporting lead to a narrowing of gender pay gaps and, if so, through what channels does this work?

- The drivers of incorporation and the economic benefits and economic costs of incorporation compared to other business forms (e.g. self-employment).

- What is the relationship between audit quality and company cost of capital?

- What is the relationship between reporting quality and corporate and financial crises?

- What are the reasons for the decline in stock exchange listings and what are the implications, if any, for the availability of corporate finance?

- What is the current state of competition in the UK audit market and the impact of regulatory measures or proposals on competition? What is the relationship between competition and audit quality?

Consumer and Competition

- How do we identify and measure new forms of consumer detriment, including hidden detriment?

- Further research is encouraged into the development of economy-wide leading indicators to measure the state of competition.

- What are the new theories of harm on how competition might be distorted in the UK, looking at how common are they and what is the harm (covering common ownership, algorithms, price personalisation, fairness and equity issues, and privacy)?

- How could we measure the effectiveness of public consumer law enforcement activities, e.g. in relation to problems reported and resourcing required?

- How does the design of consumer choices influence consumer behaviour and how could this be positively directed?

Labour Market

- Does the UK's flexible labour market framework influence business incentives for investment in human and physical capital?

- Does a rising minimum wage create incentives for businesses to make productivity enhancing-investments?

- What are the long-term effects of family friendly policies on participation and progression within the labour market?

- What is the relationship between high quality work (e.g. employee voice, autonomy, flexible working) and business productivity?

- How can be better understand the effectiveness of different tools for driving compliance with labour market regulations – including education and enforcement approaches, considering both direct and indirect (deterrence) effects?

- What role does gig/platform working play in the modern economy? How widespread is the phenomenon, how does it interact with traditional employment and what are the experiences and motivations of those participating in gig working?

Product safety and standards

- How are innovations in product design likely to pose risks or benefits for consumer product safety?

- How can we use emerging technologies to implement an effective and proportionate product regulation regime?

- How can new technologies better support market surveillance of consumer products?

- How can we best impact consumer, retailer and producer behaviour in issues of recall, safety messages and safer goods?

- What are the future trends for Post Offices internationally, including adapting to changes in consumer behaviours, responding to the 4th Industrial Revolution?

Retail

- Considering the significant role online will play in the future for retail, what are the push and pull effects of cyber risk and security for consumers and retailers?

- What does healthy productivity growth look like in retail and what opportunities or impacts will technology driven changes have on the labour force?

- How will the retail landscape change through technology and what responses/business model changes might retailers require?

- Further evidence and data is required to determine state of innovation and R&D in the retail sector and supply chain and how could this be increased in the future?

- Research is encouraged on the development and use of open data in the retail sector to drive adaptations to consumer behavioural changes and experimentation in business model changes.

- How does monopoly power of big data companies affect the price, value and access for retailers to compete on platforms?

Leading the world in tackling climate change

BEIS has committed to ending the UK's contribution to global warming by achieving net zero greenhouse gas emissions by 2050. Our work towards becoming a leader in green technologies and clean energy will drive economic growth, all whilst accelerating global climate action through strong international leadership. To achieve this, we need to better understand the following research questions:

Clean electricity

- What are the new models for supporting community and local energy in a post-subsidy world?

- In terms of development of long-term duration electricity storage, how far away are new storage technologies from commercial viability?

- What is the most cost-effective way to deploy renewables and storage into the electricity system and reduce overall system costs? For example, should variable renewable generators face the costs of extra flexibility needed to accommodate them onto the system, such as through making CfD generators more responsive to market signals, or should we address wider system costs elsewhere, outside of the CfD regime (e.g. through higher curtailment and balancing costs)?

- At what level of deployment do the additional costs of deploying further intermittent renewables lead to significantly higher overall costs – versus, for example: i) increasing the flexibility of the system to limit the need to build excess intermittent renewable capacity? ii) investing in a more diverse generating mix including more baseload and dispatchable generation (e.g. Nuclear/CCUS/Tidal etc.)?

- At what point in time (taking into account cost reduction trajectories and technological developments) would the costs of deploying storage and other flexibility solutions (e.g. compressed air energy storage, hydrogen) be lower than bearing the wider system impacts of intermittent renewables? How does this vary for different flexible technologies and deployment levels of renewables?

- Can we definitively establish a position on 'Amplitude Modulation' noise disturbance for onshore wind farms, so that BEIS/DEFRA can set specific criteria that developers have to meet to not cause a public health or public nuisance?

- How will the operation of power markets change as the proportion of renewable generation increases?

- What are the potential cost reductions due to new technology developments in innovative and pre-commercial renewables technologies? Such as, but not limited to, marine technologies, floating offshore wind, and bi-facial/tracking solar.

- What are the environmental and other local impacts of significant amounts of new renewable generation capacity being built in the UK?

- Does local generation lower the costs of moving to a net-zero emissions economy, or are the necessary electricity system upgrades required to electrify of heat & transport so dramatic that the system upgrades are required in any scenario?

- What is the limit of renewable deployment/penetration without flexible and dispatchable generation (fossil with CCUS, battery and other storage) being necessary to compensate for their intermittency?

Energy Efficiency

- What is the relationship between fuel poverty and productivity?

- How do energy efficiency and heat policies work together to maximise benefits and minimise costs of BEIS's objectives, and what is the best way to sequence this work?

- To what extent are existing energy efficiency and heat policies and schemes relevant in a more dynamic, distributed and flexible energy system?

- How and to what extent do energy efficiency policies and schemes contribute to industrial productivity?

- How could the Energy Performance Certificate metric be improved to reflect energy efficiency, cost, and carbon?

- What are the best trigger points for when households are most likely to undertake energy efficiency improvements to their homes, and what can be expected outside those times?

- What can the supply chain do to improve the way in which households increase the energy efficiency of their homes?

- What is the best way to reduce the cost of energy efficiency retrofits?

Energy Security, Systems and Strategy

- What is the viability and potential impact (e.g. environmental, safety, cost to business or consumers) of fully decommissioning offshore renewable energy installations?

- What is the appropriate governance architecture for the energy system to allow us to reach the net zero target by 2050?

- What is the feasibility of Saharan solar projects/H2 electrolyser production facilities that can ship H2 LNG into the UK?

- What is the consumer appetite for different energy business models (energy as a service, trading models such as peer-to-peer etc)? What consumers would need for these to be successful; and what benefits these could bring to the system as a whole?

- What is the role for inter-seasonal, bulk and multi-week storage in the context of the net-zero emissions target?

- What is the role of bulk storage technologies under different scenarios of wind build out i.e. the possible duration of periods of low wind and low solar irradiance across large parts of Europe? Could such periods become more frequent/severe in the coming decades as climate change alters conventional weather patterns?

- What are the challenges in getting households and electric vehicles to participate at scale in energy markets (barriers and solutions from a purely market entry perspective – not a social perspective)?

- What is the role of distributed energy resources (DERs) in providing non frequency ancillary services (e.g. black start, reactive power, inertia etc)?

- Could imports of H2/NH3 replace the need for long duration storage?

- What is the feasibility of using data from existing monitoring assets (i.e. network sensors, smart meters) and advanced data analytics to better understand network condition and optimise operational efficiency (as opposed to installing expensive sensor equipment all over the low-voltage network).

- What is the minimum required (and desired) data standards and processes are required to enable AI/ML to effectively engage with Energy System (e.g. optimising millions of distributed assets with greater precision thus reducing the reliance on blunt capacity market instruments)?

- How can we collect static and dynamic information of small-scale energy assets being deployed (e.g. EVs, domestic scale PV, storage etc) in order to use them meaningfully for system optimisation purposes?

- How can innovation initiatives can be utilised to help 'low income' consumers access a future market, removing barriers and increasing market accessibility?

- What are the implications be of freight electrifying, how likely is this (for example, in comparison with hydrogen fuelled freight) and what are the associated impacts on the grid?

- What will future electric vehicle charging patterns look like as electric vehicle uptake increases? How will this be impacted by changing transport patterns (e.g. connected/autonomous vehicles and 'mobility as a service')? What charging patterns will have the lowest impact on the electricity network?

- What is a proportionate way to address cyber security risks, in particular risks to the electricity system, of smart charging of electric vehicles? Can this be done with minimal impact on innovation and consumer uptake of smart charging?

- How is electric vehicle charging likely to evolve in the future from a technology and retail perspective (e.g. wireless charging, vehicle-to-grid capability, bundled tariffs etc.) and what risks and opportunities may this bring for consumers, businesses and government

- What business models are helpful for smart charging of electric vehicles (e.g. bundling of products, rewards, etc) and what is the impact on consumer protection and uptake?

- How important will Vehicle-to-Grid (V2G) technology be in the future and how do we exploit the UKs current position as one of the world leaders in V2G?

- What market enablers can be implemented to facilitate the flow of chargepoint installation and vehicle purchase data to relevant organisation to facilitate a better consumer experience and reduce costs?

- What are the opportunities and barriers to improving resource efficiency and industrial symbiosis within industrial clusters?

- What is the cost of implementing at-scale carbon capture and use technology in UK industrial sites, and how can costs be reduced?

- What are the costs and barriers to producing and storing large volumes of low-carbon and zero-carbon hydrogen?

- What are the costs and barriers to switching to low-carbon fuels in high-carbon industrial processes?

International

- To what extent have international climate finance programmes, covering themes such as technical assistance, cities, forestry, decarbonisation and storage and private finance, achieved their objectives and contributed to wider ICF, Departmental and global climate goals?

- What are the global economic impacts of climate change across specific regions or countries?

- What are the costs, benefits and technical potential of mitigating climate change across different global regions and sectors?

Clean Growth and Green Finance

- What are the economic impacts, opportunities and risks for the UK of the transition to net zero? How are they distributed across regions and industries and how would the transition affect their supply chain and skills distribution?

- What data and methods would be suitable to develop a more comprehensive assessment of the impact of transition risks in the UK?

- What is the investment opportunity of meeting our net zero commitment across low carbon sectors? How is this distributed between public and private investment depending on the sectors? What methodologies can be used to track alignment of investment flows with climate objectives?

Nuclear

- What is the carbon footprint of the whole nuclear fuel cycle?

- What are the perceptions of radiation risk? What type of language will be most effective to prepare the public for a radiation incident, and what will work best during an emergency situation?

- How are nuclear emergency plans in Local Authorities developed, and how they keep pace with technological advancements in the nuclear industry?

- How will the advent of advances like small nuclear reactors change the map of nuclear installations in the UK and what impact will this have on our ability to respond to incidents, perhaps of smaller scale?

- How can we use crowdsourced data in emergency preparedness and response for nuclear resilience? What are the potential standardisation processes for open datasets which could be used in across government analytics and central government communications processes?

- We need a greater evidence for radiation monitoring strategies in emergencies using interpolation and semi-variogram techniques to help develop a monitoring strategy

based upon a handful of measurement points (e.g. around sites and/or within DEPZs/OPZs).

- Further research is encouraged into sensor miniaturisation, which are graphene-based field effect transistors for radiation detection. These are small, inexpensive and low-powered devices that offer exceptional sensitivity to X-rays, gamma-rays, and neutrons (e.g. stack or personnel monitoring).

- Further evidence is required for the development of decision support system comprised of mobile, modular, and autonomous sensors (e.g. gamma/alpha/beta, EO), as well as fixed assets and model input, which feed data into a nuclear data fusion engine which controls the overall system and assumes responsibilities of central operators.

- Further research is encouraged into communication strategies during emergencies using social media mining and natural language processing (e.g. topic modelling, sentiment analysis, etc).

- Further research is encouraged into nuclear data and materials science studies for Gen-IV and fusion reactors.

- What integration of technologies are required to do radioactive aerosol monitoring to ensure overlap with inactive pollution aerosol monitoring?

- Further research is encouraged into the development of sensors (radiological, chemical, temperature etc) and associated test/calibration facilities for SMRs, Gen-IV and fusion reactors.

- What are the barriers and opportunities for commercialising advanced nuclear technology in the UK and overseas, considering public/consumer attitudes to new uses of nuclear (e.g. industrial heat, desalination, hydrogen production)?

- What are the barriers and opportunities for commercialising advanced nuclear technology in the UK and overseas, considering: product/use case segmented domestic and (addressable) international markets, UK industry comparative advantage and fuel cycle and waste management for generation 4 reactors?

Oil and Gas

- What is the environmental impact of shale gas extraction (including climate change impacts of pre-combustion emissions v other forms of gas extraction, to address the issue of domestic production vs imports)?

- What are the health impacts of shale gas extraction in the UK?

- What are the methods to reduce major causes of oil and gas production emissions (including potential for electrification and integration with offshore (floating) wind and interconnectors)?

- What will be the impact of gas price variations on the economic viability of shale gas extraction in the UK?

- What does the evidence show on the long-term safety/integrity of plugged and abandoned onshore oil and gas wells?

- What is the potential for offshore hydrogen storage?

Renewable Energy

- What innovations solutions could assist mitigation of air traffic control and air defence radar interference from offshore wind projects?

- What are the cost reduction pathways for floating offshore wind and what the potential step change innovation solutions to facilitate this?

- What is the value to the grid management of deployment of "predictably intermittent" renewable technologies such as tidal energy?

- In the context of different of levels of deployment of biomass with carbon capture and storage up until to 2050, what are the effects on biomass feedstock markets? Where would feedstocks be sourced from and what would be the effect on the sustainability of those feedstocks?

- What are the effects on local/public acceptability of offshore wind, CCUS and other forms of low carbon generation development with respect to the cumulative impacts of onshore infrastructure related to deployment (e.g. grid etc.)?

- How can coordination of offshore energy infrastructure be improved to facilitate efficient deployment of offshore wind and promote hybrid solutions such as the North Seas grid, including consideration of: the level of deployment at which the benefits of coordination outweigh the risks under the current regime?

- What impact could coordination of offshore energy infrastructure have on business models and regulation, ie. what changes are required; and what is the right balance of risk and reward for offshore wind developers, interconnectors and other transmission owners to better coordinate?

- What are the technical and innovation challenges and timelines on developing 20MW+ OW turbines?

- What has been the impact of domestic and non-domestic energy efficiency and heat policy on its objectives?

- What has been the impact of innovation policy in energy and key areas of innovation investment (such as nuclear, CCUS and renewables)?

- What are the household and business views on domestic heating and energy efficiency?

- Further research is encouraged into assessing the impact of REDD Early Movers on the livelihood of forest-dependant people in the Brazil programme.

Science and Innovation

- What are the present weather and climate risks globally and within the UK?

- Under different future scenarios, how will the climate and associated impacts change globally and within the UK, including variability, extreme weather and "tail risks"?

- What emissions pathways are compatible with different levels of warming, including the consequences of temporary overshoot?

- What are the impacts and opportunities of mitigation and adaptation?

- How can new technologies and methods for Earth observation help to monitor and verify sources and sinks of greenhouse gases, globally and in the UK.

- What is the fate of hydrogen in the environment, and its effect on climate and the ozone layer?

- Further research is encouraged into the digital optimisation, design and artificial intelligence to optimise the electricity system and in the design of nuclear and offshore wind.

- Further research is encouraged into the demonstration of early commercial gasification-based routes for bioenergy to produce liquid or gaseous biofuels, including in combination with CCUS.

- Further research is encouraged into the piloting of biomass pre-treatment and hydrolysis steps and developing processes that are tailored to feedstocks.

- Further research is encouraged into the development of miscanthus breeds and its use in energy processes.

- Further research is encouraged into innovation in storage, including bulk storage, advanced lithium-ion battery production chain and materials, phase-change materials and post-lithium-ion options for the post-2030 market.

- Further research is encouraged into the demonstration of advanced forms of methane reformers in combination with CCUS and hydrogen.

- Further research is encouraged into automation and robotics, with specific applications in nuclear, industry and offshore wind.

- Further research is encouraged into nuclear modularisation (SMRs) and simplification (4th Gen and AMR), and use of heat within this.

- Further research is encouraged into advanced materials and manufacture of low-cost electrolysers for hydrogen production.

- Further research is encouraged into advanced materials and manufacture of low-cost fuel cells for use of hydrogen.

- Further research is encouraged into innovations for offshore wind such as new blade technologies and turbine components.

- Further research is encouraged into developing floating or long-reach foundations for offshore wind to access deeper waters.

- Further research is encouraged into innovations for high temperature heat pumps including sorption, new compressors and expanders.

- Further research is encouraged into post-combustion CCUS, new solvents and absorption processes.

- How can innovative technologies and new business models overcome the barriers to take up of energy efficiency and low carbon heat?

- How can we reduce energy use and emissions in very large buildings and improve the performance of building energy management systems?

- What are the risks and benefits of taking a whole system approach to the deep retrofit of buildings and how do we manage the unintended consequences?

- How best can we reduce barriers to electrification of heating systems including optimising performance and reducing cost?

- How can we reduce the technical risks in converting the gas grid to hydrogen addressing unknowns identified in Hy4Heat programme and BEIS Transforming Heating – Overview of Evidence Report?

- What is the opportunity and impact of alternative hybrid heating solutions involving mix of renewable, gas, electric, storage, energy efficiency components in a smart energy system?

- What are the opportunities for local energy networks such as shared ground loops, mine-water heat, low temperature heat networks and CHP / heat pump deployment?

- What is the scale of the challenge and options for addressing 'hard to treat' properties (e.g. heritage, solid wall) in the context of net zero?

- What is the potential for imported hydrogen, looking at costs for and security/resilience of ammonia, liquified hydrogen and organic hydroids?

- What are the options and physical constraints for long distance hydrogen transit (e.g. ammonia, liquified hydrogen, organic hydrides)?

- What types and quantities of emissions could be associated with a hydrogen network (production, transport, etc.)?

- Driven by themes such as adaptation, overheating and marketing renewable heating systems, what role will cooling play in the future and how can technology help?

- Further research is encouraged into whole systems modelling tools and applications to decarbonisation pathways, which will support strategic decision making on local vs central planning and the phasing of transition programmes.

Smart Metering

- How can data from smart metering support planning and targeting of energy efficiency retrofit and low carbon heat?

- What is the potential for scalable smart meter data measures of building performance (in combination with other data on local areas) to inform area-based decisions?

- How can vulnerable consumers benefit from Smart Meter enabled products and services, outside of the energy consumption benefits (including health, comfort, etc.)?

- How can energy demand profiles and potential responses to time of use tariffs be segmented?

- How can we best segment customer energy use profiles?

- Which customer segments have the most flexibility in response to pricing?

- Which customer segments are most likely to shift their demand?

- How can smart metering support the development of local energy markets (connecting local generation and customers through innovative tariffs)?

- How do consumers engage with information about smart/time-of-use tariffs, and how do they use this to make decisions? What information helps open the market beyond the most engaged consumers, enabling lower cost lower carbon electric for everyone.

- What is the ideal customer journey for smart/time-of-use tariff comparisons increasing engagement and take-up of new tariffs?

- What are the key metrics in a smart energy system that consumers will use to make decisions about which energy supplier they use? (£/kWh may no longer be sufficient, and choices may be made on green credentials, customer service, bundled services).

- As we move towards a smarter energy system, we can expect the system to become increasingly complex and driven by data and communication technologies. As a result, there are potential new cyber security risks to consider. As such, what are the possible impacts and magnitude of the smart energy cyber security risk?

Section D: Recent Publications

BEIS is continually building its evidence to ensure we make informed policy decisions. Outlined below is a collation of recent research publications commissioned by from across the department that displays the quality of product we require.

The sample of published research outlined in the table below illustrates the breadth of type of research BEIS has commissioned. It is both domestic and international, sources public opinion and delves into the drivers and barriers of change. There are a variety of methodologies and specialisms required to deliver robust answers to questions posed. We request information to monitor policy delivery and regulatory compliance to make change where required. We also drive to understand the effectiveness of policy, which delves into commissioning scoping, collaborative and wholly independent evaluations and considering the impact of policy in stages.

Business Growth	Drivers of firm relocation (2019)		Econometric analysis and 40 case studies looking at the drivers of firm relocation decisions within the UK.
	The Impacts of commercial property development (2019)		Econometric analysis and eight case studies to explore the impact of new commercial and industrial development on local employment, turnover, wages and productivity.
	Business Productivity Review (2019)		Joint report with HMT in response to a call for evidence focusing on the decisions and actions taken by businesses that affect their own productivity. The report uses evidence to set out 10 key actions that will support businesses to become more productive.
	Business Basics (2019) - array of reports published under the Business Basics banner.	Business Basics Progress report	This progress report summarises early stage achievements and findings, lessons learnt and next steps.

	SME attitudes towards adopting best practice	Qualitative research, interviewing 40 SMEs to understand the barriers and enablers to adopting basic management and technologies. This resulted in five 'typologies' of SMEs in terms of how innovative they are.	
	Nudging firms to improve productivity	Rapid literature review of behavioural factors and best practice business prompts to encourage businesses to improve productivity. Including results of five messaging trials to test the most effective ways of engaging with businesses.	
	Human Resource Management: imbalances and productivity	The research explores regional differences in the use of human resource management practices across the UK compared to France.	
Business Sectors	Advanced Propulsion Centre	Scoping Evaluation (2016)	Details the objectives, rationale and economic case, and the mechanisms by which it is expected that these objectives are to be achieved. It also develops the key performance indicators required for a robust evaluation as well as considering how they should be used.
		Internal Process evaluation (2016)	Outlines and evaluates the key steps in the process for delivering the Advanced Propulsion Centre to enable the Department to understand if the processes work well and how they could be improved.
		External process evaluation (2018)	Provides early evidence on 'what works,' the emerging benefits of the programme, and early lessons for programme delivery and implementation.
	Aerospace Technology Institute (ATI)	Scoping Evaluation (2016)	Establishes baselines, monitoring systems and evaluation methodologies for the portfolio of aerospace research, technology and infrastructure projects for which the ATI is to provide strategic oversight.

Business Sectors		External process evaluation (2017)	Generates an understanding of the efficiency and cost-effectiveness of all ATI internal processes and an assessment of the programme's value for money, barriers to the programme's implementation and ways in which projects are looking to realise their longer-term outcomes.
	Future capacities and capabilities of the UK Steel Industry (2017)		Identifies keys themes and barriers for industry and government to address in the development of future strategies for the sector.
	Retentions in the construction industry (2017)		Gathers evidence about the practice of retentions, notably in relation to the costs, benefits and impacts for the construction sector and construction sector clients.\n\nIt also lists what alternatives to retentions exist, how these operate in practice, and the relative costs and benefits of these compared with retentions.
Clean Growth	Interim evaluation report of the public sector energy efficiency loan scheme (2018)		This report presents findings from the first phase of the evaluation of the Public Sector Energy Efficiency Loan Scheme, delivered by Salix Finance Ltd. The scheme provides interest free loans to public sector bodies to support the installation of energy efficiency measures.
	RHI evaluation interim report: applicant reaction to reform announcements (2018)		This report provides evidence into applicant reactions to the government's announcement of the package of reforms to the Renewable Heat Incentive (RHI), and the subsequent delays to the implementation of these reforms.
	Pilot process report of the evaluation of the Heat Networks Investment Project (2018)		This report presents findings from evaluation research into the administration, delivery and influence of the Heat Networks Investment Project pilot scheme.
	Interim evaluation report of the Energy Savings Opportunity Scheme (2017)		This report presents findings from the process evaluation of the Energy Savings Opportunity Scheme along with a discussion of evidence relating to early signals of impact.
Energy Security	Evaluation of the Transitional Arrangements for Demand Side Response (2018)		This evaluation examined the extent to which the two Transitional Arrangements auctions for Demand Side Response (DSR) met their main objectives to encourage DSR and to contribute to

		the development of flexible capacity for future Capacity Market auctions.
Labour Market	[Apprenticeship Pay Survey](#) (2019)	Informs the setting of the Apprentice National Minimum Wage and monitoring minimum wage non-compliance, which has found to be prevalent among this group. The survey has been produced biennially since 2012 and is the most detailed and accurate data on apprentice pay.
Science, Technology and Innovation	[The Impact of Incubators and accelerators in the UK](#) (2019)	This research built on evidence from the earlier directory of Incubators and Accelerators in the UK to establish what their impact has been. This followed up an earlier study by Nesta describing the landscape of incubators and accelerators. The research consisted of: • A survey of 428 startups • A regression discontinuity design • A theory of change • Commercial dataset analysis
	[Foundation Stage Evaluation of Global Challenges Research Fund](#) (2019)	This developed a theory of change (i.e. setting out how the initiative will deliver impact), conduct a process evaluation of initial activities, and design an evaluation strategy and framework for a theory-based evaluation for 2018-2027.
Science, Technology and Innovation	[Newton Fund Mid-term Evaluation](#) (2018)	The Newton Fund Evaluation was commissioned to establish whether the goal of the Newton Fund is being delivered; and whether it is being delivered in a way that represents value for money. The evaluation team used the theory of change, which sets out how the intervention will deliver impact, to test the proposed pathways of change. The research included document reviews, online and telephone surveys of grant recipients, a process evaluation, interviews, and a series of thematic impact studies covering eight partner countries.

	University Enterprise Zone (UEZs) Interim evaluation (2019)	This evaluation focused on the process by which the zones have been established. Key findings include the importance of location for UEZ effectiveness as well as previous track record in business support for organisations running the zones. Early evidence suggests that UEZs have supported an increase in university-business engagement but not yet led to greater cooperation between universities and LEP's. Evidence from this report fed into the design of the new UEZ Programme being delivered by Research England's RED fund.
	Science and Innovation Audits (2019)	This reports an overview of the main lessons that emerged from completing the waves of five Science and Innovation Audits (SIAs).
	Review of Research Excellence Framework Evidence Report (2018)	This is a report summarising the evidence on the effectiveness of the Research Excellence Framework undertaken to support Lord Stern's review.
	Organizing for Excellence (2018)	This study presents a review of international evidence on best practice in organisational design and governance for research and innovation funding bodies, to help inform the design of the structure and governance of UKRI. The report was published to comply with GSR publication standards but also to provide stakeholders with evidence that the design of UKRI was informed by approaches adopted elsewhere.
Strategy	BEIS Public Attitudes Tracker (2019)	The Public Attitudes Tracker survey covers public attitudes towards the department's policy areas such as energy, climate change and workers' rights and runs four times a year. It includes questions on issues where BEIS think attitudes might shift quickly or be affected by seasonal changes are repeated quarterly; other questions are asked annually.

Section E: BEIS Publication Principles

BEIS research is commissioned in accordance with the five [GSR principles of publishing](#) research and analysis in government:

Principle 1: The products of government analytical and scientific research will be made publicly available.

Principle 2: There will be prompt release of all government analytical and scientific research.

Principle 3: Government analytical and scientific research must be released in a way that promotes public trust.

Principle 4: Clear communication plans should be developed for all analytical and scientific research produced by government

Principle 5: Responsibility for the release of analytical and scientific research produced by government must be clear.

Compliance with this protocol helps to ensure that evidence produced by government is released into the public domain in a manner that promotes public confidence and scientific rigour.

Section F: BEIS Contact and future procurement routes

Throughout 2020, we expect the Crown Commercial Service (CCS) Marketplace to be our main route for research procurement. There are also several other procurement routes used to commission research in BEIS, such as: Contract finder, Heat Networks and Electricity Generation Assets (HELGA), Official Journal of the European Union (OJEU) and the Expert Advisory Call-Down Services (EACDS).

We welcome feedback on this ARI and details of any work you are doing or planning that is potentially relevant to BEIS. If you would like to discuss this ARI please contact Research_RAF@beis.gov.uk. BEIS plans to disseminate an updated ARI after the current financial year to continue to raise awareness of BEIS's priorities and foster ongoing engagement and collaboration with the external research community.