

# A Taxonomy of UK National Laboratories

March 2021



# What is a national laboratory?

- The UK has over 25 (estimated) national laboratories, each delivering a different public mission – covering everything from measurement and weather to food and energy. These organisations play an essential and enduring (but often hidden) role, keeping our citizens safe and secure, helping facilitate trade, looking after the environment, and more.
- Through an inclusive and coordinated arrangement, government can make full use of the national laboratories and their unique capabilities in the innovation landscape. They are a national asset.
- Sometimes these organisations are not always ‘factored in’ to the government’s strategic planning for scientific, R&D and innovation or delivery programmes. Improved understanding and awareness of national laboratories could help create a more ‘joined up’ approach by government to utilising these valuable assets, within the context of its plans for national resilience, and to support the growth of the UK economy.

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# Methodology

- This taxonomy aims to improve the understanding of the landscape of national laboratories and demonstrate the role these organisations play, in supporting economic growth and providing national resilience.
- To date, this taxonomy includes information from 15 national laboratories in the UK, but may be expanded in due course.
- Most of the information is sourced from representatives of each of national labs, capturing data on: Purpose, Status, Strategic Capabilities, Statutory Functions, Locations, Staff, Income, Departmental and Policy Engagement, Review Processes

**NOTE –** *not all organisations the organisations contained in this taxonomy are considered by everyone as ‘laboratories’; for example the Catapult Centres are defined by many as technology and innovation centres.*

# National laboratories included

NATIONAL LABORATORY	PURPOSE
Building Research Establishment, BRE	To enable transformational change within the built environment through research, demonstration and education. Purpose is centred on research and scientific expertise applied through a range of commercial products and services, relevant to the needs of our stakeholders – whether government, commercial customers or, more indirectly, consumers.
National Oceanography Centre, NOC	Provision of National Capability in Oceanographic Sciences: Strategic research and ocean measurement technology development; Operation of large research infrastructures; Creating value through advice to government, engagement with industry, public engagement.
National Measurement Laboratory, NML at LGC	Designated Institute for (DI) for 'Chemical & Biological Measurement' within the UK, hosted at LGC, providing high quality world-leading science to solve measurement problems and provide the resilient measurement infrastructure needed to support government, industry and protect consumers within the UK. The NML also supports the role of the 'Government Chemist' since 1842, which has a statutory function as an independent referee analyst under a number of acts of Parliament focusing on public protection, safety, health, value for money and consumer choice and provides advice to government. NML represents the UK, both nationally & internationally, to develop & maintain a standardised measurement infrastructure, informing policy, standards and legislation to protect the public and support innovation in our areas of designation.
European Marine Energy Centre, EMEC	Provides pre-consented and cost minimising test and demonstration facilities in major wave and tidal resources. . EMEC's vision is for a globally successful marine energy industry as part of a clean energy system. . Pioneering development of a green hydrogen economy in Orkney.
National Institute of Agricultural Botany, NIAB	The NIAB Group is the UK's fastest growing crop science organisation. NIAB is at the forefront of the application of genetics, physiology, soil science, precision agronomy and data science to improve yield, efficiency and resilience of crop production across the arable, forage and horticulture sectors.
UK Centre for Ecology & Hydrology, CEH	The UK's Centre of Excellence for research in terrestrial, freshwater and near atmosphere science. Purpose is to advance science; to advance education in the environment and environmental sciences, and sustainable development; and to promote sustainable development for the benefit of the public, within the United Kingdom.
The Welding Institute, TWI	To supply research, development, innovation, trouble shooting and training services in the fields of materials, manufacturing and structural integrity to industry in the UK and worldwide. In addition to supply vocational training, TWI now has a post-graduate foundation with >120 students at any time.
Catapult Centre – CGT, CSA, CPC, Digital, ES, HVM, MD, ORE, SA (full names on slide 29).	<ul style="list-style-type: none"> <li>– To work with industry, together with regional, national and international partners, to commercialise innovation in a way that drives long-term benefit to the UK economy.</li> <li>– To provide businesses in the sector or technology domain with access to the appropriate mixture of expertise, skills, facilities and equipment needed for them to invest in innovation and commercialisation where these are not readily available due to market failure or commercial risk.</li> <li>– To work collaboratively as part of the Catapult network, and with the wider R&amp;D ecosystem, to enable the development of innovative solutions to key challenges in the Catapult's sector.</li> <li>– To take an active role in removing industry-wide barriers to innovation and commercialisation where they exist.</li> </ul>

# National laboratories included

cont...

NATIONAL LABORATORY	PURPOSE
Centre for Environment, Fisheries and Aquaculture Science, CEFAS	Providing data and advice to UK & Overseas Gov. to keep our Seas, Oceans and Rivers healthy and productive and seafood safe and sustainable.
Science and Technology Facilities Council, STFC	Build and operate large scale science facilities for UK academic community. Provide access to international science facilities in which UK is a shareholder. Provide grants to UK academics in the areas of particle physics and astronomy. Advocate and provide training in our science disciplines for the next generation.
National Nuclear Laboratory, NNL	Nuclear Science to benefit society. Nuclear fission research, development & testing.
Atomic Weapons Establishment, AWE	To manufacture, maintain and assure the warheads for the UK's nuclear deterrent and support UK national security.
Met Office	To work at the forefront of weather and climate science for protection, prosperity and well-being. Helps government and its agencies achieve their goals through enabling protection of lives, infrastructure and the natural world.
National Physical Laboratory, NPL	Developing and maintaining the nation's primary measurement standards and traceability back to the International System of Units of Measurements (SI). Provide cutting-edge measurement science, engineering and technology that underpins prosperity and quality of life in the UK. NPL helps to accelerate the innovation process, supporting industry and academia to get products and services to market sooner.
Public Health England, PHE	To protect and improve the nation's health and reduce health inequalities. Some information for PHE was obtained from the PHE Strategy 2020-25 document and has not been checked by them.

# National laboratories at a glance...

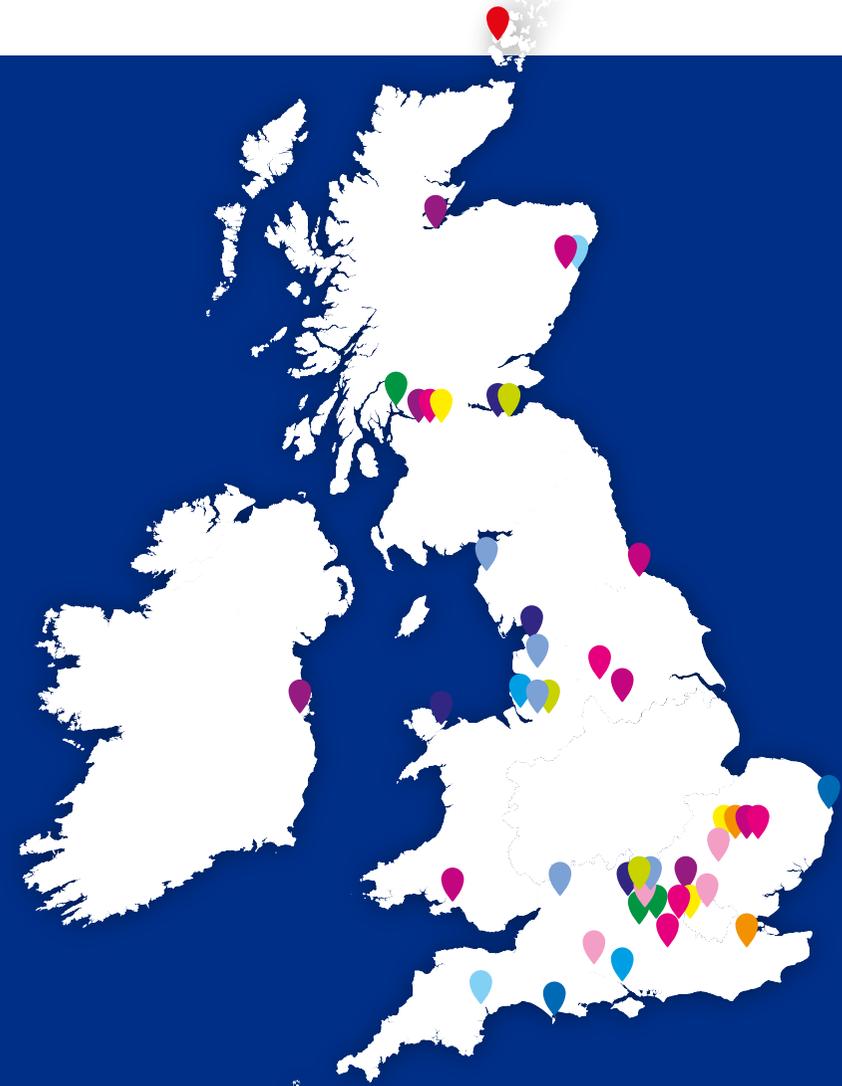
MAIN CONTACT GOV. DEPT.	NATIONAL LABORATORY	STATUS		STAFF (FTE)			PUBLIC FUNDING (£M)			STATUTORY FUNCTION		MEMBER OF		LOCATIONS									
		Private	Public	0 - 500	500 - 1000	1000+	0 - 24	25 - 49	50+	Yes	No	AIRTO	NLA	South West	LDN & SE	East	Midlands	North West	North East	Ireland	Scotland	Wales	
BEIS	BRE																						
	NML								*														
	STFC																						
	NNL																						
	Met Office																						
	NPL																						
BEIS via Innovate UK	Catapult Centres																						
UKRI	UKCEH																						
	NOC																						
NONE	EMEC																						
DEFRA	NIAB																						
	CEFAS																						
DH&SC	PHE																						
MoD, DNO	AWE	**																					
NONE	TWI																						

\* **NML** – ‘Government Chemist’ has a statutory function as a referee analyst under a number of acts of Parliament which focus on public protection, safety and health, value for money and consumer choice.

\*\* **AWE** – Government owned, contractor operated. DNO is the Defence Nuclear Organisation.

# Geographical Distribution

- BRE – Watford, UK  
Dublin, Ireland  
Glasgow, Scotland  
Inverness, Scotland
- NML – Teddington, Middlesex  
Fordham, Cambridge  
Glasgow, Strathclyde
- NOC – Southampton (headquarters)  
Liverpool
- EMEC – Orkney Islands
- NIAB – Cambridge (Headquarters)  
East Malling, Kent  
(Horticultural centre)  
12 regional centres  
across England.
- UKCEH – Wallingford  
Lancaster  
Bangor  
Edinburgh
- PHE – Porton Down  
Colindale  
Chilton  
Harlow
- CEFAS – Lowerstoft  
Weymouth
- STFC – Daresbury  
Edinburgh  
Harwell
- NNL – West Cumbria  
Warrington  
Preston  
Culham  
Stonehouse
- AWE – Aldermaston  
Burghfield and Blacknest  
Royal Navy Armaments  
Depot Coulport, Scotland  
CEA, Valduc (France)
- Met Office – Exeter (HQ)  
Aberdeen (HQ)  
Plus other regional presence  
across the UK.
- NPL – SW London, Teddington  
Regional presence in the  
North, South and East of  
England as well as Scotland.
- TWI – Cambridge  
Wales  
Teesside  
Yorkshire  
Aberdeen



# Geographical Distribution

## Catapult Network

There are 9 Catapults with 40 sites across the UK covering a range of different sectors, technology challenges and systems:

- **Cell and Gene Therapy Catapult** in London, Stevenage and Braintree
- **Compound Semiconductor Applications Catapult** in South Wales
- **Connected Places Catapult** in London, Milton Keynes, and hubs in Glasgow and Leeds
- **Digital Catapult** in London, with centres in Brighton, Sunderland and Belfast
- **Energy Systems Catapult** in Birmingham and Derby
- **High Value Manufacturing Catapult**, a network of another seven centres across 18 sites
  - AFRC in Inchinnan
  - AMRC in Sheffield, Rotherham and Broughton
  - CPI in Wilton, Sedgefield, Durham, Darlington
  - MTC in Coventry and Liverpool
  - NAMRC in Rotherham
  - NCC in Bristol
  - WMG in Coventry
  - Core team in Solihull
- **Medicines Discovery Catapult** in Cheshire
- **Offshore Renewable Energy Catapult** in Glasgow and Blyth, with centres in Aberdeenshire, Cornwall, Pembrokeshire, Leven, Hesse, Suffolk and
- **Satellite Applications Catapult** in Harwell, with centres in Glasgow, Sedgefield, Leicester, Portsmouth and Penryn
- Catapult Network Office, hosted by Digital Catapult



**CATAPULT**  
Network

| Cell and Gene Therapy  
| Connected Places  
| Compound Semiconductor Applications

| Digital  
| Energy Systems  
| High Value Manufacturing

| Medicines Discovery  
| Offshore Renewable Energy  
| Satellite Applications

# Status and governance

	BRE	NOC	NML	EMEC	NIAB
Status	Former UK government National Laboratory but now privatised in the form of a charitable trust – wholly owns commercial 'profit for purpose' subsidiary.	Charitable company Limited by Guarantee with wholly owned Trading Subsidiary (NOC Innovations Ltd).	Former UK government National Laboratory but now privatised and contracted to run its functions, as a ring fenced activity.	Company Limited by Guarantee (non-profit).	NIAB is governed by a Board of Directors who are Trustees of the Charity and administer the company.
Governance model	Board of trustees – BRE Trust is ultimate owner. Group Board 94 NEDs/CEO/CFO) runs the commercial subsidiary.	Board of trustees, executive team lead by Chief Executive.	2 work programmes (The Chemical and Biological Metrology Programme and The Government Chemist Programme) are overseen by 2 independent BEIS appointed programme expert groups.	Company Limited by Guarantee (non-profit).	The NIAB Trust, a registered charity administered by a separate Board of Trustees, owns the land and buildings used by NIAB, and has a specific object to support NIAB in pursuit of its charitable objectives.

# Status and governance

cont...

	UKCEH	PHE	CEFAS	STFC	CATAPULTS
Status	Registered Charity in England & Wales and in Scotland. Registered Company Limited by Guarantee in England & Wales.	Executive Agency.	Executive Agency of DEFRA and is a government science institute.	Non-departmental public body.	Private independent, not-for-profit organisations - Companies limited by guarantee.
Governance model	Executive Board reporting to a Board of Director Trustees. Science direction and cohesion is achieved through the UKCEH Science Board, membership of which comprises the 6 area heads and science relevant Directors. Additionally, a series of infrastructure teams which support and facilitate the delivery of science.	Chief Executive of PHE is responsible for the leadership and management of PHE and the delivery of its objectives, supported by an Advisory Board.	Has its own Chief Executive and Board of directors.	Part of UKRI.	Board of Directors, Chief Executive, Executive team. Innovate UK governance of the core grant.

# Status and governance

cont...

	NNL	AWE	MET OFFICE	NPL	TWI
Status	Public Corporation Private Company, limited by shares (Companies Act).	Government owned, Contractor operated.	Public Body – Executive Agency and Trading Fund.	Public Corporation.	Independent, non-for-profit distributing Research & Technology Organisation (RTO).
Governance model	Chief Executive personally responsible for the effective operation of NNL. Overseen by NNL Board.	Operations are outsourced to AWE Management Limited (ML) (a joint venture), under a Management and Operations contract running from 2000- 25. AWE ML Board provides governance to the AWE Executive. An on-site customer team manages the contract and provides oversight. Sites are regulated by Office of Nuclear Regulation, the Defence Nuclear Safety Regulator and the Environment Agency.	Ultimate responsibility and accountability for the work of the Met Office lies with the Secretary of State for Business, Energy and Industrial Strategy.	Framework document between NPL and BEIS which governs how NPL operates. The Secretary of State for BEIS and the Minister for Science have formal responsibility for NPL. NPL is sponsored by the International Science and Innovation team in BEIS. A Board with an independent Chair scrutinise the Chief Executive and other Executive Directors.	Company limited by guarantee. 'Owners' are industrial members of TWI which are companies operating worldwide. Chief Executive reports to a Council formed from representatives of industrial members and professional members (the TWI) learned society run by. The Council's Finance and General Purposes Committee has a more detailed remit for monitoring and approving TWI's operations. The Chief Executive is supported by the Executive Board, which comprises TWI directors and two non-executive directors. A Research Board, comprising representatives of industry and academia, oversees the Core Research Programme.

# Status and governance

NATIONAL LABORATORY	STATUS						STATUTORY FUNCTION	
	NON DEPARTMENTAL PUBLIC BODY	EXECUTIVE AGENCY	COMPANY			PUBLIC BODY	Y	N
			OWNED BY CHARITY	OWNED BY PRIVATE EQUITY	LIMITED BY GUARANTEE			
PRIVATE	BRE							*
	NOC							**
	NML							
	EMEC					not-for-profit		
	NIAB							
	UKCEH							
	TWI							
	Catapults					not-for-profit		
PUBLIC	NNL							
	NPL							
	PHE							
	CEFAS							
	STFC							
	AWE							
	Met Office							

\* **BUT** – recognised as standards and certification body for building safety.

\*\* **BUT** – main funder and owner of some assets is UK Research & Innovation (UKRI) sponsored by BEIS.

# Status and governance

## *National laboratory governance models summarised*

- Ones that are government owned:
  - STFC
  - Met Office
  - NPL
  - CEFAS
  - PHE
  - AWE
  - NNL
- Ones that were previously government owned, but are now private/third sector:
  - BRE
  - NML – hosted by LGC
  - NIAB
  - NOC
  - UKCEH
- Ones with strong connections to the government but have never been public sector:
  - EMEC
  - TWI
  - Catapults

# Status and governance

## *National laboratory governance models summarised*

- Half of the privately run national laboratories are charity owned:
  - BRE - “Former UK government national laboratory but now privatised in the form of a charitable trust – BRE Trust”.
  - NOC - “Charitable Company Limited by Guarantee with wholly owned Trading Subsidiary (NOC Innovations Ltd).”
  - NIAB - “NIAB is a Company Limited by Guarantee that is a registered charity”.
  - UKCEH “Registered Charity in England & Wales and in Scotland”.
- Status tends to vary more across publicly owned national laboratories:
  - PHE and CEFAS are run as executive agencies.
  - AWE is owned by the MoD and operated by a Management Consortium via a management contract. NOTE: AWE is not primarily a laboratory, but a manufacturing organisation, with a national laboratory function in it, accounting for about 10% of its spend.
  - Met Office is a public body run as an Executive Agency and Trading Fund.
  - STFC is run as a Non-Departmental Public Body.
  - NNL is Government owned (BEIS) and operated. It is fully customer funded.
- Majority of the national laboratories within this taxonomy, either private or public, are governed by a Chief Executive, supported by a Board of Directors.

# Funding Models

	BRE	NOC	NML	EMEC
Funding Model	<p>£50m annual turnover of which 10-15% from public funding in the form of grants (individually bid for) and service provision – see slide 19 on income. Other funding generated by commercial activities, advisory services, construction and fire safety and provision of third party assurance services.</p> <p>Commercial subsidiary creates surplus which funds research programme led by the Charitable Trust.</p>	<p>About 50% of funding comes from NERC-UKRI programmes of ‘National Capability’.</p> <p>Remaining funding won competitively with main sources being: NERC, UKRI, European Commission, European Space Agency, other government Departments, private sector, sales and licences.</p>	<p>Funding through delivery of National Measurement System (NMS) contract, funded by BEIS.</p> <p>Additional funding leveraged from the sale of reference materials, calibration services, contract R&amp;D, training courses and additional grants (historically predominantly from the EU-Horizon 2020 Programme, UKRI, recently including FSA, Defra, DH&amp;SC).</p>	<p>Since establishment in 2003, the centre received approx. £36 m of funding from the Scottish Government, Highlands and Islands Enterprise, the Carbon Trust, the UK Government, Scottish Enterprise, the European Union, and Orkney Islands Council.</p> <p>EMEC has been self sufficient since 2011, receiving no core research funding, income generated from competitively won R&amp;D calls, and commercial contracts.</p>

# Funding Models

cont...

	NIAB	UKCEH	PHE	CEFAS	STFC	CATAPULTS
Funding Model	<p>Annual turnover of c. £26m. Over 40% of this comes from commercial sources, and only about 35% from UK Government. Over half of the latter is for research funded by UKRI, but statutory services for Defra account for most of the remainder. Receive no core funding.</p>	<p>NERC commissioned National Capability competitively won income from a range of sources, including UKRI, EC, UK government departments and developed administrations, international funding bodies and private sector. Licencing of data products. Allocation of capital investment from NERC.</p>	<p>Grant in Aid plus commercial income from spare capacity and contract research/services.</p>	<p>Funded primarily from UK Government sources but also foreign governments and commercial sources. Primary funder is DEFRA accounting for 55% funding in 2019/20.</p>	<p>Government grant via UKRI.</p>	<p>Catapults raise funds through 3 main streams: (1) Innovate UK Core funding, (2) Commercial R&amp;D contracts, (3) Competitively won collaborative R&amp;D - 'the thirds model'. When a new Catapult is established, the reliance on core funding is high. As the business develops and reaches full maturity, there is an ambition to balance these streams. The [Core:Commercial+CR&amp;D] ratio across the Network was [45%:55%] in 2019/20, reflecting Catapults at various levels of maturity. A fourth source of funding is large capital (e.g. regional). Also, some HVM partners apply the membership model. The latter two do not account as part of the funding model/performance. Across the network, £1.3bn of research and demonstration facilities are under management. Including commercial R&amp;D leveraged, Catapults have directed over £2.5bn of private and public sector investment into cutting-edge industrial research since creation.</p>

# Funding Models

cont...

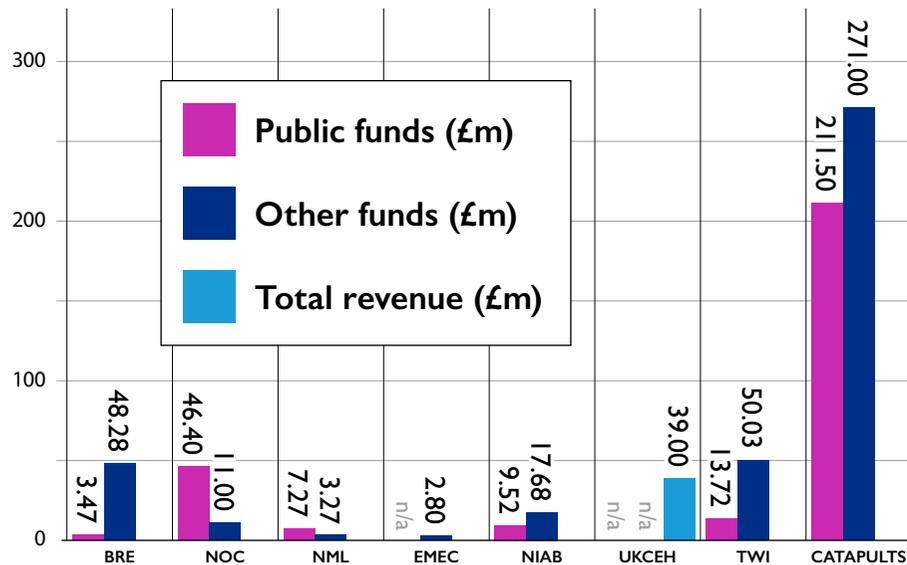
	NNL	AWE	MET OFFICE	NPL	TWI
Funding Model	<p>Commercially funded with revenues ~£100m per annum. Majority of revenue from 4 customers: NDA Estate, MoD, EDF Energy, BEIS. ~£5m per annum earnings to reinvest used to fund internal science and technology projects.</p>	<p>Vast majority of funding is provided under a Management and Operations contract between AWE ML and DNO.</p> <ul style="list-style-type: none"> <li>– Regularly negotiated funding periods which commit a package of work over a given time period for a given price.</li> <li>– The contract is a Qualifying Defence Contract under the Single Source Regulations which provides a profit limit set by government and uses a 'cost plus' model.</li> </ul>	<p>Met Office is a Trading Fund of BEIS. Funding comes as contracts for deliverables, such as providing the Public Weather Service, and comes from a range of public and private sector sources.</p>	<p>NPL receives funding through delivery of National Measurement System (NMS) contracts and through competitively won business, services and knowledge transfer. 59% of NPL's turnover in 2018 and 62% in 2017 came from the NMS. NPL delivers over 80% of the NMS contract.</p>	<p>Industrial membership fees provide a core funding and support the 'Core Research Programme'. Income from patents and licensing fund an internal innovation programme. All other work is 'bid for' projects. These can be collaborative (UK and European), joint industry projects (funded by an industrial consortium, or single client projects (work undertaken for one company on a contract basis). No core funding is received from government. Development of the organisation relies on internal resources and bid for programmes from regional and central government, and European Structural funds. TWI also has a post-graduate foundation that was initially supported by government for capital investment, and is now funded by TWI and industrial partners for revenue costs.</p>

# Sources of income

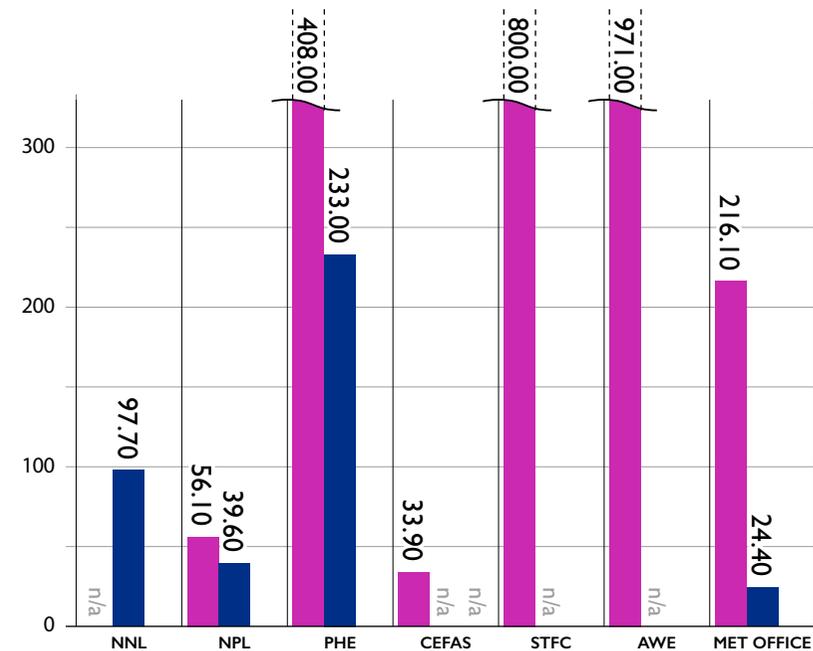
FY 18/19

	PRIVATE								PUBLIC						
	BRE	NOC	NML	EMEC	NIAB	UKCEH	TWI	CATAPULTS	NNL	NPL	PHE	CEFAS	STFC	AWE	MET OFFICE
<b>TOTAL REVENUE (£M)</b>	51.75	57.40	10.54	2.80	27.20	39.00	63.75	482.50	97.70	95.70	641.00	33.90	800.00	971.00	240.50

**Sources of income to private National Laboratories**



**Sources of income to public National Laboratories**



**Public funding** – money from government.

**Other funding** - generally made up of commercial activities i.e. sales, services, commissioned research and licencing.  
In the case of EMEC, other funding is generated from grants.

NNL stated that they receive “zero core funding”

# Funding Model

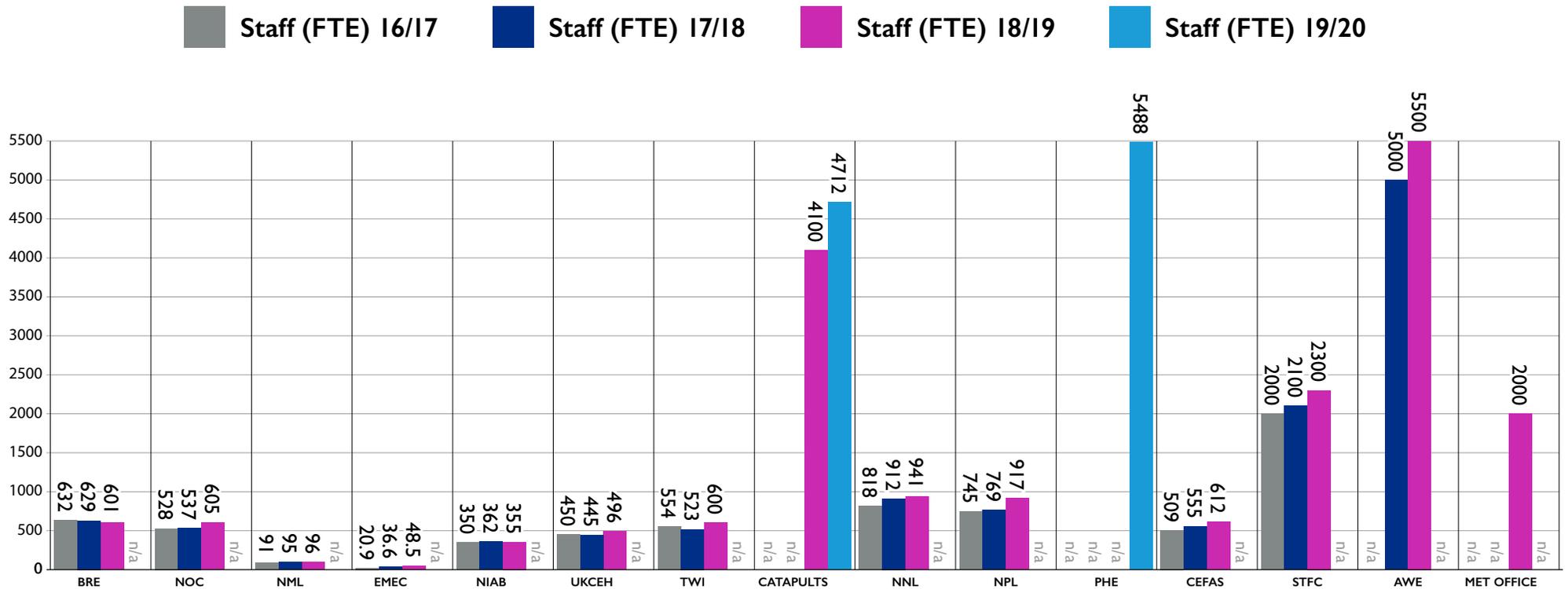
## *National laboratory funding models summarised*

- Funding across most organisations in this taxonomy comes from BEIS, NERC-UKRI and DEFRA.
- PHE receives its funding from the DH&SC.
- AWE receives its funding from the MoD.
- There is a correlation between whether an organisation is privately or publicly owned, and the amount of public funding it receives *(with the exception of the NOC and CEH\*)* – see slide 19.
- Private organisations *(with the exception of the Catapult Centres)* in this taxonomy received about 20% - 50% of funding from the public sector with the remainder predominantly made up of commercial activities.
  - Of these private organisations, the NOC receives the most (£46.4m)
  - The other 5 each receive <£10m of public funding
  - In the case of EMEC, it has been self-sufficient since 2011
  - Of the private organisations included, nine Catapult Centres collectively received the most public funding per annum (£211m in the financial year 2018/19)

*\*CEH haven't been able to give breakdown of figures.*

# Staff

## Number of employees



- In general, public organisations have a larger number of employees than private ones, with the exception of the Catapult Centres.
- Generally, over the stated financial years, the overall the number of people working at national laboratories is increasing.

# Interactions across government

NATIONAL LABORATORY		BEIS	UKRI	DEFRA	FDCCO	MOD	MHRA	PHE	NHS	GO Science	FSA	DoJ	HMRC	DSTL	CCC	NDA Estate	HO	CO	DFT	DIT	DH&SC	Met Office	EA	UK Academic Community	DNO	CAA	MHCLG		
PRIVATE	BRE																												
	NOC																												
	NML																												
	EMEC	n/a																											
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	PHE																												
	CEFAS																												
	STFC																												
	AWE																												
	Met Office																												

- All private laboratories interact with BEIS (excluding UKCEH for which there was no information available). \* Limited work with BEIS.
- NML, NPL and Catapults have the broadest interactions across the government.
- All organisations do work for departments or related organisations such as UKRI, other than for their immediate departmental sponsor.
- Note – NNL also interacts with UKGI, which is part of Treasury. UKGI “own” NNL with BEIS as their sponsor department.

# Interactions across government

NATIONAL LABORATORY		RELATIONSHIP WITH GOVERNMENT DEPARTMENT
PRIVATE	BRE	Provide research, data products, testing and technical input – compete for all funding with other commercial and academic bodies.
	NOC	Contractual funding relationship via UKRI to provide national capability for oceanographic sciences.
	NML	Delivery of National Measurement System contracts and provision of advice through BEIS: Government Chemist as an independent expert and arbiter in disputes between regulators and trade, and Chemical and Bio-measurement Programme. Supports food and feed regulation for FSA, DEFRA. Supports healthcare through DHSC/NHS England.
	EMEC	N/A
	NIAB	NIAB is the Official Seed Testing Station for England and Wales, and also delivers statutory functions and services in relation to National Listing (NL) and Seed Certification for major agricultural crops and plant breeders rights where relevant.
	UKCEH	Independent (however important to note UKCEH's strategic role in delivering NERC national capability).
	TWI	No formal relationship with any government department. Core funding of the RTO community by the then DTI ended in the late 1980s.
	Catapult Centres	Catapult Centres work closely with the government departments representing their core sectors, taking a variety of roles such as strategic, advisory, influencing policy, coordination, providing links to companies, shaping concepts, shaping standards, regulation, project management, supporting delivery, leading programme delivery, informing approaches.
PUBLIC	PHE	Executive Agency of DHSC; provides research, data, testing and technical input across central government directly to public departments; performs public health/health protection duties as a Category 1 responder under Civil Contingencies; direct support to NHS England (and Das) for public health policy and operational support.
	CEFAS	Executive Agency of DEFRA .
	STFC	Non Departmental Public Body.
	NPL	The NMS supports food, agriculture, air and water quality regulation for DEFRA and FSA. NPL supports transport infrastructure monitoring and drink drive legislation for the Department for Transport.
	AWE	Contract with MOD, DNO. MOD owns the land, assets and material used by AWE.
	Met Office	The majority of Met Office services are delivered to government departments, government arms length bodies or to the public and civil contingencies providers, on behalf of government.
	NNL	BEIS - Owner. MOD - key customer NDA Estate - tenant on various sites.

# Interactions across government

## *National laboratory function across varying areas and capabilities*

- National laboratories have been categorised in two ways. Firstly, by their purpose and a description of each National laboratories international standing, and the second is a more detailed breakdown according to skills, facilities, equipment and software.
- All but a few of the private national laboratories analysed do not have a statutory function, including the Catapult Centre although these are not laboratories in the traditional sense.
  - **NML** - ‘Government Chemist’ has a statutory function as a referee analyst under a number of acts of Parliament which focus on public protection, safety and health, value for money and consumer choice, and provides advisory role to government.
  - **NIAB** - NIAB is the Official Seed Testing Station for England and Wales - delivers statutory functions and services in relation to National Listing (NL) and Seed Certification for major agricultural crops and plant breeder rights where relevant.
  - **NPL** - for example NPL supports transport infrastructure monitoring and drink drive legislation for the Department for Transport.
- A number of the national laboratories have common research areas:
  - **STFC** and **NPL** both specialise in science and engineering.
  - **NNL** and **AWE** both specialise in nuclear science.

# National laboratory capabilities

## Purpose and International Standing

NATIONAL LAB	PURPOSE	INTERNATIONAL STANDING
BRE	To enable transformational change within the built environment through research, demonstration and education. Purpose is centred on research and scientific expertise applied through a range of commercial products and services, relevant to the needs of our stakeholders – whether government, commercial customers or, more indirectly, consumers.	BRE has offices in USA, China and Ireland. BREEAM is used in 86 countries on thousands of projects. BRE Global's LPCB certification is an internationally recognised reference document that is used round the world by construction professionals looking for high quality products and services. BRE Academy offers training internationally.
NOC	Provision of National Capability in Oceanographic Sciences: a. Strategic research and ocean measurement technology development b. Operation of large research infrastructures c. Creating value through advice to government, engagement with industry, public engagement.	<ul style="list-style-type: none"> <li>– High international standing - One of about 6 similar scale oceanographic institutions in the world (others in USA, Germany, France, Japan).</li> <li>– In 2019 NOC had the highest percentage (24%) of most highly cited papers in ocean science compared with international peer institutions.</li> </ul>
NML	Providing high quality world-leading science to solve measurement problems and provide the resilient measurement infrastructure needed to support government, industry and protect consumers. Designated Institute for (DI) for 'Chemical & Biological Measurement' within the UK. Maintaining the role of 'Government Chemist' since 1842, which has a statutory function as an independent referee analyst under a number of acts of Parliament focussing on public protection, safety, health, value for money and consumer choice.	<ul style="list-style-type: none"> <li>– World leading within their field of designation (recognised in the last international science review).</li> <li>– One of the top three metrology (measurement) institutes globally within their designation (as evidenced by performance in international comparison studies).</li> <li>– Works closely with the international measurement community.</li> </ul>
EMEC	Provides pre-consented and cost minimising test and demonstration facilities in major wave and tidal resources. EMEC's vision is for a globally successful marine energy industry as part of a clean energy system. Pioneering development of a green hydrogen economy in Orkney.	<ul style="list-style-type: none"> <li>– In 2020, was designated with Renewable Energy Testing Laboratory (RETL) status, the highest international designation for marine energy test laboratories.</li> <li>– EMEC is the first RETL for ocean energy in the world.</li> <li>– Up until now, EMEC could perform accredited performance assessments in UK; RETL designation enables EMEC to perform tests to assess the power performance of tidal energy converters anywhere in the world.</li> </ul>
PHE	To protect and improve the nation's health and reduce health inequalities	Core member of IANPHI, key WHO Collaborating Centres across spectrum of public health activity, current member of ECDC and strong relationships with US CDC and influential with similar institutions in multiple countries (Africa, Middle East, Commonwealth); key partner for biosecurity activities (with Dstl) in particular Global Affairs Canada. Operates the UK's Public Health Rapid Support team, an early-entry/reconnaissance capability for HMG that informs aid/deployment decisions for international health/humanitarian emergencies. World leading Containment Level 3 and 4 lab research capabilities for infectious diseases including rare/dangerous pathogens; international reference lab capabilities

# National laboratory capabilities

cont...

NATIONAL LAB	PURPOSE	INTERNATIONAL STANDING
NIAB	The NIAB Group is the UK's fastest growing crop science organisation. NIAB is at the forefront of the application of genetics, physiology, soil science, precision agronomy and data science to improve yield, efficiency and resilience of crop production across the arable, forage and horticulture sectors.	Internationally recognised centre for crop innovation – plant varieties and seeds, delivering independent assessment services according to internationally harmonised standards, world class research, and training, information and advice.
UKCEH	The UK's Centre of Excellence for research in terrestrial, freshwater and near atmosphere science. Purpose is to advance science; to advance education in the environment and environmental sciences, and sustainable development; and to promote sustainable development for the benefit of the public, within the United Kingdom.	Until 2019, was a UK PSRE and was entirely UK based. Still solely based in UK, however obtaining independence (2019) afford them opportunity to establish both entities and presence overseas. CEH has a standing in undertaking international research with approximately 30% of income having an international focus. Additionally, NERC has commissioned NC has been for delivery of Official Development Assistance (ODA) as a contribution towards the governments commitment to spend 0.7% of GNP on foreign aid. UKCEH active in a range of countries, most notably India, China, Malaysia, Indonesia, Thailand, Myanmar and West Africa.
CEFAS	Providing data and advice to UK & Overseas Gov. to keep our Seas, Oceans and Rivers healthy and productive and seafood safe and sustainable.	High – world renowned science in the field. Borne out by high publication, citation and impact factors (compared to similar institutes) and International Centres of Excellence status. Significant proportion of delivery on International projects.
STFC	Build and operate large scale science facilities for UK academic community. Provide access to international science facilities in which UK is a shareholder. Provide grants to UK academics in the areas of particle physics and astronomy. Advocate and provide training in our science disciplines for the next generation.	High - Operate international science facilities and participate in the funding and operation of non UK international science facilities where we are partners.
NNL	Nuclear Science to benefit society.. Nuclear fission research, development & testing.	It is seen as a peer to all other national nuclear labs, and a partner to several major multinational institutions. NNL operates world leading high active research facilities and has world renowned capability across the nuclear fuel cycle NNL deploys UK capability to address nuclear challenges abroad for a range of international customers.
AWE	To manufacture, maintain and assure the warheads for the UK's nuclear deterrent and support UK national security.	AWE maintains strong relationships (under UK Govt treaties) with US and French counterparts. It also provides support, through the UK Govt, into some parts of the international nuclear system.

# National laboratory capabilities

cont...

NATIONAL LAB	PURPOSE	INTERNATIONAL STANDING
Met Office	<p>To work at the forefront of weather and climate science for protection, prosperity and well-being. Helps government and its agencies achieve their goals through enabling protection of lives, infrastructure and the natural world.</p>	<p>Met Office global forecast skill is consistently ranked as the highest of any national meteorological service globally, as measured using a standard set of verification scores for deterministic NWP forecasts. The Met Office is one of only two World Area Forecast centres, delivering forecasts globally. One of only a small number of national meteorological services that work collaboratively with, and sells services to government institutions in other countries, including Australia, South Korea and the US Air Force.</p>
NPL	<p>Developing and maintaining the nation's primary measurement standards and traceability back to the International System of Units of Measurements (SI). Provide cutting-edge measurement science, engineering and technology that underpins prosperity and quality of life in the UK. NPL helps to accelerate the innovation process, supporting industry and academia to get products and services to market sooner.</p>	<p>All the NMS Science areas performed at an internationally competitive level, and more than half of the NMS Science areas are considered to be internationally-leading. NPL works closely with the international NMI community. In 2019, NPL had a leading role in the global collaboration to redefine the International System of Units of Measurement (SI). NPL is considered one of the top NMI's in the world and the leading NMI for creating impact.</p>
TWI	<p>To supply research, development, innovation, trouble shooting and training services in the fields of materials, manufacturing and structural integrity to industry in the UK and worldwide. In addition to supply vocational training, TWI now has a post-graduate foundation with &gt;120 students at any time.</p>	<p>Worldwide reputation. Industrial members and contract work from companies worldwide. Partnerships with universities and research organisations worldwide. Participation in &gt;150 standards committees, many of which are international.</p>
Catapults	<p>Catapults have a strong track record of international engagement, both in R&amp;D programmes or offering of specialist services. Several Catapults employ staff in other countries to identify alliances and create strategic advantage for domestic companies. They seek partners with complementary technical expertise not available in the UK, couple these with UK companies, design entrepreneurial missions, showcase potential growth companies, shape standards and regulation, where relevant. Collectively they are helping drive UK exports and encourage foreign direct investment.</p>	<p>The Catapult brand is well recognised internationally. Catapults have strong standing internationally and since 2013 have completed over 1200 international projects. ORE and SA Catapults have established centres in China. Catapults are highly respected amongst their international peers in conferences and have been attracting much opportunity for collaboration. Since 2016/17 to mid 2019, Catapults won over £80m in European funding. The Catapult model has also attracted a number of international missions from countries looking to establish a similar model (e.g. Chile, India, Hong Kong, etc).</p>

# National laboratory capabilities

## International Standing

### Private

### Public

#### BRE

BREEAM is used in 86 countries on thousands of projects. BRE Global's LPCB certification is an internationally recognised reference document that is used round the world by construction professionals looking for high quality products and services.

#### EMEC

In 2020, was designated with Renewable Energy Testing Laboratory (RETL) status, the highest international designation for marine energy test laboratories. EMEC is the first RETL for ocean energy in the world.

#### CEFAS

World renowned science in the field. Borne out by high publication, citation and impact factors (compared to similar institutes) and International Centres of Excellence status. Significant proportion of delivery on International projects.

#### NOC

High international standing - One of about 6 similar scale oceanographic institutions in the world (others in USA, Germany, France, Japan).

#### NIAB

Internationally recognised centre for crop innovation.

#### Met Office

Met Office global forecast skill is consistently ranked as the highest of any national meteorological service globally, as measured using a standard set of verification scores for deterministic NWP forecasts.

#### NML

World leading within their field of designation (recognised in the last international science review). One of the top three metrology (measurement) institutes globally within their designation (as evidenced by performance in international comparison studies).

#### UKCEH

Obtaining independence (2019) afforded them opportunity to establish both entities and presence overseas. CEH has a standing in undertaking international research with approximately 30% of income having an international focus.

#### NNL

It is seen as a peer to all other national nuclear labs, and a partner to several major multinational institutions. NNL deploys UK capability to address nuclear challenges abroad for a range of international customers.

# National laboratory capabilities

## Catapult Centres - purpose and capabilities

	PURPOSE	CAPABILITIES
CATAPULTS	The Catapult Network brings together nine elite technology centres established by Innovate UK as a long-term investment in the UK's economic capability. Through cutting-edge R&D infrastructure, partnership building and specialist knowledge, Catapults help businesses accelerate the development, deployment and adoption of new technologies, bringing valuable products and services into existence to compete in global markets of tomorrow.	Catapults work businesses and innovators to prove and adopt breakthrough products, processes, services and technologies by: <ol style="list-style-type: none"> <li>Providing access to world-class unique R&amp;D infrastructure, expertise and capabilities</li> <li>Promoting collaboration building between businesses, their supply chains, academia, charities, service providers, end-users, etc.</li> <li>Enabling the development and deployment of innovative solutions to accelerate commercialisation and value chains.</li> </ol>
Cell and Gene Therapy Catapult	Cell and Gene Therapy Catapult accelerates the translation of early stage research into commercially viable and investible therapies, helping businesses start, grow and confidently develop advanced therapies, delivering them to patients rapidly and effectively. Making the UK a global leader in the development, delivery and commercialisation of cell and gene therapies.	<ul style="list-style-type: none"> <li>Industrialisation, Manufacturing, Regulatory, Health economics and market access, Non-clinical safety</li> <li>Development laboratories: 1200m2 purpose built centre, Analytical characterisation, Process development, Viral vector</li> <li>7,700m2 Manufacturing Centre: Specifically designed for cell and gene therapies, 12 segregated large cleanroom modules, Unique collaborative operating model, central to the development of the third largest cell and gene therapy cluster globally</li> </ul>
Compound Semiconductor Applications Catapult	Compound Semiconductor Applications Catapult accelerates the development and commercialisation of new applications for compound semiconductors (CS), and creating a collaborative innovation centre within the world's CS cluster in South Wales helping the UK become a global leader in new applications for compound semiconductors.	<ul style="list-style-type: none"> <li>Facility: 30,000 sq. ft; Design studio: simulation tools, industry collaboration</li> <li>Class 10K advanced packaging lab: materials characterization, precision engineering, die preparation &amp; hybrid integration</li> <li>Power electronics lab: power device characterisation &amp; modelling, access to 100KW to 300KW of power; EMC screened</li> <li>RF/microwave lab; device characterization, harsh environment analysis</li> <li>Photonics &amp; sensors lab: advanced metrology, dark room</li> </ul>
Connected Places Catapult	Connected Places Catapult is the UK's innovation accelerator for cities, transport, and places. They provide impartial 'innovation as a service' for public bodies, businesses, and infrastructure providers to catalyse step-change improvements in the way people live, work and travel.	Urban IoT    Market Analysis & Strategy    Standards Visual & Urban Design    Architecture & Engineering    Economics Software development    Connected & Autonomous Vehicles    Drone & Aviation Business & Economist Modelling    Systems Architecture & Data Human Factors & Anthropology    Customer Insight    Air Quality & Pollution Systems Development

# National laboratory capabilities

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	PURPOSE	CAPABILITIES												
CATAPULTS	The Catapult Network brings together nine elite technology centres established by Innovate UK as a long-term investment in the UK's economic capability. Through cutting-edge R&D infrastructure, partnership building and specialist knowledge, Catapults help businesses accelerate the development, deployment and adoption of new technologies, bringing valuable products and services into existence to compete in global markets of tomorrow.	Catapults work businesses and innovators to prove and adopt breakthrough products, processes, services and technologies by: <ol style="list-style-type: none"> <li>Providing access to world-class unique R&amp;D infrastructure, expertise and capabilities</li> <li>Promoting collaboration building between businesses, their supply chains, academia, charities, service providers, end-users, etc.</li> <li>Enabling the development and deployment of innovative solutions to accelerate commercialisation and value chains.</li> </ol>												
Digital Catapult	Digital Catapult drives the early adoption of advanced digital technologies to make UK businesses more competitive and to grow the UK economy. They are the UK's leading advanced digital technology innovation centre accelerates the early adoption of AI, Future Networks – including 5G and IoT - DLT and Immersive technologies.	<ul style="list-style-type: none"> <li>– Future Networks: 5G, Low Powered Wide Area Networks, Internet of Things</li> <li>– Immersive Technologies: Virtual Reality, Augmented Reality, Mixed Reality, Haptics</li> <li>– Artificial Intelligence and Machine Learning</li> <li>– Future Focus: Cybersecurity and testing Distributed ledger (blockchain) outside finance</li> <li>– Markets: Creative Industries and Manufacturing</li> </ul>												
Energy Systems Catapult	Energy Systems Catapult accelerates the transformation of the UK's energy systems, identifying priorities and market barriers for decarbonisation. Their vision is to unleash innovation and open new markets to capture the clean growth opportunity, ensuring UK businesses and consumers capture the opportunities of clean growth.	<ul style="list-style-type: none"> <li>– Modelling: energy systems, storage and flexibility modelling and analysis</li> <li>– Consumer Insight: research, design, trials</li> <li>– Digital and data: digital and data systems, AI and data science, Living Lab</li> <li>– Systems Integration: systems engineering, architecting and simulation, with business model innovation</li> <li>– Infrastructure and Engineering: renewables, nuclear, networks, CCS, energy storage, bioenergy hydrogen, transport</li> <li>– Markets, Policy and Regulation</li> </ul>												
High Value Manufacturing Catapult	High value Manufacturing Catapult helps grow the UK's advanced manufacturing value add by helping industry to develop new manufacturing technology. They create the conditions for economic growth by enabling UK manufacturers to achieve significant improvements in their performance and productivity.	<table border="0"> <tr> <td>Technology Development</td> <td>Workforce Development</td> <td>Problem solving</td> </tr> <tr> <td>Manufacturing Expertise</td> <td>Policy Insights &amp; Intelligence</td> <td></td> </tr> <tr> <td>Research and Testing</td> <td>Advanced Assembly</td> <td>Automation</td> </tr> <tr> <td>Biotechnology</td> <td></td> <td>Biologics</td> </tr> </table>	Technology Development	Workforce Development	Problem solving	Manufacturing Expertise	Policy Insights & Intelligence		Research and Testing	Advanced Assembly	Automation	Biotechnology		Biologics
Technology Development	Workforce Development	Problem solving												
Manufacturing Expertise	Policy Insights & Intelligence													
Research and Testing	Advanced Assembly	Automation												
Biotechnology		Biologics												

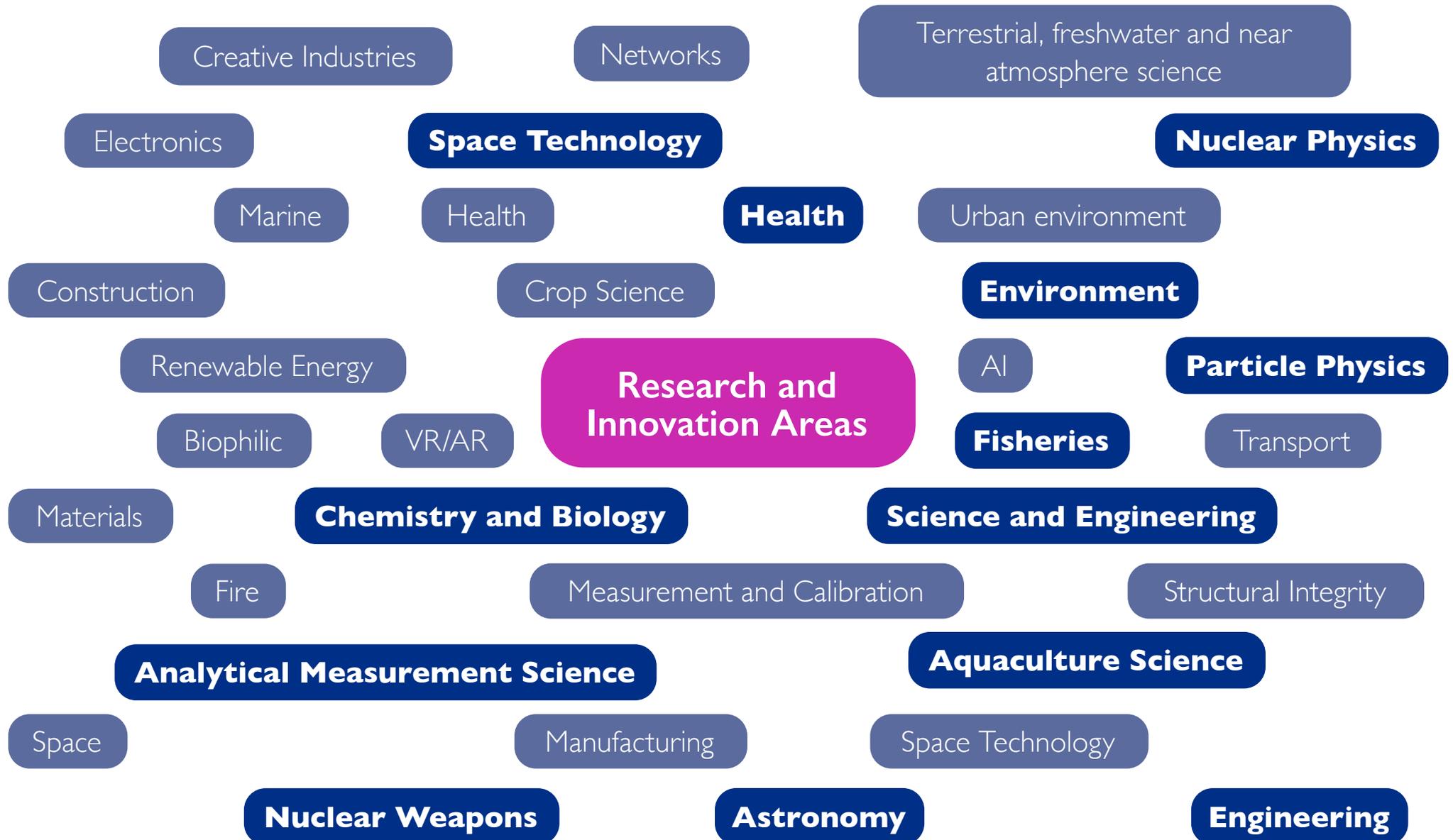
# National laboratory capabilities

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	PURPOSE	CAPABILITIES
CATAPULTS	The Catapult Network brings together nine elite technology centres established by Innovate UK as a long-term investment in the UK's economic capability. Through cutting-edge R&D infrastructure, partnership building and specialist knowledge, Catapults help businesses accelerate the development, deployment and adoption of new technologies, bringing valuable products and services into existence to compete in global markets of tomorrow.	Catapults work businesses and innovators to prove and adopt breakthrough products, processes, services and technologies by: <ol style="list-style-type: none"> <li>Providing access to world-class unique R&amp;D infrastructure, expertise and capabilities</li> <li>Promoting collaboration building between businesses, their supply chains, academia, charities, service providers, end-users , etc.</li> <li>Enabling the development and deployment of innovative solutions to accelerate commercialisation and value chains.</li> </ol>
Medicines Discovery Catapult	Medicines Discovery Catapult is a national facility connecting the UK community to accelerate and reshape innovative drug discovery. Their mission is to industrialise & drive adoption of breakthrough approaches that discover patient-centered medicines, faster improving the productivity and fundability of medicines discovery assets in the UK.	<ul style="list-style-type: none"> <li>– Preclinical imaging</li> <li>– Biomarkers for precision medicine</li> <li>– Target engagement and validation</li> <li>– Informatics: data analysis, information extraction, natural language processing and machine learning</li> <li>– Virtual R&amp;D to leverage the UK's renowned leadership in drug discovery</li> <li>– Syndicates enabling patient centred drug discovery</li> </ul>
Offshore Renewable Energy Catapult	Offshore Renewable Energy Catapult creates clean growth opportunities by accelerating the creation and growth of UK companies in offshore renewable energy. Their mission is to enable the transition to a low carbon economy and expanding the sector by becoming the world's leading offshore renewables technology centre.	<ul style="list-style-type: none"> <li>– Research, Innovation, Testing &amp; Validation, Supply Chain Growth</li> <li>– Facilities: Turbine blade testing    Powertrain test rigs High Voltage testing lab    Marine test docks 7MW offshore research turbine    Offshore anemometry hub</li> </ul>
Satellite Applications Catapult	Satellite Applications Catapult fosters the growth of satellite applications through the exploitation of space. Their vision is to be a world-leading innovation and technology company, helping businesses of all sizes to realise the potential from space. They aim to support integration for a connected and information centric world.	<ul style="list-style-type: none"> <li>– Markets: Ubiquitous Connectivity, Geospatial Innovation, Access to Space, Satellite enabled applications in: Agriculture, Extractive Industries, Health &amp; Wellbeing, Transport &amp; Infrastructure, Sustainable Finance</li> <li>– Facilities : Disruptive Innovation for Space Centre, for rapid-prototyping and manufacturing, 5G test-bed, Business incubation centre, In-orbit servicing and satellite operations centre</li> </ul>

# National laboratory capabilities

**BOLD** = public organisations



# National laboratory capabilities

SPONSOR	NATIONAL LABORATORY	RESEARCH AREAS	CAPABILITIES
Ministry of Housing and Local Government (also BEIS for some projects)	BRE	Construction Materials Fire Biophilic	<p>Advisory services to help deliver high quality buildings and infrastructure that meet legislative, client, safety, social and environmental requirements.</p> <p>Certification of fire, security and environmental products and services, management processes and other products and services.</p> <p>Impartial research services to local and national government in the UK, international, and to businesses and other private sector organisations.</p> <p>Loss Prevention Standards (LPS) and Environmental Standards</p> <p>Test individual materials and products, building systems, engineering structures and whole buildings, using established engineering structures and whole buildings.</p> <p>Provide UKAS accredited verifications.</p>
None – but main funder and owner of some assets is UKRI sponsored by BEIS	NOC	Strategic Marine	<p>Marine Physics &amp; Ocean Climate; Marine Systems Modelling, Ocean Biogeochemistry and Ecosystems, Marine Geosciences, Ocean Technology and Engineering, Sustained Ocean Observations, Research Vessel Operations (RRS Discovery, RRS James Cook, National Marine Equipment Pool including Marine Autonomous and Robotic Systems Facility, British Oceanographic Data Centre, British Ocean Sediment Core Research Facility, Discovery Collections (Deep Sea Biological Specimens).</p> <p>Permanent Service for Mean Sea Level.</p> <p>Marine Robotics Innovation Centre.</p> <p>Programme Coordination.</p> <p>International Representation – Lead UK delegation to Intergovernmental Oceanographic Commission of UNESCO.</p> <p>Leadership of Marine Science National Capability for NERC-UKRI.</p>
BEIS	NML	Analytical Measurement Science – Chemistry and Biology	<p>Provide high quality world-leading chemical and bio-measurement science to solve measurement problems and provide the measurement infrastructure needed to support government, industry, academia and protect consumers. Our work provides the confidence in data needed to support current, emerging and breakthrough technologies. Addressing diagnostics, advanced therapeutics, safety and security through provision of reference materials, calibration services, measurement research and training.</p> <p>Specific capabilities include: isotope ratios, elemental analysis and imaging, trace metals, nano-particles, organo-metals, small organic molecules, peptides, proteins, nucleic acids and cells.</p>
N/A	EMEC	Renewable	<p>Demonstration: covering the provision of testing infrastructure, as well as consenting, H&amp;S, and data collection support.</p> <p>EMEC also offers Technical Verification (ISO/IEC 17020) to provide assurance to investors, and can support test plan development and implementation, and environmental assessments.</p> <p>Commercial: Spanning test centre consultancy support, project management, bid writing, procurement, marketing and communications, and commercial road mapping.</p>

# National laboratory capabilities

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SPONSOR	NATIONAL LABORATORY	RESEARCH AREAS	CAPABILITIES
No sponsor department, however carries out statutory functions for DEFRA.	NIAB	Crop science	Research and knowledge regarding all things crop science. Services including: variety assessment, characterisation and evaluation, seed certification and testing, lab crop analytical services, crop yield modelling, precision irrigation and irrigation scheduling. Field and glasshouse/protected crop trials – trial coordination, data handling and statistics. Advisory and consultancy services on crop varieties and management/agronomy.
None, but UKCEH is strategic delivery partner for NERC-UKRI, via delivery of NERC funded by National Capability.	UKCEH	Research in terrestrial, freshwater and near atmosphere Science	Long-term, large-scale systems-based monitoring and modelling, addressing the fundamental processes and status of the terrestrial, freshwater and near atmosphere environments. Also see UKCEH 5-year Research and Innovation Strategy <a href="https://www.ceh.ac.uk/science-strategy">https://www.ceh.ac.uk/science-strategy</a> .
Dept. Health and Social Care	PHE	Health protection & emergencies, health improvement and inequality, infectious and non-infectious disease, emerging infections, environmental and industrial hazards, health impacts of climate change	Influencing agendas, shaping policy and practice, delivering services and building system capability.
DEFRA	CEFAS	Environment Fisheries Aquaculture Science	Ocean going bespoke Research Vessel (CEFAS Endeavour). Specialist experimental Aquarium, Laboratory and Workshop facilities.
N/A	TWI	Materials Joining Structural Integrity Manufacturing	TWI is one of the world's foremost independent research and technology organisations, with expertise in materials joining and engineering processes.
BEIS	STFC	Science and Engineering, Particle Physics, Nuclear Physics, Space Science, Astronomy	Building, operating and developing large capital investment in science infrastructure with long time horizons and the technologies that underpin their operation.

# National laboratory capabilities

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SPONSOR	NATIONAL LABORATORY	RESEARCH AREAS	CAPABILITIES
BEIS	NNL	Nuclear science	<ul style="list-style-type: none"> <li>– Spent fuel management technology</li> <li>– Fuel and radioisotopes, including advanced fuel development and fuel cycle</li> <li>– Nuclear asset care (robotics and remote engineering)</li> <li>– Nuclear safety, security and safeguards</li> <li>– Reactor technology, chemistry and materials</li> <li>– Waste management technology (immobilisation, storage and disposal)</li> <li>– Radiochemical analysis</li> <li>– Custodian of £1.5bn of critical national nuclear research infrastructure, including world leading high active facilities</li> </ul>
MOD and DNO	AWE	Nuclear weapons engineering Radiology	Nuclear warhead design, manufacture, maintenance, qualification, assurance, recycling. Nuclear and radiological security, emergency response and support to arms control. Laser/plasma physics, shock physics (hydro-dynamics), explosives, materials science, high-performance computing.
BEIS	Met Office	Meteorology Climate science	<p>Core capabilities in weather and climate observation, monitoring, modelling and prediction.</p> <ul style="list-style-type: none"> <li>– Met Office supercomputer</li> <li>– Met Office observations network</li> <li>– Met Office NAME model</li> <li>– Met Office Hadley centre</li> </ul> <p>All of these are used to produce the core public weather services and core Hadley Centre Climate Programme outputs including climate projections.</p>
BEIS	NPL	Science and Engineering Measurement and calibration across a vast array of industries	<p>350 world-class laboratories, enabling precision measurement to be realised across the fields of acoustics, biosciences, chemical analysis, communications, data science, engineering, environmental monitoring, graphene, ionising radiation, materials, medical physics, quantum and time and frequency.</p> <p>NPL provide specialist services in measurement, testing and validation that are not provided by any other organisation in the UK.</p> <p>NPL conducts cutting edge research in the science of metrology that enables it to build capability and address the future measurement needs of academia and industry.</p> <p>Large number of laboratories that provide calibration and measurement services, but these are customers of NPL and work at a lower level of accuracy.</p>
BEIS via Innovate UK	Catapult Centres	Cell and Gene Therapies, Medicines Discovery, High Value Manufacturing, Offshore Renewable Energy, Energy Systems, Digital, Connected Places, Satellite Applications, Compound Semiconductor Applications.	The Catapult Network brings together nine elite technology centres established by Innovate UK as a long-term investment in the UK's economic capability. Through cutting-edge R&D infrastructure, partnership building and specialist knowledge, Catapults help businesses accelerate the development, deployment and adoption of new technologies, bringing valuable products and services into existence to compete in global markets of tomorrow.

# Performance

NATIONAL LABORATORY	EVIDENCE OF INFLUENCING GOVERNMENT'S DEPARTMENTAL POLICY	EVIDENCE FOR ENGAGEMENT WITH BUSINESS
BRE	<p>Advise government on wide ranging built environment issues e.g. actions needed to meet 80% reduction of carbon emissions by 2050 target in UK and fire/building safety requirements.</p> <p>Conduct UK Housing stock condition Surveys – provide data that can be used to advise on housing and health and the likely impacts of particular housing strategies.</p>	<p>Over 90% of income is commercial.</p>
NOC	<p>FCO and MoU - scientific advice relating to international ocean governance.</p> <p>DEFRA – NOX provides secretariat for UK Marine Science Coordination Committee relating to science based marine evidence.</p>	<p>Marine Robotics Innovation Centre – about 30 industrial partners with 11 SME co-located engaged in technology development with the others engaged in use and influence development of technologies. Other industry funded contracts for R&amp;D.</p>
NML	<p>Advisory role across government departments and to Devolved Administrations through, e.g. Government Chemist, DHSC advisory panel for Covid-19 technologies, hydrocarbon oil duties for HMRC.</p> <p>Respond &amp; contribute to consultations &amp; enquiries from government.</p> <p>Visits and meetings with CSAs.</p> <p>Provide expertise to colleagues in POST.</p> <p>Contribution to development of the UK Measurement Strategy on behalf of BEIS.</p>	<p>5 routes in which they support businesses:</p> <ul style="list-style-type: none"> <li>i. COLLABORATION – work in partnership with 100 companies through programmes such as Analysis for Innovators to develop joint research projects whilst providing the skills and expertise of the NML to improve growth or productivity.</li> <li>ii. ANALYTICAL SERVICES – calibration facilities or contract R&amp;D (in 2019 helping over 50 companies)</li> <li>iii. TRAINING – Over 20 years of courses focused on lab quality assurance to help labs implement best practice and ensure they meet accreditation and regulatory requirements. Trained over 2000 delegates from over 350 organisations across 29 different sectors.</li> <li>iv. REFERENCE MATERIALS AND STANDARDS</li> <li>v. ADVICE AND CONSULTATIONS – direct enquiries helpline, email, expert committees. Also respond to numerous public consultations each year.</li> </ul>
EMEC	N/A	N/A
NIAB	<p>Provides technical advice to DEFRA Plant Varieties and Seeds Policy and APHA Varieties and Seeds to support their decisions.</p>	<p>Works extensively with businesses – achieved through commercially-funded R&amp;D and services, industry partners in research projects, hosting SMEs and company staff/activities at its premises, and its membership networks and industry clubs.</p> <p>NIAB's membership schemes an important mechanism for two-way dialogue with industry, ensuring that our services provide maximum benefit and that our research is focused, solution-orientated and impacts on practice.</p>

# Performance

cont...

NATIONAL LABORATORY	EVIDENCE OF INFLUENCING GOVERNMENT'S DEPARTMENTAL POLICY	EVIDENCE FOR ENGAGEMENT WITH BUSINESS
UKCEH	Centre evaluation exercise, equivalent to the REF includes a series of Impact Case studies – outline best examples of where UKCEH attains impact, including UK departmental policy. UKRI annual collection of Research Impacts through ResearchFish.	Recorded in terms of research contracts undertaken, and wider engagement with business.
PHE	Produce data, analysis and scientific research that provide authoritative information on the big factors affecting the public's health and use this evidence to influence the priorities of national and local government and the NHS. Examples include: PHE's National Cancer Registration and Analysis Service (NCRAS) and the Health Profile; vaccination policy; health, diet and obesity programmes (Change4Life, Stoptober).	Distinct Business Development department working in parallel with Commercial (Procurement) Department. Health Marketing/public messaging department.
CEFAS	Yes – CEFAS are primary advisors to ministers (particularly DEFRA) on fisheries and other marine issues around health and sustainability.	Yes – CEFAS have a long relationship of delivery to industry partners particularly in the Nuclear Energy, Offshore wind, oil & gas and fishing/aquaculture sectors.
STFC	Influence policy through UKRI which has a £7.5B budget.	To STFC sites operate from high tech campuses and host on site our sites a wide range of small high tech businesses that are able to use STFC core competences and capabilities, STFC operations generate IP which is marketed for the benefit of the UK economy
NNL	NNL hosts NIRO which provides advice to BEIS on technical matters underpinning policy.	NNL has strategic relationships with its major customers and transactional relationships with most industry players. NNL conducts research, development and innovation in partnership with the UK business and academia, for example as part of the BEIS Nuclear Innovation Programme.
AWE	AWE is tasked by DNO to provide technical support to policy. AWE does not attempt to influence departmental policy.	AWE benefits from reach-back into its shareholders for reach-back, innovation, processes and technology. AWE provides specialist capabilities for a limited set of nuclear and defence business. Close to half of AWE annual spend is spent in a 94% UK supply chain, providing funding to business and academia.

# Performance

cont...

NATIONAL LABORATORY	EVIDENCE OF INFLUENCING GOVERNMENT'S DEPARTMENTAL POLICY	EVIDENCE FOR ENGAGEMENT WITH BUSINESS
Met Office	The majority of Met Office services are delivered to government departments, government arms length bodies or to the public and civil contingencies providers, on behalf of government.	It provides bespoke industry services that build on this capability and bring in commercial revenue to support the sustainability of the organisation.
NPL	<p>Led development of the UK Measurement Strategy on behalf of BEIS and are currently undertaking foresight activity to understand the future measurement needs for the UK.</p> <p>NPL responds to consultations and inquiries from Government &amp; Parliament, recently submitting evidence on topics aligned to their areas of research expertise. Additionally provide expertise to colleagues in POST.</p> <p>NPL leads engagement activity to understand the needs of industry.</p> <p>NPL works directly with BEIS to support policy.</p> <p>Chief Scientist of NPL sits on the GSE Profession Board.</p> <p>NPL is leading the delivery of the National Timing Centre to develop infrastructure to ensure UK timing resilience.</p>	<p>NPL has a customer base of over 3000 businesses.</p> <p>NPL is a partner in the Analysis for Innovators Programme – early impact analysis from this programme indicates the projects have helped businesses to move products up TLR levels, increased businesses competitiveness, increased FTE, companies reported expected sales, licencing and cost reductions of £125M.</p>
TWI	Informal links, discussions and advice. TWI did have a client manager at DTI/BIS in the 2000s, but this system has lapsed.	<p>Strong relationship with industrial members and other organisations worldwide.</p> <p>As well as bilateral discussion, TWI holds industry sector meetings, seminars and conferences on a regular basis. Until the current crisis, there was a high level of industry visits to all TWI sites, and a programme of visits by TWI staff to companies worldwide. During the pandemic this been replaced by on-line meetings and workshops, except where site visits are essential. It is expected that these on-line events will continue, and be additional to face to face meetings when they can resume.</p>
Catapults	<p>Catapults work closely with a number of Government Departments representing their core sectors, taking a variety of roles such as strategic, advisory, influencing policy, coordination, providing links to companies, shaping concepts, shaping standards, regulation, project management, supporting delivery, leading programme delivery, informing approaches. DCMS, Department for Transport, HM Treasury, Cabinet Office for instance have contracted activities with Catapult Centres in digital policy, transportation and decarbonisation. Catapults participate in national taskforces. Working with their communities, Catapults have helped build many of the cases for the Industrial Strategy Challenge Fund (ISCF), including the Faraday Battery Challenge, Future Flight, Driving the Electric Revolution, Prospering from the Energy Revolution, Made Smarter, Transforming Construction, etc. . Catapults also had a strong contribution in shaping industrial strategy sector deals and providing input towards the R&amp;D roadmap.</p>	<p>Catapults Centres' primary customers are businesses. In 2019/20 collectively Catapult Centres had over 14,000 collaborations with industry and supported over 8,000 SMEs. Fostering the current pull through of research breakthroughs into industrial applications, Catapult Centres are helping companies improve retention of UK entrepreneurial capability, improving the quality of early stage concepts, supporting start-ups, and enabling the scale up of established UK companies. The Catapult Centres' hands-on expertise and extensive knowledge of emerging markets and R&amp;D programmes increase the level of maturity of innovations, activating trust in the investor communities and reducing barriers to entry for fledgling businesses engaged on their programmes.</p>

# Performance

PSRE		PERFORMANCE MEASUREMENT							
		KPIS	BALANCE SCORECARD	ANNUAL REVIEW	QUARTERLY REPORTS	CUSTOMER SURVEYS	CONTRACT DELIVERABLES	CORPORATE PLAN	MONTHLY FINANCIAL ACCOUNTS
PRIVATE	BRE								
	NOC								
	NML								
	EMEC								
	NIAB								
	UKCEH								
	NPL								
	TWI								
	Catapult								
PUBLIC	PHE								
	CEFAS								
	STFC								
	AWE								
	Met Office								
	NNL								

## How do they measure their performance?

- All laboratories analysed use KPIs to measure Performance (PHE provided no data).
- BRE, EMEC and UKCEH use these KPIs in the form of balance scorecards.
- Majority of laboratories' parameters/KPIs are developed and agreed by the Board.
- NIAB have specific KPIs relating to the delivery of statutory services for Defra/APHA, with achievement reviewed on a quarterly basis.
- Catapult Centres undergo other formal reviews led by BEIS, under the governance of Innovate UK.

# Performance

## Processes for reviewing work of the national laboratories

NATIONAL LABORATORY	PROCESSES FOR REVIEWING WORK OF THE NATIONAL LABS
BRE	<ul style="list-style-type: none"> <li>- UKAS accredited for testing and certification.</li> <li>- LRQA approved for ISO9001/14001/45001</li> </ul>
NOC	<ul style="list-style-type: none"> <li>- NERC-UK conducts an independent overall Centre Evaluation every 5 years.</li> <li>- Independent review of selected published outputs, independent review of case studies of 'impact' of research, review of strategic 'environment statement' prepared by the centre.</li> <li>- Each major area of National Capability is subject to evaluation prior to commissioning by NERC-UKRI</li> </ul>
NML	<ul style="list-style-type: none"> <li>- Independent International Science Review carried out at regular intervals – evidenced by performance in international comparison studies carried out under CIPM, the Mutual Recognition framework through which National Metrology Institutes (NMIs) demonstrate their international equivalence.</li> <li>- The work of the NMS is continually reviewed by Programme Expert Groups composed of stakeholders from across government, industry and academia.</li> <li>- Evaluation framework to evaluate its performance against key themes</li> <li>- Science quality monitored internally by Director of Measurement, Science Fellows, CSO and Science Board</li> </ul>
EMEC	<ul style="list-style-type: none"> <li>- EMEC operate a quality management system which is accredited to ISO 17025, ISO 7020 and certified to ISO 9001.</li> <li>- EMEC are audited annually by the United Kingdom Accreditation Service in order to maintain those accreditations.</li> </ul>
PHE	<ul style="list-style-type: none"> <li>- To be issued</li> </ul>
NIAB	<p>Reviews of NIAB occur at range of levels:</p> <ul style="list-style-type: none"> <li>- Business plan and science strategy reviews</li> <li>- Monitoring meetings for grant funded projects</li> <li>- Management meetings for service contracts</li> <li>- Periodic surveys used to seek feedback on services from members/clients</li> <li>- Statutory services are subject to regular internal and external audits, associated with NIAB's ISTA and (until EU exit) CPVO accreditations</li> <li>- Quality management system meets ISO 9001:2015 standard</li> <li>- NIAB and its facilities have also been officially recognised as being competent to carry out efficacy trials/tests in the UK (ORETO)</li> </ul>
UKCEH	<p>NERC Centre Evaluation exercise – provides a critical basis for UKEH to evaluate its performance, and benchmark this against other research establishment and HEIs. Subject to the same evaluation process as NOC.</p>

# Performance

cont...

NATIONAL LABORATORY	PROCESSES FOR REVIEWING WORK OF THE NATIONAL LABS
Catapult Centres	Typically, each Catapult produces a five year delivery plan (latest plans to end March 2023) aligned with core grant funding agreements, setting their vision, objectives and targets for delivery. This plan is updated on an annual basis. Quarterly reports are produced to describe progress against objectives and targets. Progress is reviewed at formal meetings with Innovate UK monitoring officer (Relationship manager) and senior officials. Furthermore, all Catapults are currently transitioning to a new form of monitoring with Outputs and Outcomes reporting on the use of public funds and will have Innovate UK monitoring the health of the business through a Non-Executive Director on the Catapult Board of Directors (rather than as observer)
CEFAS	Number of external accreditation including ISO 9001, 14001 and 17025. Subject to regular internal and external audit. CEFAS' science is subject to a comprehensive Quinquennial Review from a panel of external experts.
STFC	Recent establishment of UKRI bringing together 7 Research Councils including STFC, IUK and Research England is the result of the latest Nurse Review of public sector investment in research and innovation.
NNL	Operational performance is reviewed by the Board, which includes a Non Exec Director from UKGI as the Shareholder representative. Technical performance and direction overseen by a Technical Advisory Board with senior representatives across Government, industry and academia
AWE	DNO is on-site, undertaking contract management and performs monthly and annual reviews. Also has access to two boards of experts to undertake technical scrutiny. AWE's work is subject to investigations by the National Audit Office and the Infrastructure Projects Authority.
Met Office	Undertake science reviews of the organisation in addition to the review of the delivery of their work programmes by customer groups. Met Office Scientific Advisory Committee (MOSAC) meets annually to review the Met Office's Foundation, Weather and Climate Science programmes. Met Office Hadley Centre Science Review Group (SRG) carry out independent review of the HCCP climate research to advise government customers on the quality, robustness and relevance of science outputs.
NPL	Evaluation framework to evaluate its performance against key themes. Science quality is monitored internally by their Research Director, Head of Science, Engineering and Metrology; and key scientists; and externally via their Science and Technology Advisory Council (STAC). An independent International Science Review of the NMS was conducted in 2016 by 32 expert reviewers from across academia, industry and internationally. The work of the NMS is continually reviewed by Programme Expert Groups composed of stakeholders from across government, industry and academia. In 2020, NPL will be undertaking the international Science Review.
TWI	Rolling three year 'Corporate Plan' develop every Autumn and published to governance at the end of each year. All staff receive a copy of the plan (now electronically) and attend a briefing on the plan early in the new year. Participation in developing the plan is required at all levels in the organisation. An Annual Report is published each year to the governance, member companies and other stakeholders, outlining the activities and progress of TWI. Regular surveys of member companies are undertaken to assess which services they value and look for gaps in provision. Members have a direct input to the scope and direction of the Core Research Programme both individually and via the Research Board.

# Performance

## *Processes for reviewing work of the national laboratories – in summary*

### **KPIs**

- The majority of national laboratories in this taxonomy use key performance indicators (KPIs) to measure performance.
- BRE, EMEC, NNL and UKCEH use KPIs in the form of balance scorecards.
- Majority of laboratories' parameters/KPIs are developed and agreed by their Boards.
- NIAB agree some of their KPIs with DEFRA/APHA relating specifically to the delivery of the statutory service – these are reviewed at regular contact management meetings.
- PHE's key metrics are designed to support DH&SC priorities and are monitored through quarterly reviews at functional management levels.

# Performance

## *Processes for reviewing work of the national laboratories – in summary*

### **Reviews by external bodies**

- In addition to assessment of performance through management processes such as business plans and annual reports, some national laboratories are subject to external review/assessment, either as part of their accreditation to perform a particular function or to assess the quality of their science.
- At least nine of the national laboratories in this taxonomy have undergone some form of external review. Examples include:
  - NOC and UKCEH, which are both subject to the NERC-UKRI Independent Overall Centre Evaluation every 5 years.
  - NML, which undertakes a regular independent International Science Review.
  - EMEC, which is audited annually by the United Kingdom Accreditation Service (UKAS) in order to maintain the accreditations to which its management systems are accredited to.
  - NNL's science and technology performance, which is reviewed by an external Technical Advisory Board
  - PHE, which is regularly internally and externally audited by various organisations depending on the nature of our accreditation (e.g. ISO, WHO). Most reviews/audits are conducted annually although WHO visits/inspects less frequently.

# Performance

## Outcome of most recent organisational review

NATIONAL LABORATORY	DATE	OUTCOME
BRE	2020	Approved/recertified.
NOC	2013	Outcomes of previous centre evaluations (2013) can be found at <a href="https://nerc.ukri.org/about/perform/evaluation/evaluationreports/eval-results/">https://nerc.ukri.org/about/perform/evaluation/evaluationreports/eval-results/</a> . 2014-2019 Centre Evaluation due for publication in December 2020.
NML	2019	Delivery of the programmes on track and achieving impact. KPIs met or exceeded. 2016 international science review determined NML delivers internationally leading, very high quality metrological services of very high impact within the NMS across its areas of designation.
EMEC	2020	Last audit carried out by UKAS was carried out in August 2020 – the outcome of that audit was that EMEC has successfully maintained its accreditation. Also carry out internal audits of EMEC's activities on an annual basis to ensure they comply with the standards that EMEC are accredited to.
PHE	N/A	No data provided.
NIAB	N/A	Recent independent analysis revealed an 18-fold return on investment to the wider UK economy through improved production, efficiency, economic growth, import substitution, export earnings and inward investment.
UKCEH	2013	Outcomes of previous centre evaluations (2013) can be found at: <a href="https://nerc.ukri.org/about/perform/evaluation/evaluationreports/eval-results/">https://nerc.ukri.org/about/perform/evaluation/evaluationreports/eval-results/</a> .

# Performance

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NATIONAL LABORATORY	DATE	OUTCOME
CEFAS	2018	Last Science Review was 2018 – very positive. One conclusion of panel stated overall impression was that CEFAS is a dynamic and vibrant research community that, over the past five years has addressed and embraced a range of challenges, and continues to do so In a changing funding environment, a changing political environment, a changing scientific environment and a changing physical environment, there is no a clear articulation within CEFAS of movement from a national and legacy approach to forecasting and advice on the international stage.
STFC	N/A	Formation of UKRI.
NNL	N/A	Operation performance exceeded targets.
AWE	2020	Recent NAO reviews cover management of capital projects published early 2020, partially addressed AWE's performance on two capital projects. Customer reviews of AWE's performance are not publicly accessible due to national security requirements.
Met Office	2015	BEIS General Review of Met Office (2015), concluded that taking account of investment already committed, the Met Office would bring some £30billion of value to the UK over the next 10 years. Around a third of that value can be attributed to the world-class standard of the Met Office, with its Unified weather and climate Model (UM).
NPL	2016	2016 review found that the NMS: demonstrated considerable value for money, operates over a wide range of technology readiness levels; is able to clearly elucidate good benefits of their work to the UK and global economy and to claim leadership in many technical areas; needs to do more forward-thinking beyond five to ten years to address future needs; have good connections with, and are delivering, good services to the UK user community.
TWI	N/A	Members receiving the services they require. High level of customer satisfaction with project work. Need for capital investment from public funds to give more support to UK industry (that they have stated they require) and play a full role in the government's target of 2.4% of GDP invested in R&D by 2027.
Catapults	2020	Hauser Review in 2014 indicated good progress toward the establishment of new centres. EY review in 2017 indicated need for improved governance and performance management. 2020 Review by BEIS in progress: Phase 1 in Feb2020 involved data analysis, international benchmarking, consultation with stakeholders. Phase 2 Aug-Dec2020 incl. roundtables, 1:1s with CEOs & Chairs, and various policy sessions. Outcomes expected early 2021.

# Representative Bodies

DEPT	NATIONAL LABORATORY	NLA	AIRTO
BEIS	BRE		
	NML		
	STFC		
	NNL		
	Met Office		
	NPL		
	Catapults		
UKRI	UKCEH		
	NOC		
N/A	EMEC		
DEFRA	NIAB		
	CEFAS		
DfH&SC	PHE		
MoD, DNO	AWE		
NONE	TWI		

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