BUILDING BRITISH INDUSTRY · PAPER 02

Paper II: Advanced Manufacturing and the Production Base

Testing, pilot lines, power electronics and automation within reach of every manufacturer.

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Frontier industries do not scale on science, software or design alone. They scale when a country can test and certify new products quickly, turn prototypes into repeatable production, make the critical components on which every machine depends and equip its factories with the tools and robots to produce at competitive cost. That production base sits beneath every other mission in this series, from the materials that go into a reactor to the medicines made in a biologics plant and the autonomous systems built for defence.

Britain still has islands of real strength. Its makers of machinery and equipment are far more productive than the average manufacturer, its instruments for measuring, testing and navigation have added billions of pounds of value over the past decade, it has a compound semiconductor cluster in South Wales and a national network of manufacturing research centres that industry around the world wants to work with. But the system that should turn these strengths into scale is too thin. Employment in electronics has halved since 2000, trade deficits in machinery and electronics have widened, too few factories use robots and too many British inventions are scaled in someone else's production system.

The present government's advanced manufacturing plan is strong on individual industries such as aerospace, automotive and space. This paper is the layer beneath them. It concentrates on the capabilities every advanced industry needs, chooses five areas in which Britain can lead and sets out eight measures to build them, together with the adoption of robotics and automation across manufacturing as a whole.

1 Why the production base is too thin

MEASURE	FIGURE
Manufacturing as a share of UK output	Around 10%
UK industrial electricity prices compared with the United States	Around four times higher
UK rank for industrial robot density	24th

MEASURE	FIGURE
Unfilled long-term vacancies in manufacturing	Around 55,000
Venture investment in advanced manufacturing, US compared with UK, adjusted for GDP	Around twice as much

The causes are well documented. Energy costs shift the whole investment decision against production in Britain, which the energy papers address directly. Capital for hardware firms is scarce, because they need more money for longer and carry more physical risk than software firms. Smaller manufacturers adopt robots and automation slowly, held back by cost, uncertainty about the return and a shortage of people to install and run them. Technician shortages run through every part of the production base. Supplier networks have thinned as production moved abroad, so that even successful British designs are often built elsewhere.

Two further failures are specific to the production base. The first is the under-provision of shared infrastructure. Testing, measurement, certification and pilot production lines are essential to every firm but owned by none, and markets left alone will build too few of them. The second is that the state is too fragmented as a customer. Public bodies buy enormous quantities of equipment, but their orders are scattered across departments and rarely give producers the steady demand that justifies investment.

2 Principles

Build the layers beneath every industry. The mission concentrates on the capabilities that serve many sectors at once, such as certification, power electronics and production equipment, rather than on any single industry.

Shared infrastructure is a public good. Testing, measurement and pilot production should be available to every British firm on fair terms, so that each does not have to build its own.

Choose niches Britain can lead. Britain should not try to recreate the German machine tool industry or build a leading-edge chip foundry. It should lead in the parts of the stack where it already has strength.

Every factory should be able to automate. Productivity across manufacturing depends on ordinary firms adopting robots and digital tools, not only on frontier firms inventing them.

Close what fails. Each programme will be narrowed, merged or closed if it does not attract private investment, move firms into production or raise exports.

3 What Britain will own

AREA	WHY BRITAIN CAN LEAD
Testing, measurement and certification	The National Physical Laboratory and the UK Accreditation Service, whose work reduces risk and time to market for every advanced product
Power electronics	Four national industrialisation centres at Newport, Nottingham, Strathclyde and Sunderland, with demand from vehicles, aircraft, the grid, rail and defence
Compound semiconductors and related manufacturing	The South Wales cluster, strength in chip design, photonics, packaging and test, rather than leading-edge foundries

AREA	WHY BRITAIN CAN LEAD
Precision engineering and instrumentation	High-productivity strength in instruments for measuring, testing and navigation and in specialist engineering
Specialist production equipment	Niche strengths in high-precision tooling, process equipment and machinery for aerospace, defence and medical manufacturing

Advanced materials are the subject of their own mission in Paper III, and the autonomous systems built for defence and hazardous work are covered in Paper V. This paper covers the adoption of robots and automation across manufacturing as a whole.

4 Shared infrastructure

A1 Upgrade national testing, measurement and certification

Expand the testing and certification capacity of the National Physical Laboratory, the UK Accreditation Service and the Catapult centres in the mission's priority areas, including power electronics, semiconductors, autonomous systems and medical devices, and develop digital certification so that more evidence can be provided through modelling and simulation. The goal is to halve the median time taken to certify new products in the priority areas within ten years. The qualification of new materials is covered separately in Paper III.

A2 Create a national pilot-line fund

Fund shared pilot production lines, delivered through the High Value Manufacturing Catapult and its centres, in semiconductor packaging, power electronics, specialist equipment and manufacturing validation. Lines will be open to any British firm on published terms and judged on how many products move from pilot to serial production.

5 Priority capabilities

A3 Take power electronics from research into production

Extend the four power electronics industrialisation centres from research into repeatable production, with support for firms to scale up manufacturing and to localise supply chains in Britain. Public buyers of grid, rail and defence equipment will be asked to set out their future demand for power electronics so that producers can plan capacity.

A4 Build the compound semiconductor and related industries

Back the parts of the semiconductor industry Britain can realistically own, including compound semiconductors, photonics, advanced packaging, test and specialist equipment, centred on the South Wales cluster and linked to the semiconductor materials work in Paper III. Secure supply for defence and critical infrastructure will be used as anchor demand.

A5 Back niche strengths in precision engineering and production equipment

Provide capital grants, export support and access to testing for firms in precision engineering, instrumentation and specialist production equipment that serve the mission areas, with priority for equipment that multiplies capability elsewhere, such as high-precision tooling and integrated measurement.

6 Automation, capital and demand

A6 Put robots and automation within reach of every manufacturer

Expand the Made Smarter programme and the robotics adoption hubs into a national service available to manufacturers in every region, combining independent advice, demonstration, help to find integrators and finance to buy or lease robots and digital systems through the British Business Bank. The service will be judged on deployments rather than advice given, and the goal is for Britain to be among the ten countries with the highest density of industrial robots by year six.

A7 Open a scale-up capital window for hardware

Create a scale-up capital window within the British Business Bank providing patient equity and venture debt for capital-intensive manufacturing firms that have proven their technology, investing alongside private capital in later funding rounds. Investments will carry conditions to keep production in Britain while public capital is invested.

A8 Coordinate the state as a customer

Agree demand compacts with prime contractors and major public buyers, including defence, the grid, rail and the nuclear estate. The compacts will distinguish two things that are often confused. Published demand forecasts give firms a view of likely future requirements but carry no obligation. Contractual orders commit the buyer to minimum volumes over several years, with the buyer bearing the cost of cancellation through agreed compensation, so that a supplier can raise finance against the order to build production capacity. Requirements will be set by performance and resilience rather than origin, as set out in C5 of the sixth paper, and suppliers will continue to compete on price and performance at each stage. UK Export Finance will support exports from the mission's priority areas, and the Production Missions Board will publish a combined view of public demand for equipment in each area.

7 Ambition

Because this mission serves many markets at once, its goals are measured mainly by capability and by the performance of the production base, consistent with the first paper of this series.

GOAL	MEASURE	BY
Certification	Median time to certify new products in the priority areas halved	Year 11
Automation	Britain among the ten countries with the highest density of industrial robots, up from 24th	Year 6

GOAL	MEASURE	BY
Scale-up	Firms moving from pilot to serial production through the pilot-line fund, reported each year	Annual
Semiconductors and power electronics	A rising share of the world markets for compound semiconductors and power electronics, measured as revenue from production located in Britain, with the segments sized and the starting share fixed in the first year	Year 11
Investment	Private capital invested for each pound of public support, reported each year	Annual

8 Regions

REGION	ROLE IN THE MISSION	EXISTING FOUNDATIONS
South Wales	Compound semiconductors and power electronics	Compound semiconductor cluster around Newport, power electronics centre at Newport
Midlands	Power electronics, precision engineering, automation and production equipment	MTC, WMG, power electronics centre at Nottingham
South Yorkshire	Advanced machining and production equipment	AMRC, Nuclear AMRC
North East England	Power electronics and electrification	Power electronics centre at Sunderland, automotive and battery manufacturing
West of Scotland	Digital process manufacturing and power electronics	NMIS, power electronics centre at Strathclyde
West of England	Aerospace production and testing	National Composites Centre, aerospace supply chain

9 Cost

The mission is costed as a single estimate of about £8.25 billion of public money over ten years, covering the full cost of its measures. Existing commitments in the government's advanced manufacturing plan will be absorbed into it and are counted as sources in the funding note rather than as additional money. The estimate is built from the cost of each measure, with a contingency of a quarter added.

MEASURE	TEN-YEAR COST	BASIS
A1 Testing and certification	About £300m	Expanded capacity at the National Physical Laboratory, the UK Accreditation Service and the Catapults, excluding materials
A2 Pilot-line fund	About £1.25bn	Shared pilot lines through the High Value Manufacturing Catapult
A3 Power electronics	About £550m	Extending the four industrialisation centres into production and supplier development
A4 Compound semiconductors and related manufacturing	About £750m	Packaging, photonics, test and specialist equipment programmes

MEASURE	TEN-YEAR COST	BASIS
A5 Precision engineering and production equipment	About £250m	Capital grants and export support for niche strengths
A6 Automation for every manufacturer	About £600m	An expanded national adoption service, including finance for smaller firms
A7 Scale-up capital window	About £1.75bn	Patient equity and venture debt through the British Business Bank
Sites, skills and programme delivery	About £1.15bn	Site readiness in production regions under P3 of the first paper, technician pipelines and the mission team
Contingency	About £1.65bn	A quarter of the total above
Total	About £8.25bn	Of which around £1.75bn is expected to be equity and loans rather than spending

The demand compacts in A8 work through existing procurement budgets, and export support is provided through UK Export Finance as guarantees rather than spending. The mission forms part of the combined budget set out in the funding note, which draws first on existing business support and on the public investment banks.

10 Territorial application

Industrial strategy, export finance and the public investment banks operate across the United Kingdom, and the mission applies across the United Kingdom. The skills measures apply in England and will be extended by agreement with the devolved administrations, as set out in the first paper.

FIELD	APPLICATION
Testing, pilot lines, priority capabilities and adoption service	United Kingdom
Scale-up capital and export finance	United Kingdom
Skills measures	England, and by agreement in Scotland, Wales and Northern Ireland

11 Legislation and delivery

INSTRUMENT	MEASURES	CONTENT
Funding and procurement policy	A1 to A6 and A8	Testing and certification, the pilot-line fund, priority capability programmes, the adoption service and demand compacts
British Business Bank	A7	The scale-up capital window under existing powers
Industrial Strategy Bill	A8	The duty on the Production Missions Board to publish a combined view of public demand

A country that can test, build and equip its own factories can turn every invention into an industry. That is the production base Britain needs to rebuild.