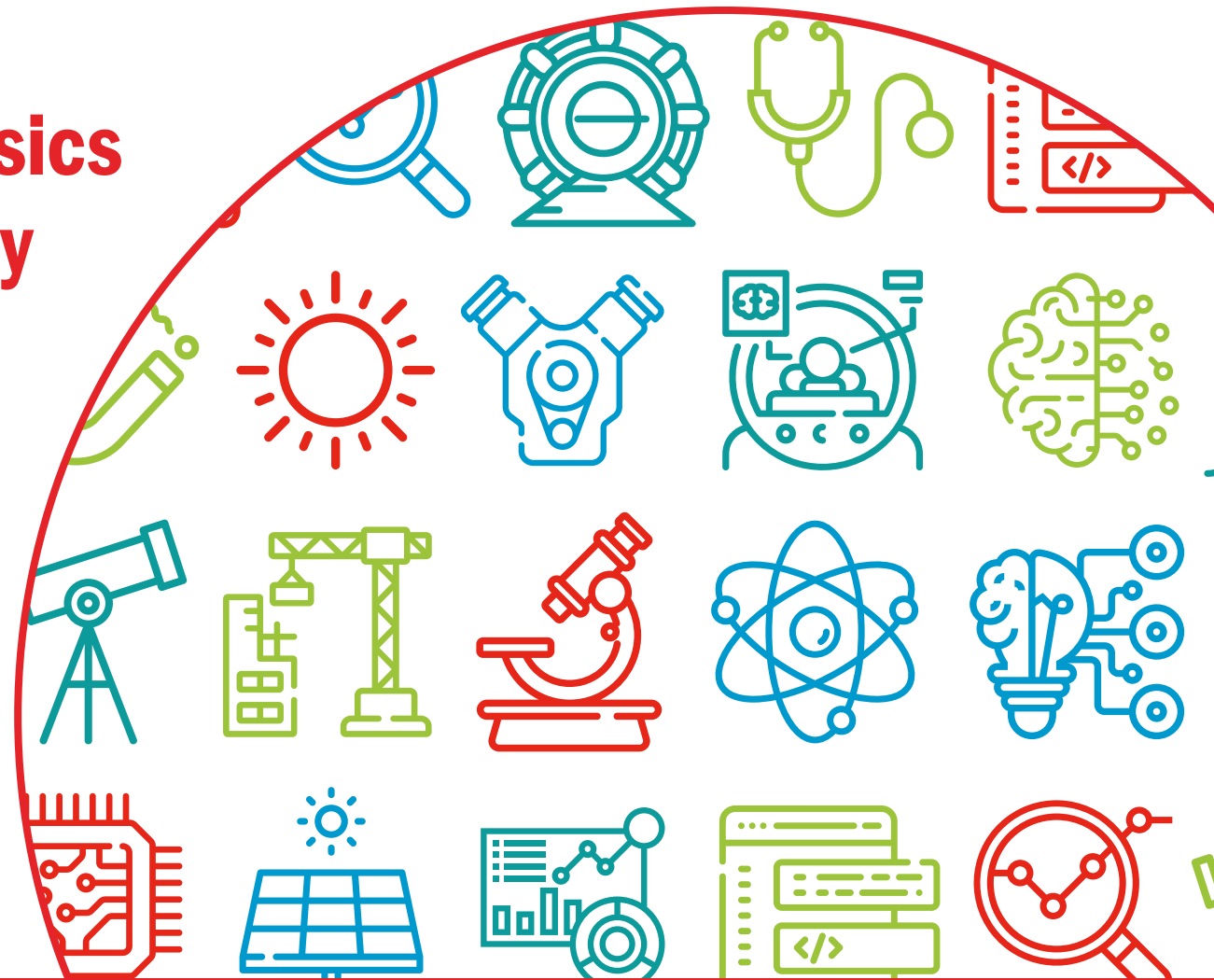


# The contribution of physics to the Scottish economy

## Executive Summary



Physics is a core pillar of the Scottish economy, with industries which use physics accounting for more than one-sixth of national gross domestic product (GDP) (17%). The sector is both important and highly productive, employing 220,000 people (FTEs) and generating £129,000 of labour productivity per worker, per year.

A project commissioned by the Institute of Physics (IOP) and conducted by the Centre for Economics and Business Research (CEBR) shows the performance and growth of the sector between 2010-2019. Read the full report at <https://www.iop.org/strategy/productivity-programme/physics-and-economy>.

## What is the physics sector?

Physics-based industries (PBIs) are industries whose enterprises demonstrate...

- A) ongoing research and development (R&D) which consistently makes use of physics knowledge (and the R&D activity can be expected to significantly affect the fortunes of businesses within the industry), or
- B) those where underlying technology supporting the industry requires significant physics knowledge for continued operation.

The largest parts of the physics sector are Physics Manufacturing (which includes, but is not limited to, the production of a wide range of goods, from fibre optic cables to aircraft and medical equipment to support civil and defence objectives) and Physics Science and Technology, which includes, but is not limited to, technical testing and analysis and practical scientific consultancy. Physics machine services and sales, along with medical equipment sales, represent downstream servicing and sales of the goods physics manufacturing creates. The energy, oil and gas extraction and telecoms industries are major standalone industries with physics at their heart.

## In 2019...

\*All figures are rounded.

### Employment - Full Time Equivalent (FTEs) - thousands

Total: 220



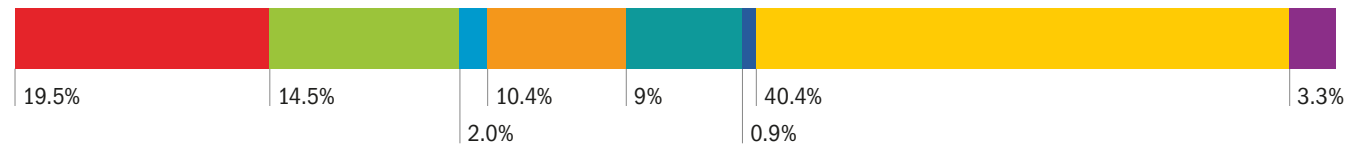
### Number of enterprises - thousands

Total: 27,235



### Gross Value Added - GVA (£bn)

Total: 28.4

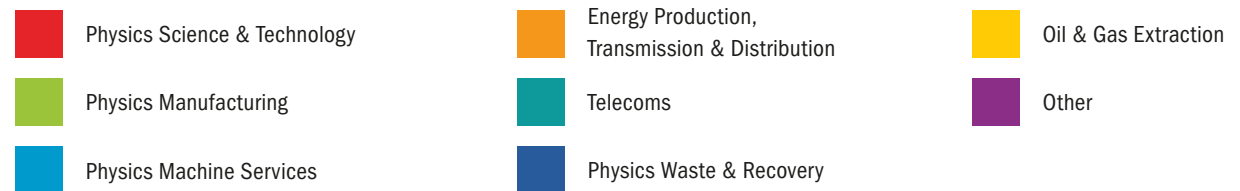


### Turnover (£bn)

Total: 63.8



### Industry



# The physics sector is highly productive and a significant contributor to the Scottish economy

In 2019...

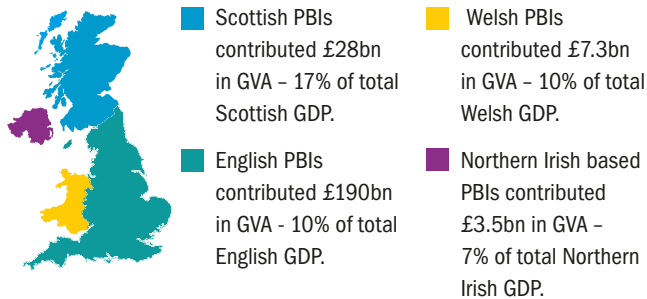
## GVA Contribution

# £28bn

The physics sector directly generated £28bn Gross Value Added (GVA), 17% of total Scottish Gross Domestic Produce (GDP).

### National breakdown

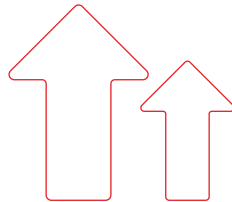
Proportionally, Scottish PBI GVA contribution is significantly greater than the other UK nations:



**UK Total: £229bn - 11%**

### Sectoral comparison

The physics sector generated around four times the GVA of the Scottish Construction (£7.2bn), Transport and Storage (£6.3bn), and Retail (£6bn) sectors.



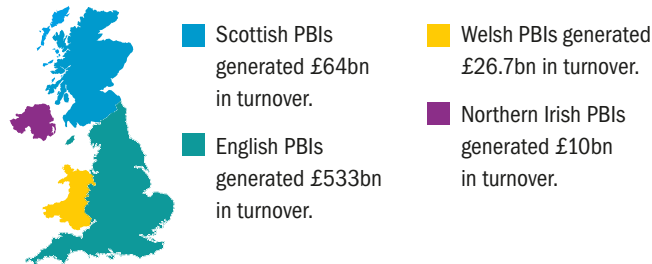
## Turnover

# £64bn

The physics sector generated £64bn in turnover.

### National breakdown

Scottish PBI turnover outstripped that of Wales and Northern Ireland.



**UK Total: £634bn**

### Sectoral comparison

PBI turnover (£64bn) is nearly three times that of the Retail sector (£23bn), and more than three times that of the Construction (£18bn) and Transport and Storage (£13bn) sectors.

## Labour Productivity

Labour productivity sat at

# £129,000

This is higher than all other nations in the UK.

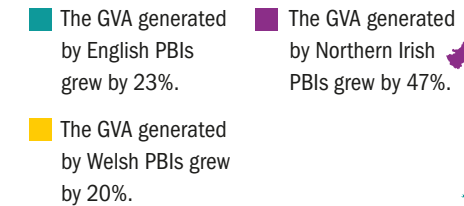
Northern Ireland – £71,966, Wales – £64,828, England – £81,300.



## Across the decade...

### GVA Contribution

Direct GVA rose by 0.5%. This is a lower growth rate than seen in the other UK nations:



### Turnover

Scottish PBIs experienced a turnover decline of £2 billion; a 3% decrease across the decade.



### Labour Productivity

Despite the high figure, labour productivity decreased slightly (by 4%) across the decade from £134,000 to £129,000.



# Spotlight on Oil and Gas

## Across the decade...

The strength of the Scottish PBI sector is largely due to the Oil and Gas Extraction industry, which contributed nearly half of the PBI's GVA: £11.46bn.

### Spotlight on Oil and Gas

The negative performance trends seen across the decade are driven by Scotland's Oil and Gas industry. Whilst this sector is a heavy weight which contributes significantly to Scotland's economy, the last decade saw annual UK crude oil production decline by nearly 14 million metric tonnes, or 21.4%.

Despite this, as Oil and Gas is phased out, the sector will continue to strongly demand physics skills and technologies. Over the coming decade, this demand will transfer to existing and up-and-coming renewable and clean energy industries as these are scaled up.

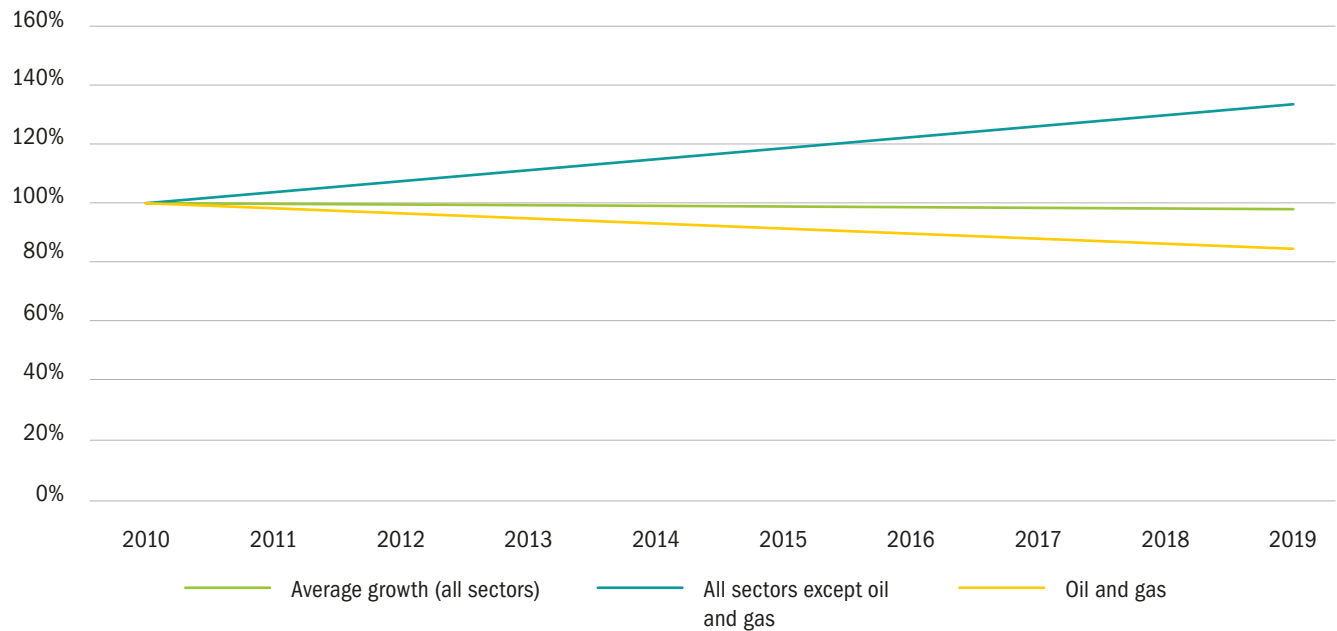
Looking outside of the energy sector, the other industries within the Scottish Physics sector have experienced positive growth across the last decade.



Despite Oil and Gas Extraction dominating GVA, this industry is rivalled in terms of turnover:

|  |                |
|--|----------------|
| Oil and Gas Extraction                           | <b>£17.9bn</b> |
| Energy Production, Transmission and Distribution | <b>£13.9bn</b> |
| Physics Science and Technology                   | <b>£11.6bn</b> |
| Physics Manufacturing                            | <b>£11.4bn</b> |

Scotland's low level of PBI growth comparative to the other UK nations is driven by an 18% decline in the GVA of the Oil and Gas Extraction industry, from £14.1bn to £11.5bn. The other PBI sectors grew by 30% across the decade.



### Turnover

When Oil and Gas is removed, the other PBIs experienced turnover growth of 10% across the decade.



### Labour Productivity

Productivity decreased by around 40% in the Oil and Gas sector, but saw positive growth in other sectors, such as 40% in Physics Manufacturing.



# The physics sector has a large number of enterprises

In 2019...

There were **27,235** physics enterprises operating in Scotland, **15%** of all Scottish enterprises.

## Across the decade

This is a 60% growth from the number operating in 2010.



The majority of physics businesses in Scotland are SMEs (99%), which employ a maximum of 9 people.

- 93% (25,390) of enterprises were categorised as micro companies.
- 6% (1,505) of enterprises were small (10-49 employees).
- 1% (340) were medium (50-249 employees) or large (250+).

## Sectoral Comparison

The size of physics sector enterprises is similar to, but marginally smaller on average than, the wider Scottish average.

By comparison, in the wider Scottish economy...

**88%** of firms are micro enterprises

**10%** are small

The remaining **2%** are medium or large.

Northern Ireland had a total of

**5,285**

businesses in the physics sector  
(7% of all Northern Irish enterprises)

Wales had a total of

**12,170**

businesses in the physics sector  
(12% of all Welsh enterprises)

Scotland had a total of

**27,235**

businesses in the physics sector  
(15% of all Scottish enterprises)

England had a total of

**305,445**

businesses in the physics sector  
(13% of all English enterprises)

# The physics sector is a significant employer in Scotland

In 2019...

## Total employment

# 220,000 FTEs

The physics sector accounted for 10% of total Scottish employment.

### National breakdown

These figures are consistent with the other UK nations:

- Scottish PBIs directly employed 220,000 FTEs – 10% of total Scottish employment.
- English PBIs directly employed 2,338m FTEs – 10% of total English employment.
- Welsh PBIs directly employed 113,138 FTEs – 10% of total Welsh employment.
- Northern Irish PBIs directly employed 48,842 FTEs – 7% of total Northern Irish employment.



### Across the decade...

Employment in the Scottish physics sector grew by 8%.



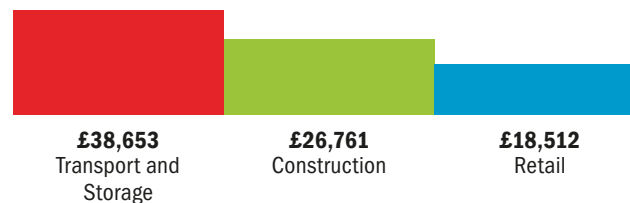
## Compensation of employees

# £47,000

Average employee compensation.

### Sectoral comparison

This is a strong figure compared to other sectors;



### National breakdown

- Scottish PBIs had a total £10.4bn employee compensation - £47,000 per FTE worker on average.
- English PBIs had a total of £98bn employee compensation - £41,990 per FTE worker on average.
- Welsh PBIs had a total of £4.1bn employee compensation - £36,089 per FTE worker on average.
- Northern Irish PBIs had a total of £1.7bn employee compensation - £34,791 per FTE worker on average.



### Across the decade...

Compensation of employees (COE) grew by 18% across the decade, from £8.8 billion to **£10.4 billion**.

This was a much higher growth rate compared to employment, meaning that average employee compensation increased by 9% (from £43,200 to £47,000).

### Compared to the other nations:

Average English COE/FTE increased from £36,103 to £41,990 (16% across the decade).

Average Scottish COE/FTE increased from £43,000 to £47,000 (9% across the decade).

Average Welsh COE/FTE increased from £27,711 to £36,089 (30% across the decade).

Average Northern Irish COE/FTE increased from £29,304 to £34,791 (19% across the decade).

## More information and the methodology

The Institute of Physics (IOP) worked with the Centre of Economic and Business Research (CEBR) to quantify the contribution of Physics-Based Industries (PBIs) between 2010-2019 across the Scottish economy. For the full findings and methodology, see <https://www.iop.org/sites/default/files/2022-01/Physics-and-the-Economy-Scotland.pdf>.

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The Institute of Physics (IOP) is the professional body and learned society for physics in the UK and Ireland. It seeks to raise public awareness and understanding of physics, inspire people to develop their knowledge, understanding and enjoyment of physics and support the development of a diverse and inclusive physics community. As a charity, it has a mission to ensure that physics delivers on its exceptional potential to benefit society.

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