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How many engineers do we need?
(And where will they come from?)

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The Royal Academy of Engineering

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We know we need more engineers!

- We want to rebalance the economy

"Made in Britain, Designed in Britain, Created in Britain to drive the economy forward"

G. Osborne 2011

- Industry tells us we don't have enough engineers… they're turning away work
- But wait! Engineering Graduates are not finding work in engineering companies.
- So where's the proof?

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The hunt is on…

- We can find the jobs people do through the 900 Standard Occupational Codes (SOC)

- We know the 16 major industry sectors of the UK through the Standard Industrial Classification (SIC)

- Labour Force Survey
  - Quarterly sample of households in the UK
  - Respondents self-declare occupation, wage…
  - 4 *waves* provides annual data

The engineering skills landscape

There are 30 million workers in the UK economy

- 730,000 self-declaring '*engineers*'
- 700,000 Level 3+ SET technicians or associate professionals(90% more E,T than S)
- 880,000 skilled engineering operatives.

This make 2.3m skilled people in the engineering-related skills base – 8% of the workforce.

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Engineering Industry in the UK

GVA from *engineering sectors* is:

Manufacturing	£130bn
Utilities	£40bn
Construction	£90bn
Transport & storage	£60bn
Computing & Telecoms	£50bn

(total £360bn – finance sector is £130 bn)

Total GVA of UK economy is £1.3 trillion

'engineering' output is 30% of total economy

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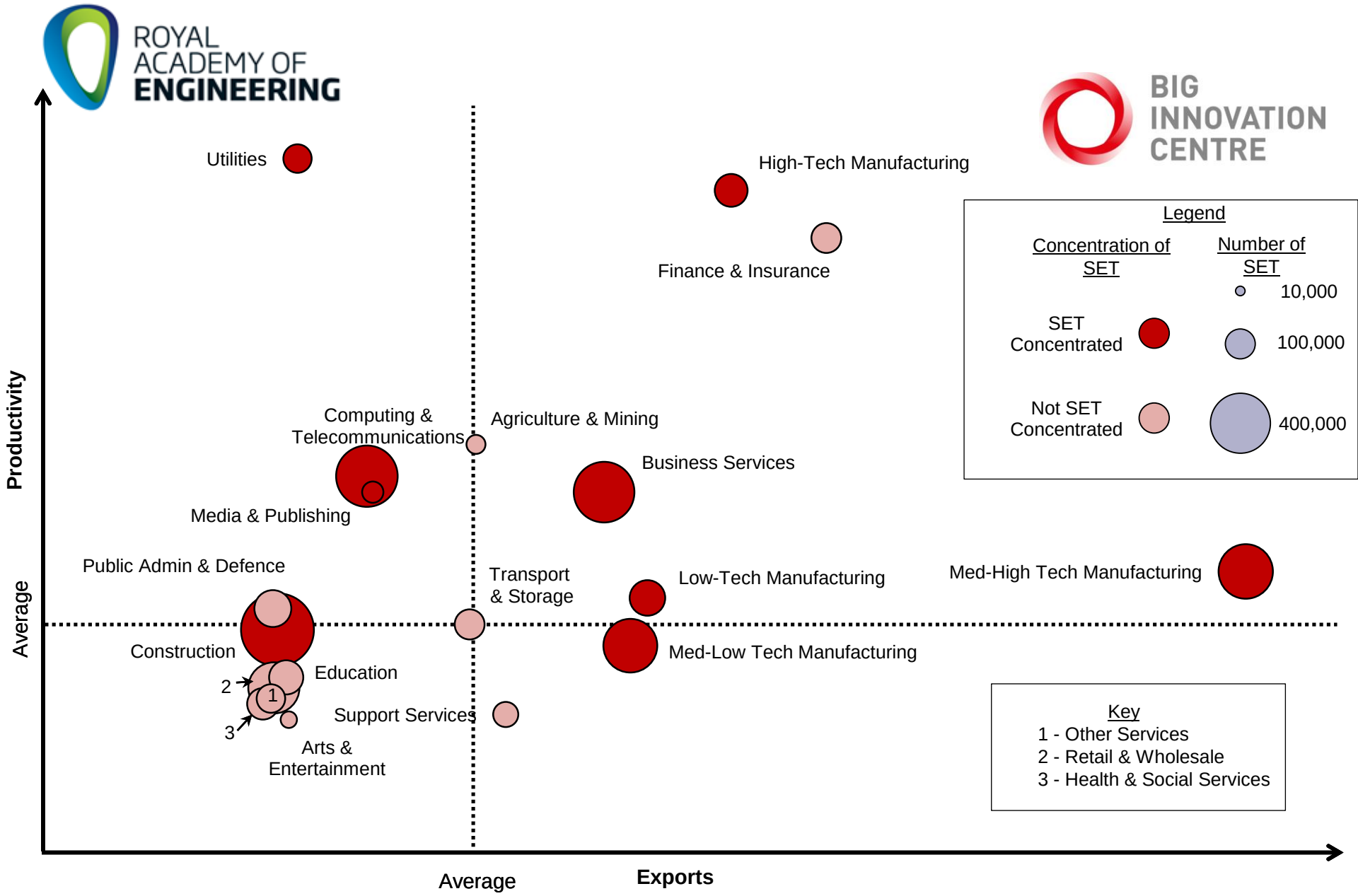
But engineers are not just working in engineering…



Source: ONS Labour Force Survey, Business Registration & Employment Survey, Supply and Use Tables

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Evidence item #1

- There is demand for engineers from employers in both service and productive sectors.
- People in engineering occupations are found throughout the economy – although concentrations vary between sectors.
- This pervasive deployment is partly due to the general capabilities of engineers so there is competition to attract them into non-engineering roles too.

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Wage Returns

- Premium for working in SET occupations (regardless of qualifications) is substantial
  - 10% premium for Science occupations
  - 33% premium for Technology occupations
  - 15% premium for Engineering occupations
- A*dditional* wage premium is found for many STEM qualifications, when used in SET occupations:

  First / Foundation degrees (up to 12% premium for STEM)

(Greenwood, Harrison, Vignoles', 2011)

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Evidence item #2

- There is a persistent, sizeable wage premium for people holding engineering degrees and this premium has grown over the last 20 years.

- This is good econometric evidence that the demand for graduate engineers exceeds supply and the demand is pervasive across the economy.

What about the future?

- UKCES undertake 10 year forecasts of UK economy
  - Demographic changes
  - Historic trends
  - Crystal Ball gazing
  - Predicts Growth/Decline in specific sectors

- Using the LFS data, we can *map* engineers onto the future growth patterns

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SET workers required by 2020

- UKCES models predict, by 2020:

  450,000 Professional SET Technicians (90% in engineering)

  820,000 SET professionals required (80% in engineering)

- 7:1 ratio of replacement to expansion demand
- 25% of engineers and technicians aged 55-64

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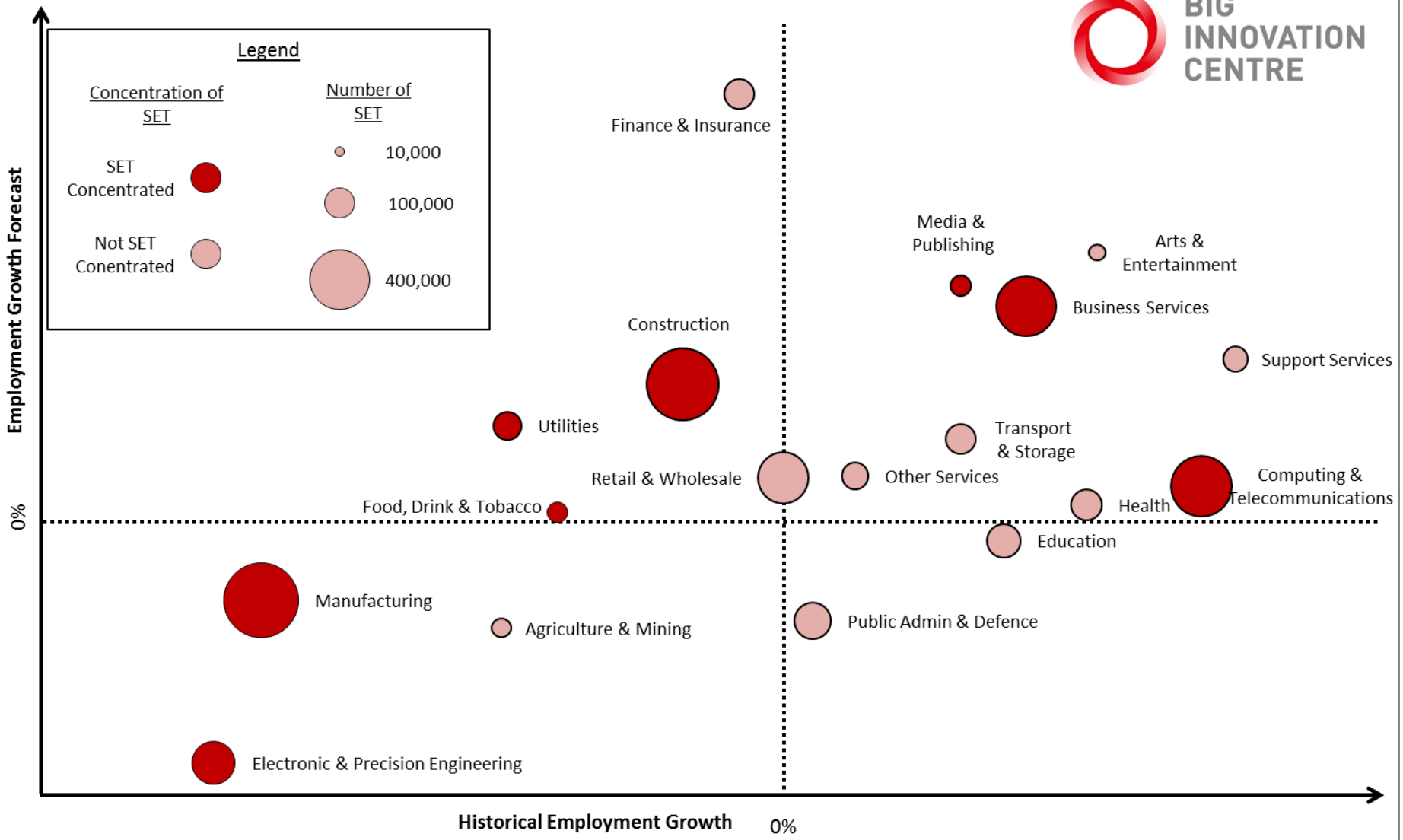
BIG INNOVATION CENTRE



Source: ONS Labour Force Survey, UKCES Working Futures 2010-20

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Evidence item #3

- Models of demand show the need for:
    - 820,000 SET professionals by 2020 with a high proportion being engineers (inc. IT)
    - 450,000 SET Technicians
- Demand is mostly replacement demand in the medium term.
- Demand will grow in *non-traditional* sectors
- Further numbers will be demanded for deployment in non-SET roles.

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The Question…

Does 160,000 STEM qualified people (100,000 of them gradates) per annum to 2020 look achievable?

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Where will they come from?

- The UK education system has key points for progression to engineering careers
  - GCSEs
  - A Level (or equivalent)
  - Higher Education
  - Workplace

- We call this the STEM Pipeline…but it is leaking

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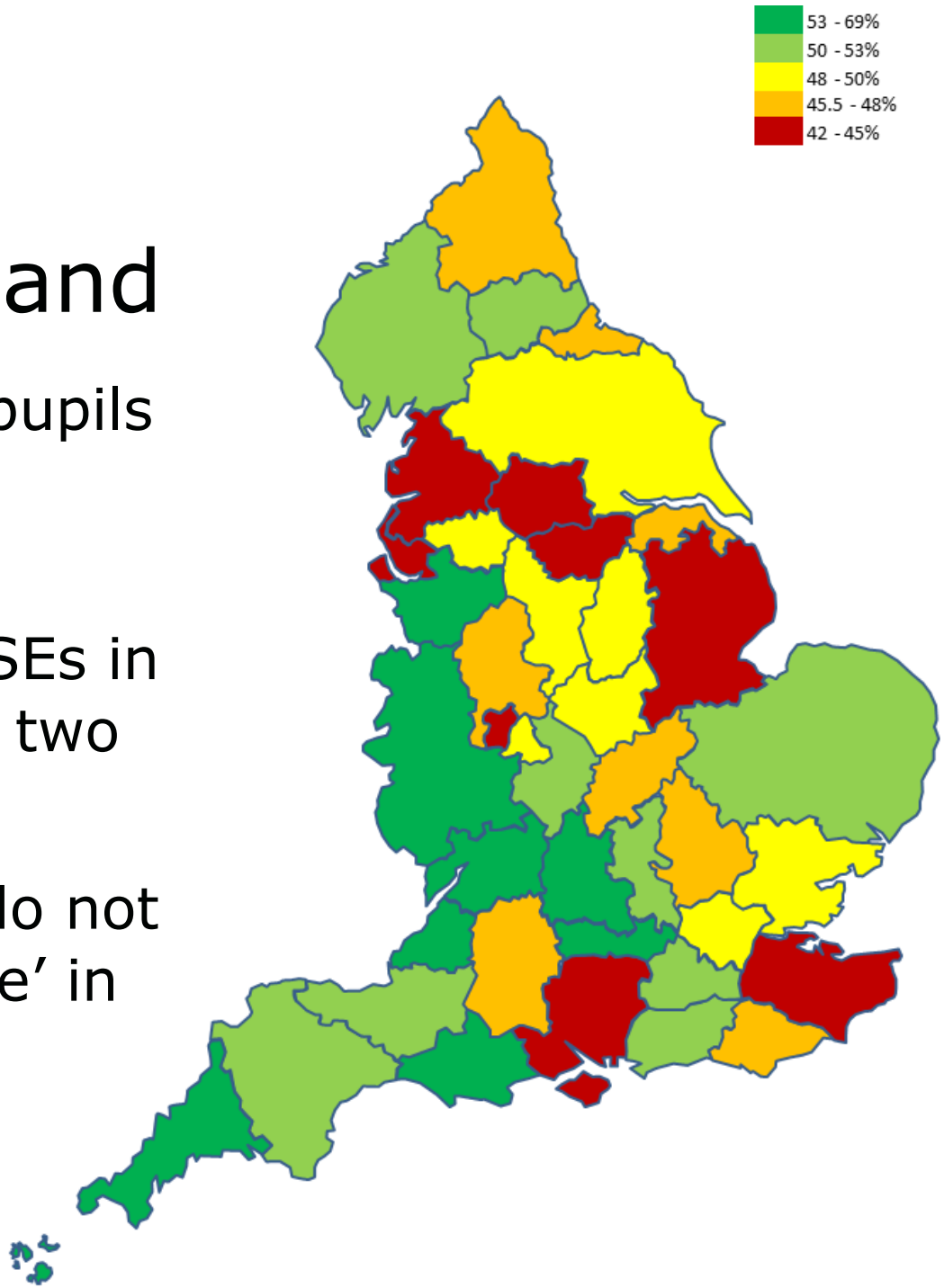
GCSEs - England

- Around 600,000 pupils in a year
- Fewer than 50% achieve good GCSEs in mathematics and two science subjects
- Just under 40% do not achieve a ‘C grade’ in mathematics



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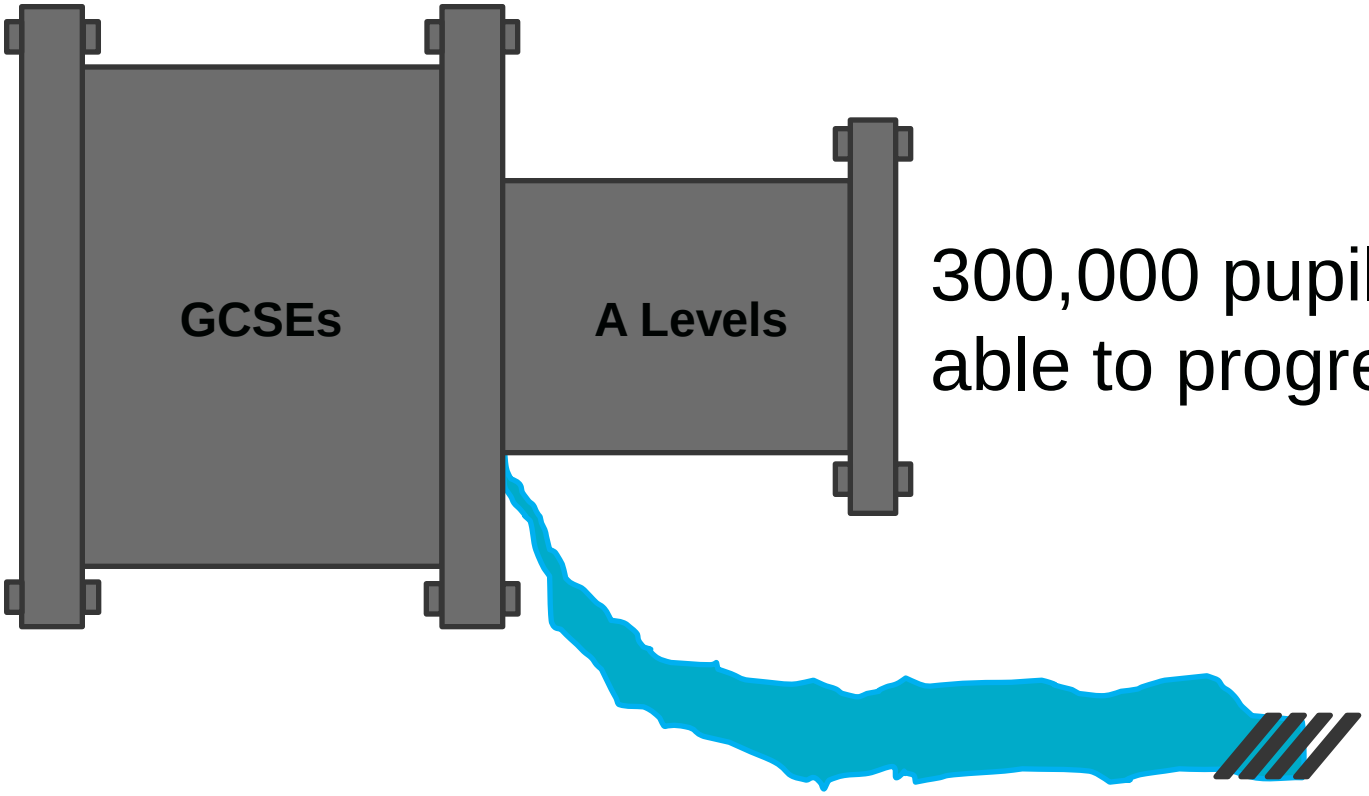
The STEM Pipeline GCSE leak

600,000 pupils



300,000 pupils able to progress

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A Levels

- Combinations of Physics and Maths are generally pre-requisites for engineering courses

- Of the 300,000 young people who achieved good science and maths GCSEs…

- Around 28,000 choose to do Physics A Level, and 80% of those also take maths A level

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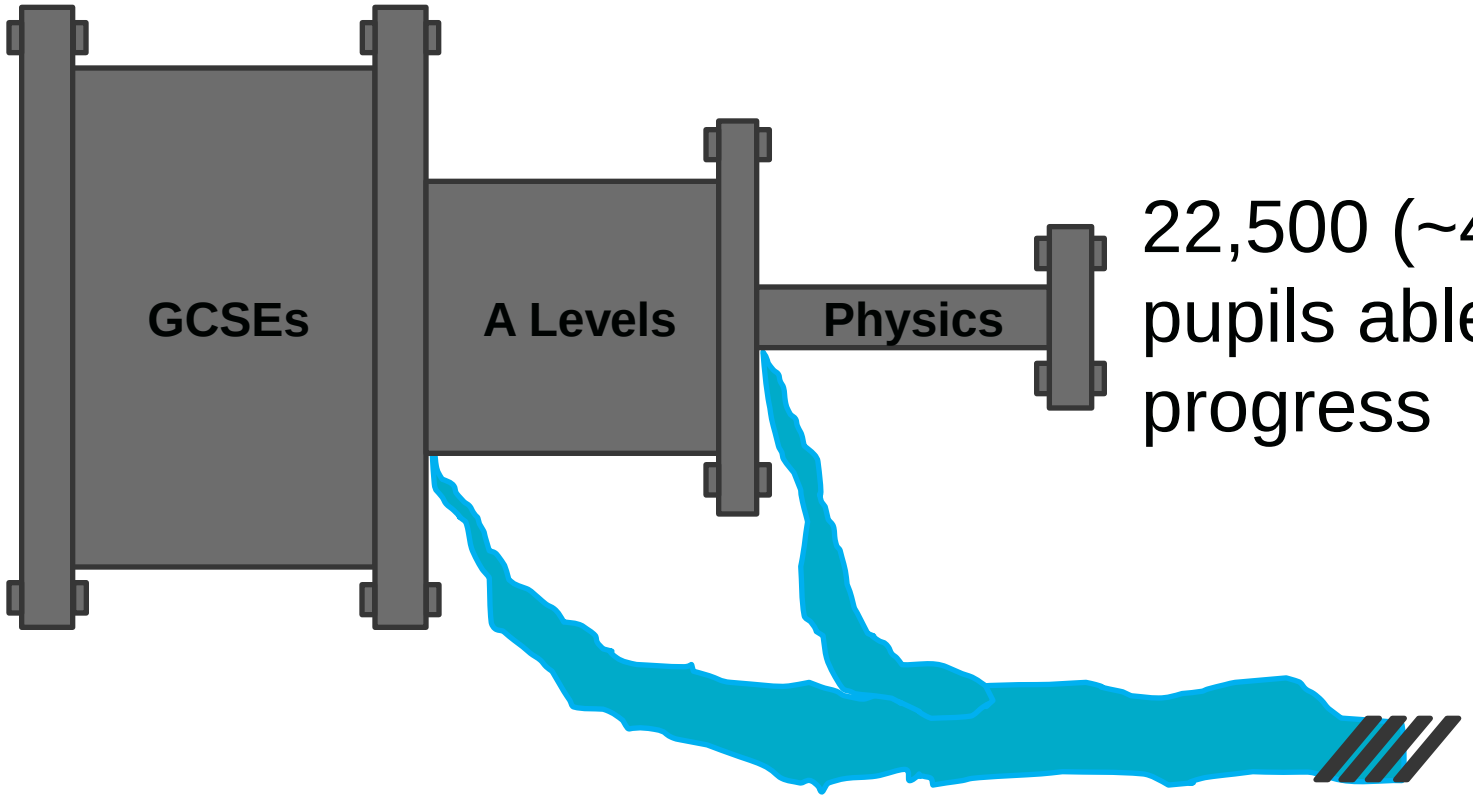
The A Level Leak

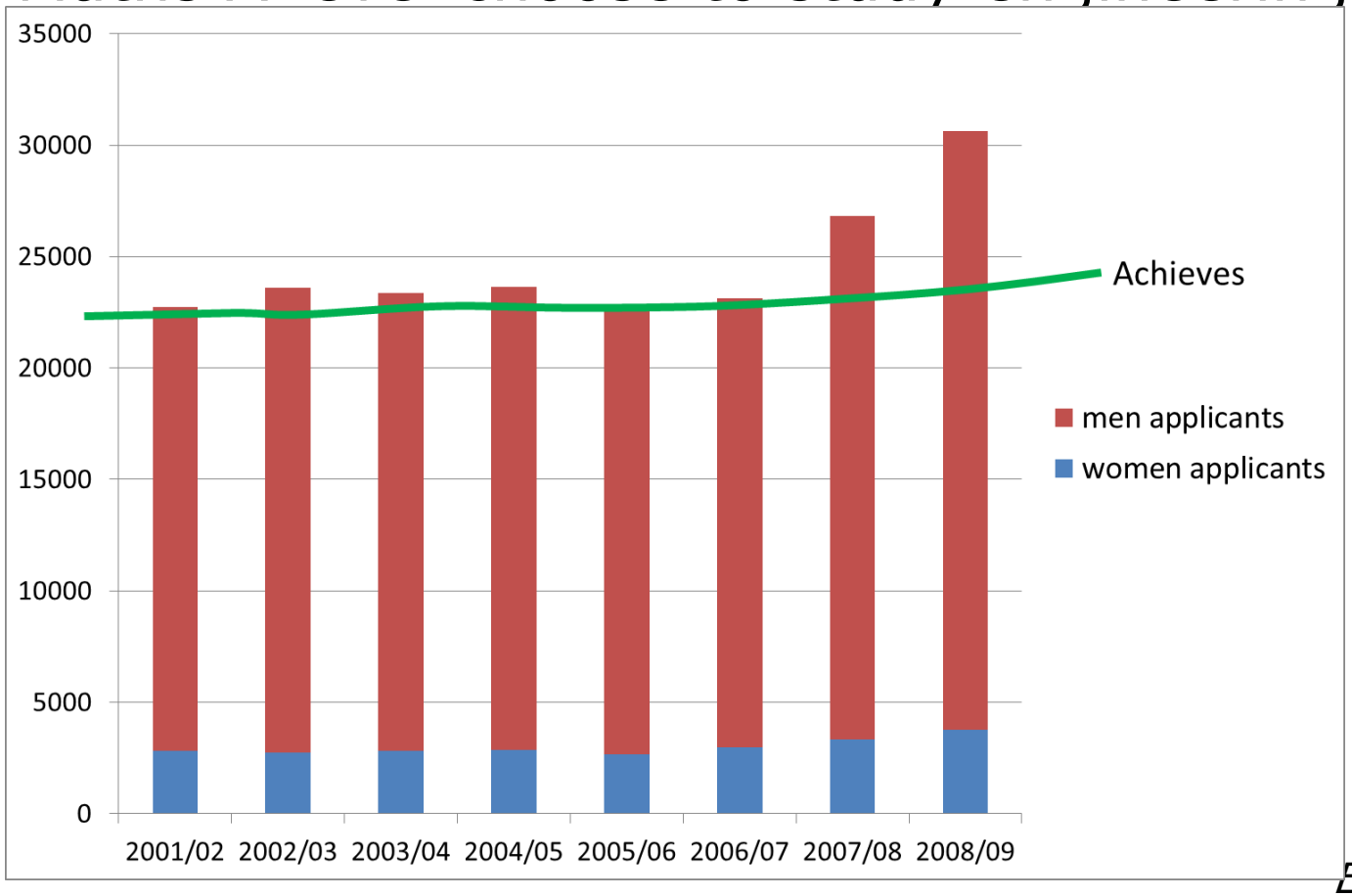
600,000 pupils



22,500 (~4%) pupils able to progress

Higher Education applications

- Majority of students who take Physics and Maths A level choose to study engineering



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Graduate Destinations

- The LFS data shows that engineers are pervasive throughout the economy
- Anywhere between 30-70% of engineering graduates will choose non-engineering roles and non-engineering sectors
- Taking an average, around 10,000 graduates will go into engineering

DIUS Research report 08.21, 2008

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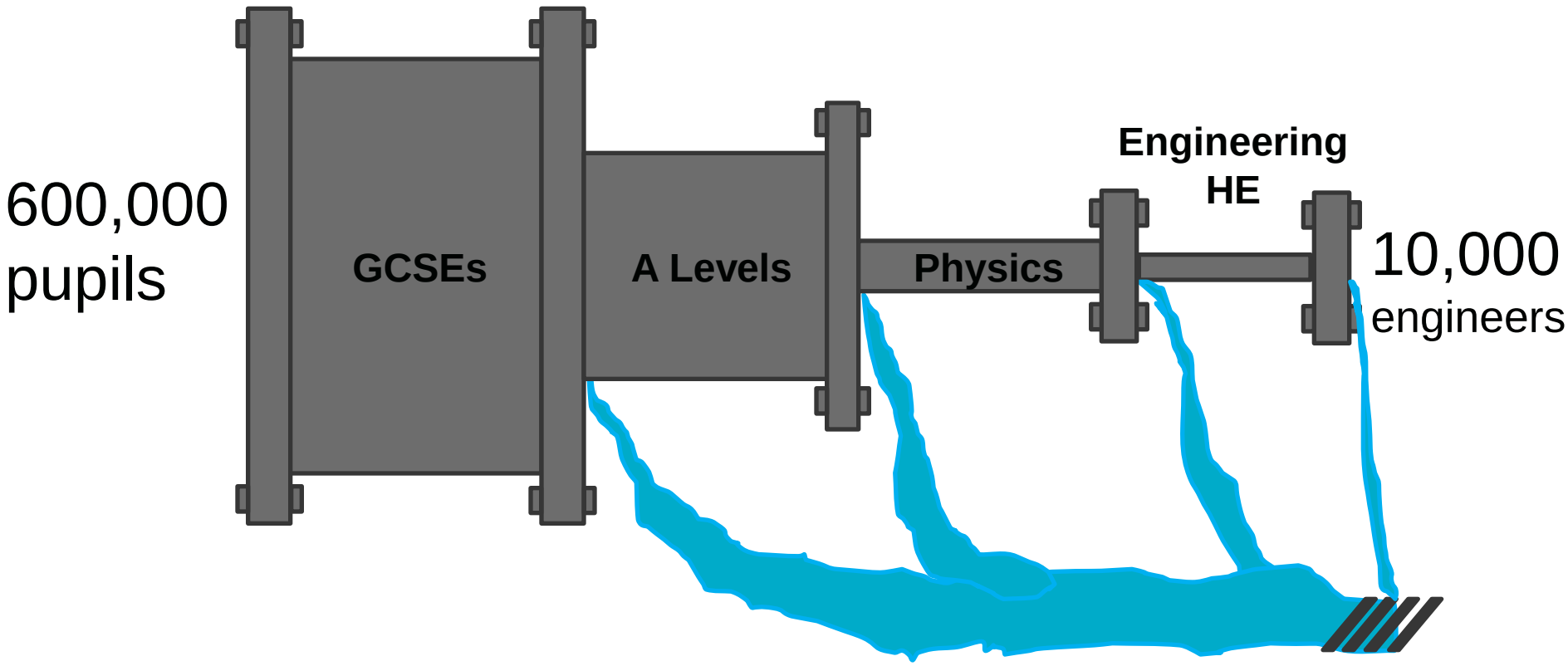

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Summary

- There is clear evidence of demand for engineers and a very real danger that the UK will not be able to meet the demands of industry in 2020.
- A critical ‘pinch point’ is around the conversion of GCSE pupils to post-16 physics.
- Increasing the number of specialist physics teachers will help.
- Increasing diversity of engineering cohort will help.

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Thank you

Does anyone have any suggestions?