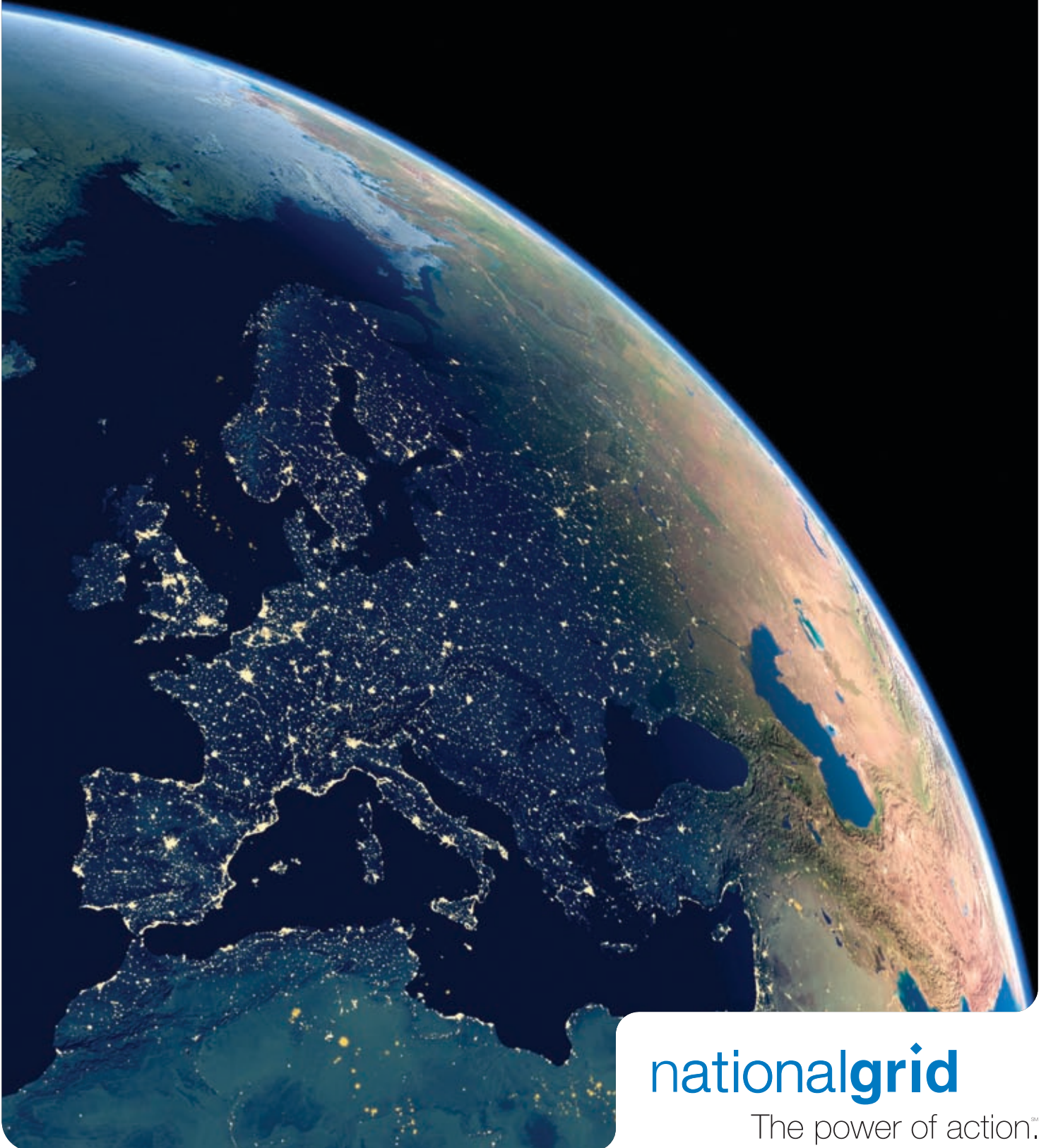


# Engineering Our Future

Inspiring and attracting  
tomorrow's engineers



**nationalgrid**

The power of action.™



The National Grid *Engineering Our Future* Report provides an assessment of current attitudes towards engineering, and insights into how we can encourage budding young engineers of the future.

The report is based on extensive opinion research with young people, parents, teachers and National Grid engineers. Qualitative research in the form of focus groups and trios were conducted with young people (16 and 17 year olds), parents, teachers and young engineers at National Grid. This was followed by telephone and face-to-face surveys with young people (14 to 19 year olds), parents and teachers. Further details on the methodology are included in the Appendix.

Following an initial analysis of the research, National Grid and the Royal Academy of Engineering held a series of roundtable sessions to discuss the implications. Roundtable participants were drawn from engineering, business, academia, science, skills organisations and the education community.

The research findings, roundtable sessions and discussions within National Grid has led us to develop a new set of programmes designed to encourage more young people to become engineers over the next twenty years.

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# Introduction



I am delighted to be sharing this essential piece of research with you. This report contains information that is frankly shocking, but perhaps not totally surprising to those of us in industry and it offers a real wake-up call. Engineers and scientists are at the heart of modern society. Even though you may not often see them or know exactly what they do, without them our world would be a very different place.

Today we find ourselves potentially facing a lack of talented, qualified people. I was very concerned to learn parents were not only generally unsupportive of their children pursuing an engineering career, but even worse, their teachers and career advisers were not even sure what we do! Based on this research, we have learned that much of society sees engineering as a dirty, low paid, job for men. Today, nothing is further from the truth.

My own company, National Grid, is committed to playing a major role in delivering the transition to a low carbon economy to meet the UK's demanding emissions and renewable energy targets. We believe that society is facing a cross-roads where the only way to tackle the challenge of changing climate, ensure energy supplies are secure, and address the required fundamental changes in the way each of us thinks about energy may require engineering the future.

We are at the beginning of an energy revolution and there has never been a more exciting time to join and help shape the future. We'll be shifting from a society where an ever increasing use of energy is the norm to one where we stop using resources so quickly and reducing energy use is everyone's business. We simply must use less energy, but how we do this whilst ensuring consumers are satisfied, will need to be carefully thought through. Accomplishing this lofty goal will require a lot of clever people, many of whom will be trained scientists and engineers. Over the next 10

years nearly one third of our work force may be retiring. There is a world of opportunity waiting for today's youth and it's up to us to inspire them to come and see the exciting challenges they can help meet.

This is a problem that spans more broadly than just the energy industry. Many companies are taking action to help solve this problem. At National Grid we are increasing our own activity by focusing on three areas where we can make a real difference. First, launching our 'School Power' programme that aims to enthuse primary school pupils about engineering and science. Secondly, we plan to significantly enhance work experience to better explain to students what they will be doing as engineers and show how they can make an impact on the world. And finally, we plan to build on our very successful Young Offender's programme by identifying individuals who have the potential to succeed in engineering or science but have not had the best environment when growing up. If not found early enough these individuals could be at risk.

We are only a part of the solution - but we know that the Royal Academy of Engineering and other businesses will increasingly play a role.

I hope this research inspires you to take action to help solve these crucial issues.

Steve Holliday  
Chief Executive

# Main findings



The polling and the research among more than 1300 young people, parents and teachers shows that the profile of engineering in the UK faces many challenges, but there are clear opportunities for change and progress.

There is an apparent acceptance of engineers and engineering at cursory level, but in-depth discussion reveals negative perceptions underlie this:

- ◆ Engineering is seen as a job rather than a profession. The work has an image of being menial, dirty and about fixing things. Because of this association with blue collar work, it is seen as a dying industry.
- ◆ It is almost an invisible industry and for many young people is simply not on their radar as a career option. For example, 6 out of 10 young people cannot name a recent engineering achievement
- ◆ This leads to low appreciation of what engineers do for society. Both parents and young people placed engineering below medicine, teaching and policing in its contribution to modern life.
- ◆ There is a snobbery among some parents who think their children could do better than choose engineering. And unhelpful gender stereotypes mean that for every ten boys who would consider engineering as a career, there is only one girl.

In addressing these issues, the challenge is to;

- ◆ Show the impact of engineers, their crucial role in society and the opportunities the profession provides.

- ◆ Connect engineering to creativity and technology. Young people want creative careers, and they want to design things and solve problems.
- ◆ Add aspiration and allure to engineering careers and show how engineers play a crucial role in shaping our future world.
- ◆ Stress pay and job security, emphasising the immediate and long term demand for engineers. These are compelling propositions in today's economic climate. Job security is the principal factor when deciding on a career and the current economic climate has made it more important.

The research shows the need to create opportunities for young people (and their parents and teachers) to gain exposure to real engineers and engineering companies and organisations. The most effective ways are through visits to schools, open days and particularly work experience, which is felt to have greatest impact.

- ◆ Scalability is the key to success. It is imperative to move beyond piecemeal activity.
- ◆ Increase media presence and profile. At present, engineering represents an invisible industry, with no clear role models nor common points of reference.
- ◆ We must also impact young people's lives at different stages through the educational journey – different interventions are required at different ages. If a young person only has one interaction with engineering; it is unlikely to be successful.

# Defining the challenge

At present, engineering is poorly understood and beset by stereotypes. There is a lack of clarity about what it encompasses and a low appreciation of its huge contribution to society, making it almost an invisible industry.

There is a huge opportunity to raise and enhance the profile of engineering, to inspire young people by demonstrating the impact of engineering's successes and to ensure more of them aspire to a career as an engineer.

## The definition problem

The terms 'engineer' and 'engineering' are ill-defined; parents, teachers and young people find the terms broad and vague. Although there is some awareness of higher-end engineering roles, people are more comfortable talking about more visible 'blue collar' roles – the car mechanic or the person who repairs their washing machine – people they might meet day-to-day. The focus on lower-skilled roles leads to an emphasis on the 'lowest common denominator', with engineers and engineering characterised as:

- ◆ Dirty
- ◆ Menial at times
- ◆ Overalls, not suits
- ◆ Fixing/mending things
- ◆ Unsociable hours
- ◆ Physically demanding
- ◆ Low paid
- ◆ A job not a profession
- ◆ Not for women

Engineers are frustrated by both the lack of public understanding of their role and the 'watering down' of the job title engineer.

"When you say 'I'm an engineer', people think you fix photocopiers or lifts or something."  
National Grid Engineer

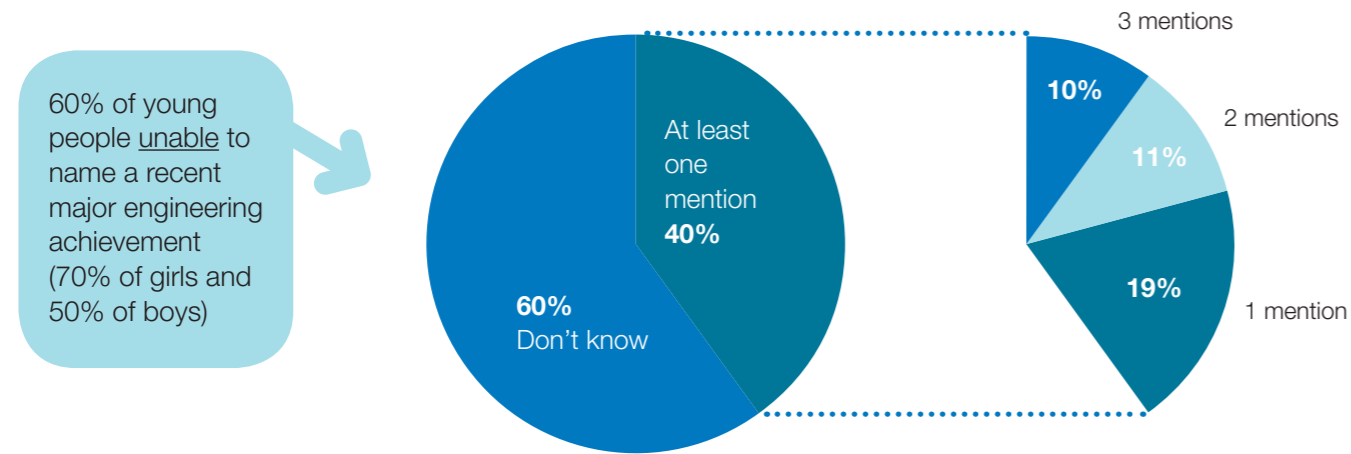
## The invisible industry

Building up engineering's profile would have substantial consequences for recruitment to the industry.

Currently, parents, teachers and young people are unsure about what an engineer actually does, where they work, and how to get into engineering. This low profile has significant long-term consequences and is exacerbated by a lack of media profile. It is particularly acute for organisations that do not have a consumer-facing brand or product.

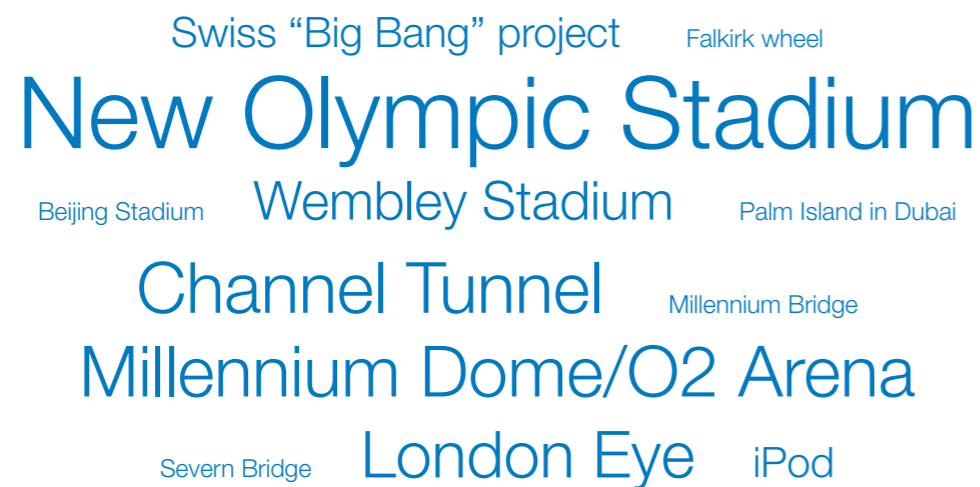
A stark illustration of this comes from the response to a question we asked on recent engineering achievements: 6 in 10 young people are unable to name a recent engineering achievement (7 in 10 girls). Of the 4 in 10 who can name at least one, the achievements mentioned tend to be major civil engineering projects with high visibility: stadia, bridges and large buildings.

Q. Now thinking of engineering in general, please could you name some recent engineering achievements that have taken place? Spontaneous mentions captured



Base: All Young People (552), Brunswick Research

Q. Now thinking of engineering in general, please could you name some recent engineering achievements that have taken place? Spontaneous top mentions



Note on 'tag cloud': the type of each word varies according to its frequency of usage. The larger the type size, the more that example was mentioned. This is not an exhaustive list of mentions and is included for illustrative purposes.

Base: selected comments from young people able to name a recent engineering achievement, Brunswick Research.



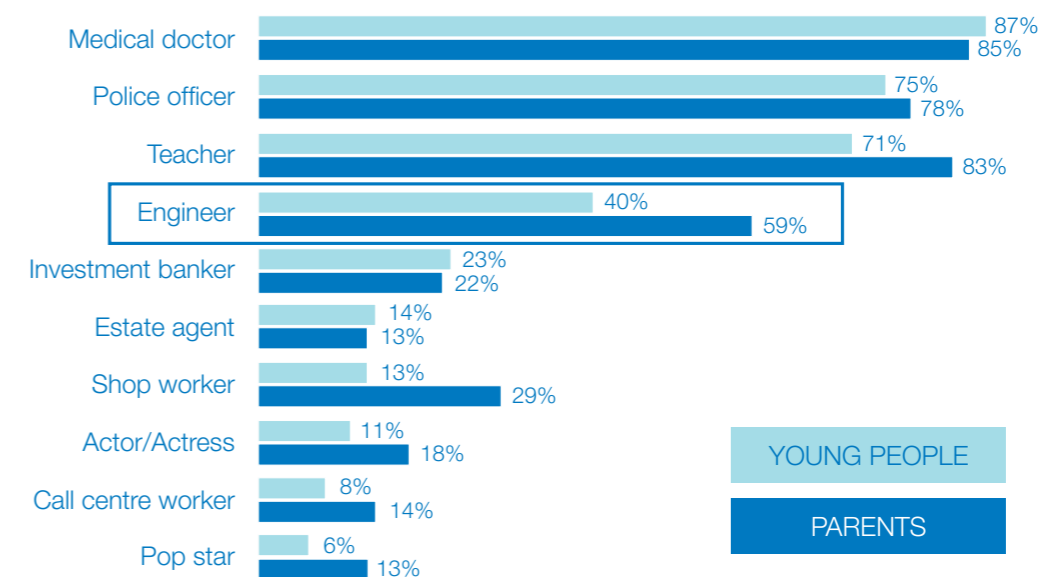
The focus groups with young people showed a lack of awareness of engineering as a career option, and even young people studying science and maths A Levels could not visualise what an engineer does every day. Parents' knowledge is limited to perceptions of declining manufacturing and stereotypes of 'blue collar' roles. We also found that some science and maths teachers were embarrassed by their lack of knowledge, and are unlikely to recommend engineering as a career. The exceptions are FE (Further Education) teachers who tend to have been engineers, and those teachers with family connections.

An additional sign of engineering's low profile is around its perceived contribution to society. Substantially fewer young people, parents and teachers consider that engineering makes a significant and positive contribution to society than medicine, policing and teaching. Although, interestingly given recent events, engineering is rated above investment banking.

Teachers are most likely to support all the professions; almost all (98%) teachers believe engineering makes a significant and positive contribution to society. However, parents and young people are less supportive of engineering; 6 in 10 (59%) parents and only 4 in 10 (40%) young people agree that it makes a significant and positive contribution.

"A silent industry. You don't know about it and it is very hard to find out about it."  
 Parent, London

Q. Here is the list again of jobs and careers and this time I'd like you to tell me which, if any, you think make a significant and positive contribution to society?



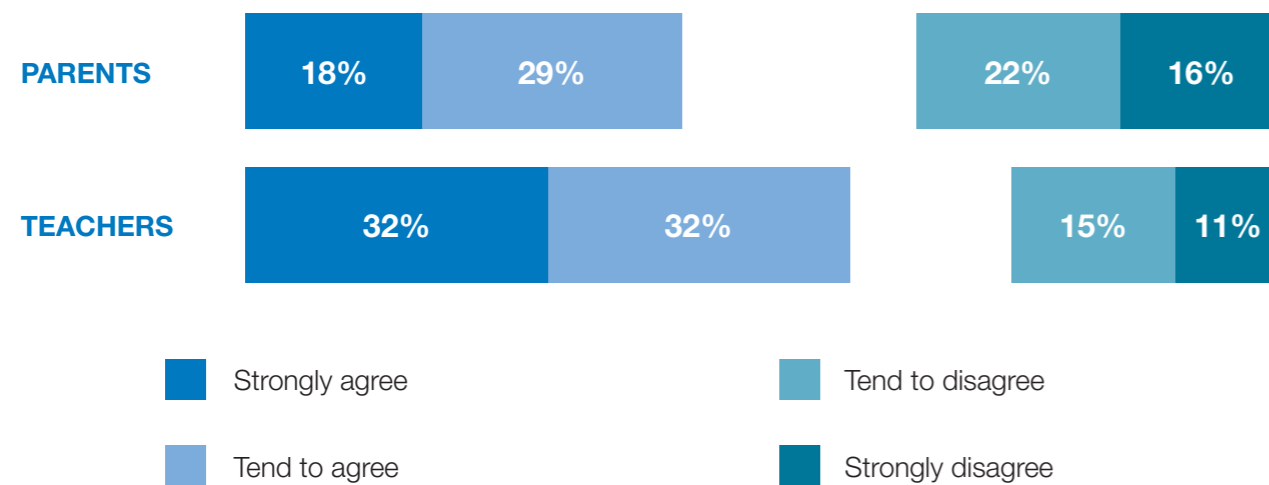
Base: All Young People (552) and all Parents (532), Brunswick Research

## Prejudice and stereotypes

When initially questioned, a substantial proportion of parents and teachers say they feel they have enough information about engineering in order for them to recommend it as a job or career.

Q. Please tell me to what extent you agree or disagree with the following statements.

“I feel I know enough about engineering to be able to recommend it as a job or career to my child/to the young people I teach”



Base: All Parents (532) and all Teachers (300), Brunswick Research

However, beyond this topline acceptance, the qualitative discussions showed a reliance on underlying prejudices and stereotypes. These views can result in unhelpful behaviours – particularly when parents would prefer to see their children pursuing other routes rather than engineering.

The main prejudices that act as barriers to engineering as a career are that it is:

- ◆ ‘Menial’ or ‘blue collar’
- ◆ ‘Fixing not creating’
- ◆ ‘Northern’ – a view held by some parents in the London focus groups
- ◆ ‘A dying industry’ with few jobs – voiced by parents in Midlands focus groups
- ◆ For men not women – particularly expressed by Black and Minority Ethnic parents

These perceptions drive attitudes that reinforce behaviours, reducing the likelihood that parents and teachers will recommend engineering to young people. Some see engineering as ‘settling for a lesser option’. Indeed, FE teachers are concerned that teachers in schools judge that engineering is for less academic young people, and for those who are ‘good with their hands’, even if their maths is very weak.

The combination of a strong emphasis on academic results and the belief that engineering is about ‘vocational work’ often means engineering is not actively recommended to those studying A Levels and aiming for university entrance.

“If their son said he wanted to become an engineer] “Although I know I have to support him in what he does – I know he could do better, and I would probably feel disappointed.”  
 Parent, London

Teachers are more comfortable recommending subjects such as medicine and pure science to study at university. This has implications too for those looking at vocational routes; the engineering apprentices interviewed had often chosen their career path despite discouragement from teachers and parents.



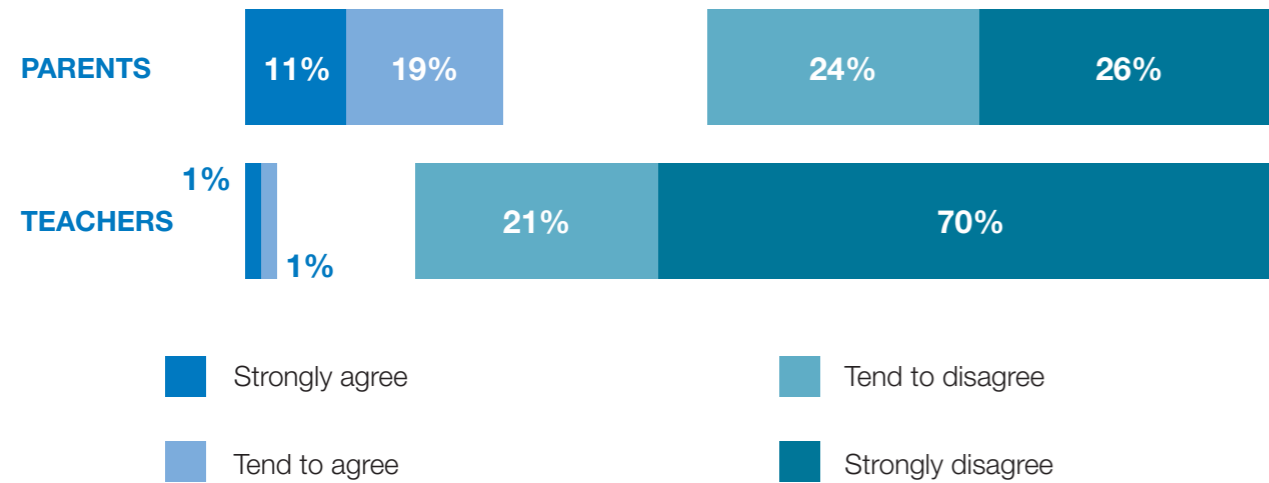
“None of my teachers were that useful. I went to a Connexions meeting and they said, ‘What do you want to do when you leave school?’ and I said I wanted to get an apprenticeship, and she said ‘Oh, I don’t know anything about that’, and we sat in silence for 15 minutes.”  
 (National Grid Engineer)

Despite the ‘blue collar’ associations evident during the qualitative phase, parents and particularly teachers, are unwilling in a poll to agree that engineers ‘repair things rather than design them’. This is another example of the acceptance of engineering in principle at a superficial level, which contrasts with the deeper seated prejudices that emerged during the in depth conversations.

Teachers do not show any gender bias in the survey. Almost all (91%) teachers disagree with the statement ‘Engineering is a job or career better suited to men than to women’. However, parents show more bias, with only half of parents disagreeing with the statement, and 30% supporting it.

Q. Please tell me to what extent you agree or disagree with the following statement.

“Engineering is a job or career better suited to men than to women”



Base: All Parents (532) and all Teachers (300), Brunswick Research

### National Grid's Point of View: The paradox

There is an alarming divide between perception and reality. It is worrying that many people think engineering is an invisible industry, and worse, is in decline. But at National Grid, we are very aware of the reality that many of today's and tomorrow's challenges require the skills and know-how of engineers.

Many of the major issues we face as a country – not least the challenge of tackling climate change and moving to a low-carbon economy – are dependent on the knowledge and talents that

engineers can bring to bear. We need to ensure people – particularly young people – know that engineering is about tomorrow, not yesterday.

National Grid alone is investing £3 billion a year up to 2012 to help Britain meet its security of supply and climate change goals. The scale and variety of the challenges ahead of us make this one of the most exciting times to be an engineer in our industry.

### Pursuing engineering as a career

The qualitative group discussions reveal that 16 and 17 year olds are not yet thinking deeply about careers – and appear to have stronger ideas about which careers they would least like to pursue than about those they would like to pursue. The polling showed that around a quarter (26%) of young people would not like to pursue any of the careers listed, though the remaining three quarters indicate they are open to some of these career options. No one career stands out, apart from call centre working, which is not a popular option. Engineering is not rejected, in fact it appears as the second most favoured.

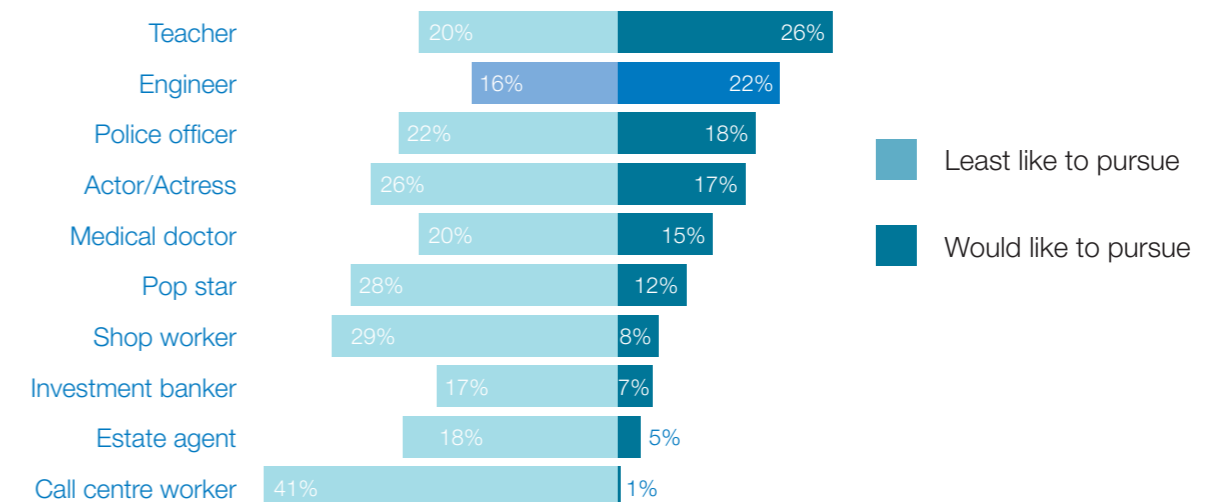
However, there are striking differences in how girls and boys view a job or career in engineering. The focus groups indicated engineering is perceived to



be a career for men and our polling among young people supports this.

Whilst just under a quarter (22%) of all young people would like to pursue engineering, this is skewed towards boys: 39% of boys would like to pursue it as a career compared to only 4% of girls. Ten times as many boys would like to pursue a career as an engineer as girls.

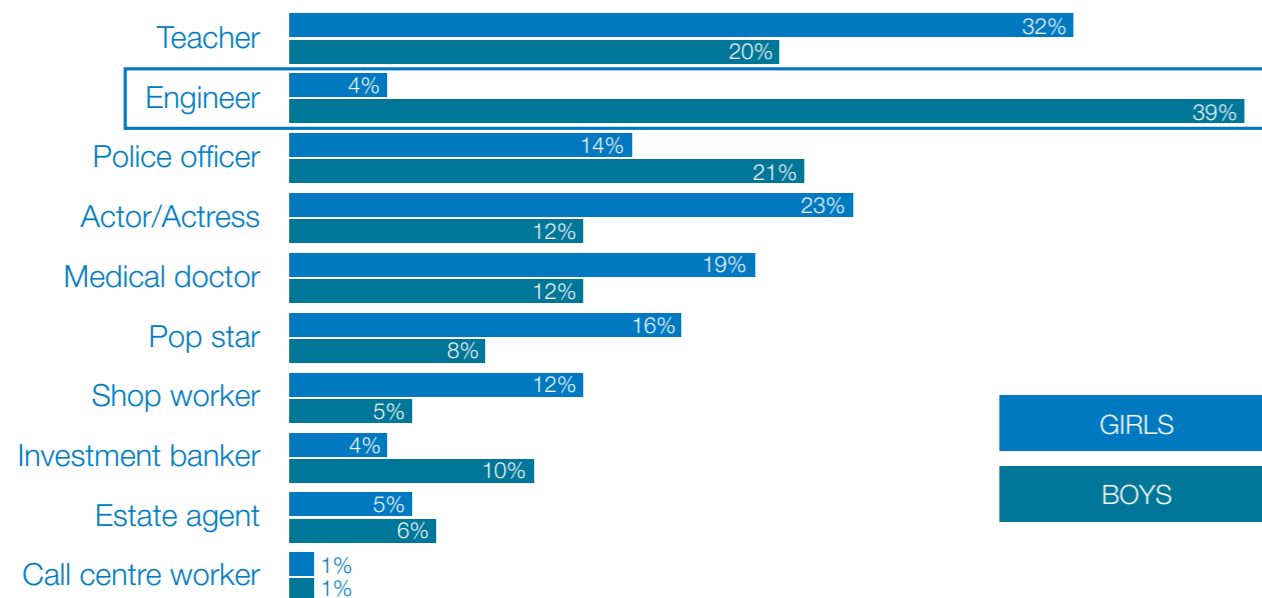
Q. I'd like you to tell me which, if any, you would like to pursue as a job or career. And which would you least like to pursue as a job or career?



Base: All Young People (552), Brunswick Research



Q. I'd like you to tell me which, if any, you would like to pursue as a job or career.



Base: All Young People (552), Brunswick Research

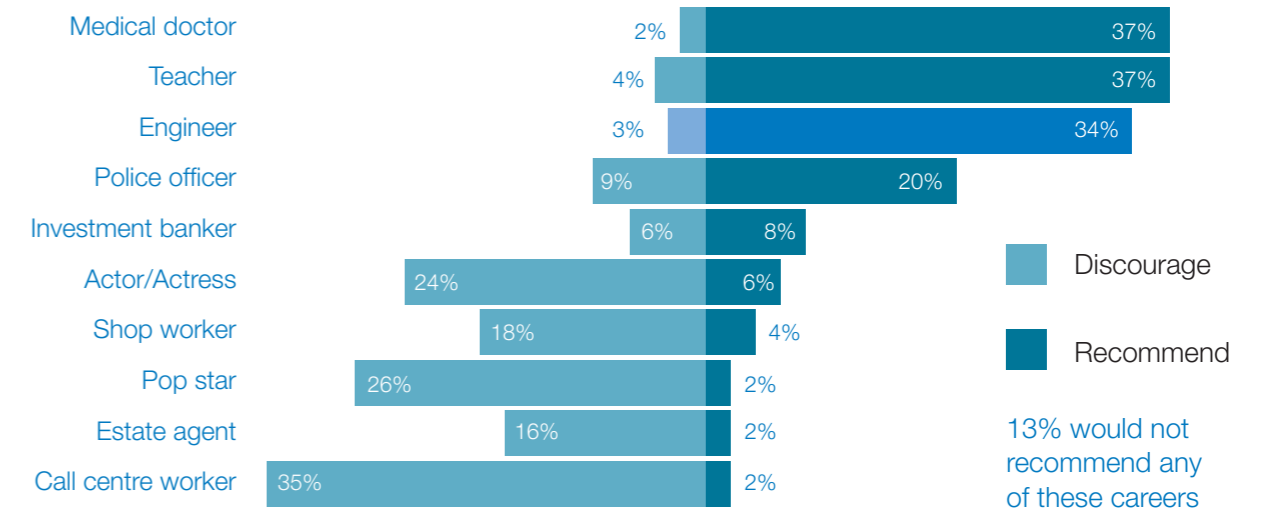
Even the girls studying science, maths and technology at school can be put off engineering as a career.

“My daughter took maths and physics ‘A’ Levels and we did look at engineering as something she could do at university but she shied away from it, because she was female she decided it wouldn’t be for her.” (Parent – of a girl studying STEM A-levels – in London)

For parents there is clear hierarchy of jobs they would recommend to their children. Engineering is surprisingly popular given what we heard in the focus groups, with a third (34%) of parents saying they would recommend it as a career, only marginally behind the 37% who would recommend medicine and teaching. Again, underneath this apparent acceptance we should remember that in-depth discussion reveals a lack of knowledge and unhelpful attitudes about engineering.

However, there is a realistic opportunity to improve this, as only 3% of parents say they would actively discourage their child from pursuing engineering.

Q. I'd like you to tell me which, if any, you would recommend as a job or career to your child. Which, if any, would you discourage your child from pursuing as a job or career?



Base: All Parents (532), Brunswick Research

### National Grid's Point of View: Talking stereotypes

It is concerning that so many prejudices exist towards engineering – particularly the perception that engineering is only for men. It is especially worrying that these stereotypes seem to take root at such a young age – with girls quickly deciding that engineering is not for them.

As a business and as part of the wider industry, we need to work to overcome this, and look at how we broaden the appeal of engineering.

At National Grid, we already participate in the *Engineering Education Scheme*, *Headstart* and *The Year in Industry*, all part of the Royal

Academy of Engineering's Best Programme, which encourages and enables young people from all walks of life to experience hands-on engineering and technology. Using this research as a starting point, we are looking at ways we can further engage and enthuse young people about a career in engineering.

We also need to tackle the view that engineering is seen as a lesser option by parents with children studying STEM subjects. By emphasising the impact engineers make on society, and the potential personal benefits it brings, we should look to demolish this myth.



### National Grid's Point of View: Making connections between business and schools

The research underlines the need for business and the education community to work together more, particularly when it comes to demonstrating the relevance of STEM subjects to the world of work.

We have worked hard to bridge the gap between what happens in the classroom and what happens in the workplace. In part, we have done this through contribution to *Imagineering* – clubs and fairs that provide fun, hands-on activities that allow children to find out how things work and how they are made, and allows them to meet real engineers and find out what they do.

Collaboration is also important to ensure that maths and science teaching reflects the expectations of potential employers, and that teachers have access to the latest thinking and know-how from business and industry.

#### People you know

This research underlines the positive and powerful impact knowing an engineer has on perceptions of engineers and engineering.

Parents and teachers who know engineers see the benefits, for example the salaries engineers earn and their ability to work around the world. The FE teachers we spoke to tended to be ex-engineers and are positive about the profession. A significant number of the young engineers we spoke to have a family connection to engineering – a show of hands in the discussion groups often revealed a majority – and we found this had directly influenced their decision to apply for an engineering career.

#### Where does STEM teaching fit in?

Young people, including those studying STEM subjects, do not see clear links between these subjects and a career as an engineer. They have little understanding of where studying STEM leads and struggle to name professions beyond medicine, healthcare, accounting and science.

Although many young apprentices have enjoyed the more practical science and maths activities, they judged that maths and science 'A' levels, and even GCSEs, were too difficult and theoretical, geared to very bright academic students. Although the apprentices and also graduate engineers had been put off these subjects at school, they say that they now enjoy using maths more at work than they did at school. They now understand the applications of these subjects and use them in a more meaningful and more practical way.

“You need to make it [maths] look interesting at a really young age, like Year 9 or 10 and give people an idea of what they can actually do in science or maths. I knew when I was doing maths at GCSE I was thinking when am I actually going to use it? This is pointless... And so if someone had come in and said 'I use maths in everything I do', it might have given some purpose to what I was doing.”  
(Young Person – studying STEM A-levels - in London)

FE teachers voiced concern that there is a disconnect between the needs of industry and what students are taught in schools, feeling that maths and science teaching is geared for academic 'stars', not for mainstream use.

# Addressing the challenge

The poor understanding and stereotyping of engineering are major challenges to be tackled. In addressing them, we should be guided by the research. It provides clear insights on how communications can help, specifically the messages young people want to hear.

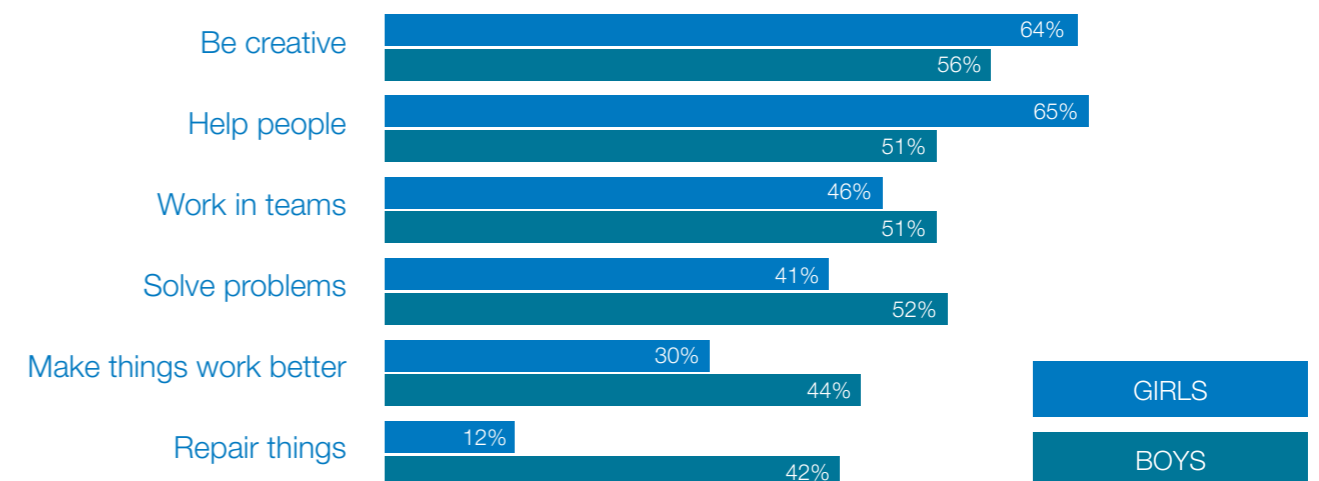
#### Re-connecting engineering with creativity and technology

Engineering currently sits in isolation and is limited by its image as mending not creating and being more about lathes not laptops. This research indicates that communications should emphasise two aspects of engineering that provide powerful inspiration for the young:

◆ **Creativity.** Young people want creative jobs; this is a particularly powerful driver for girls; 64% of girls interviewed would like to be able to be creative in their jobs. Young people would much rather solve problems than repair things. Yet people don't currently associate design with engineering, nor do enough associate problem solving with it.

◆ **Technology.** Engineering is seen separately from technology, in fact it is perceived as quite removed from 'high technology' and more linked to the past. Teachers recommend engaging young people with engineering by connecting the topic with kids' interest in IT, gaming, the Internet and gadgets.

Q. Please tell me which of these are things you would like to be able to do in a job.



Base: All Young People (552), Brunswick Research

### Adding aspiration and inspiration

Currently, there is little aspiration or allure attached to engineering. This can be added through four routes, listed here in descending order of relative importance and priority – all though have a role.

◆ **Money and Benefits** – it is important not to underestimate the importance and attractiveness to young people of the financial benefits of a career. Young people are keen to understand how much engineers might earn. The opportunity to travel is another important benefit we can emphasise. Later in the report we will see that in the current economic climate, the urgency of need for engineers and long-term career prospects are both important messages to communicate.

◆ **The Impact of Engineering and Iconic Projects** – Engineers can point to a striking array of achievements, whether that is sporting arenas and skyscrapers, or medical equipment and communications devices. Young people will be impressed if we can demonstrate the crucial role engineers play on big, iconic projects; they add glamour, longevity, respect and fame to engineering. They also allow people to understand the crucial contribution engineers make to society and the responsibility they have, not just the features of the job. Equally, as we have seen, the connection engineering has to new technology is powerful across all audiences, and young people in particular.

“Those (Wembley and other major buildings) are things to be proud of. Big landmarks.”  
(Young Person, Birmingham)



◆ **Personality and Celebrity** – Engineering does not have a ‘human aspect’– currently, no individuals or faces are attached to engineering. This could be about celebrity endorsement or developing the profile of ‘famous’ engineers, for example, Jonathan Ive, the inventor of the iPod. However, in the conversations young people indicated the powerful potential of showcasing engineers who are “people like me”, to show it’s possible, and also to allow self-identification. It would be particularly compelling to show young, recently-qualified engineers, while the need to show black and Asian engineers is highlighted by BME parents.

“You need to be more inspirational and make young people believe they can do it. Show profiles of young people who have gone into engineering within the last 18 months.” (Young Person, Birmingham)

◆ **Hobbies and Interests** – To enhance the appeal of engineering, it can help to demonstrate connections to things young people are interested and passionate about. There is potential to connect engineering to music or to an interest in sport – showing the engineering and science behind sporting and technological achievement.

### National Grid’s Point of View: Showing the impact

It is vital that business shows the impact of engineers and engineering on society. Seeing the contribution engineering makes can bring to life the opportunities engineers have, both in terms of personal career paths and wider chances to be involved in landmark projects and societal challenges.

Engineers in the UK are playing a major role in delivering major infrastructure projects, such as the London 2012 Olympic Games, and developing new aircraft like the Airbus A380 Superjumbo. They contribute fresh thinking on mobile telephony and the internet, and are

helping to combat climate change through new technology.

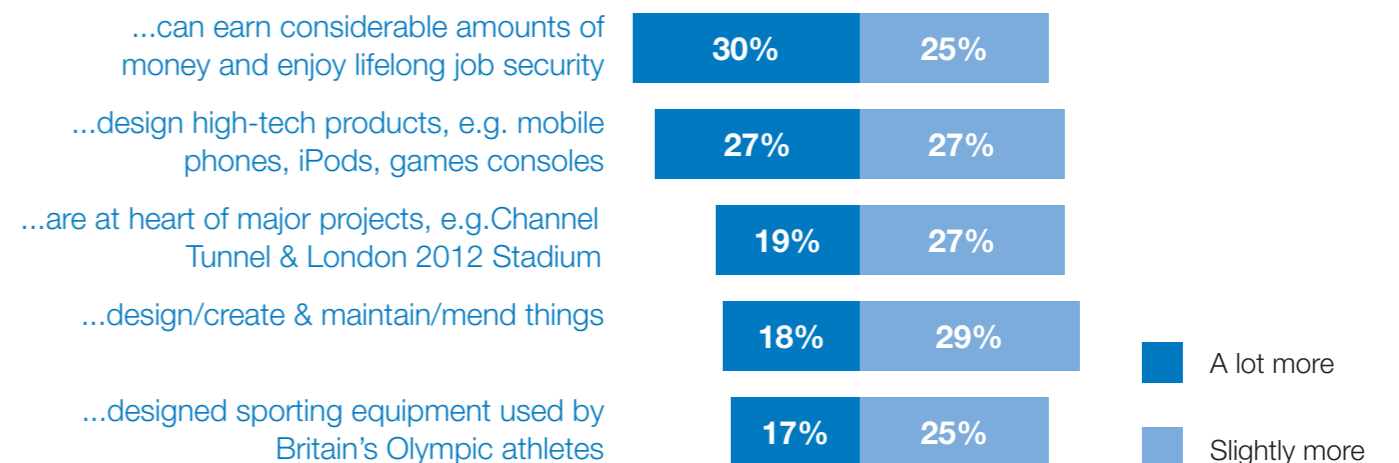
Industry, government and professional bodies need to promote these stories better, and show the road from the classroom to the projects of today and tomorrow. That is why we are involved with *The Big Bang*, a national event that shows young people the role engineers play in society, and why we talk to potential employees about the role National Grid plays - whether that is providing the power systems for the London Olympic Park, or operating the UK’s leading Liquefied Natural Gas terminal at the Isle of Grain, with its giant storage tanks each big enough to encompass London’s Royal Albert Hall.

### Potential messages

The polling underlines that some of the most potent messages, in attracting young people into engineering, relate to the aspirational themes we outlined earlier. Young people respond particularly

well to messages that highlight the financial advantages of engineering, job security and technology. Engineers’ roles at the heart of major projects and designing and creating also constitute compelling messages.

Q. Would you be more or less interested in pursuing a job or career in engineering if it was more widely known that engineers...?

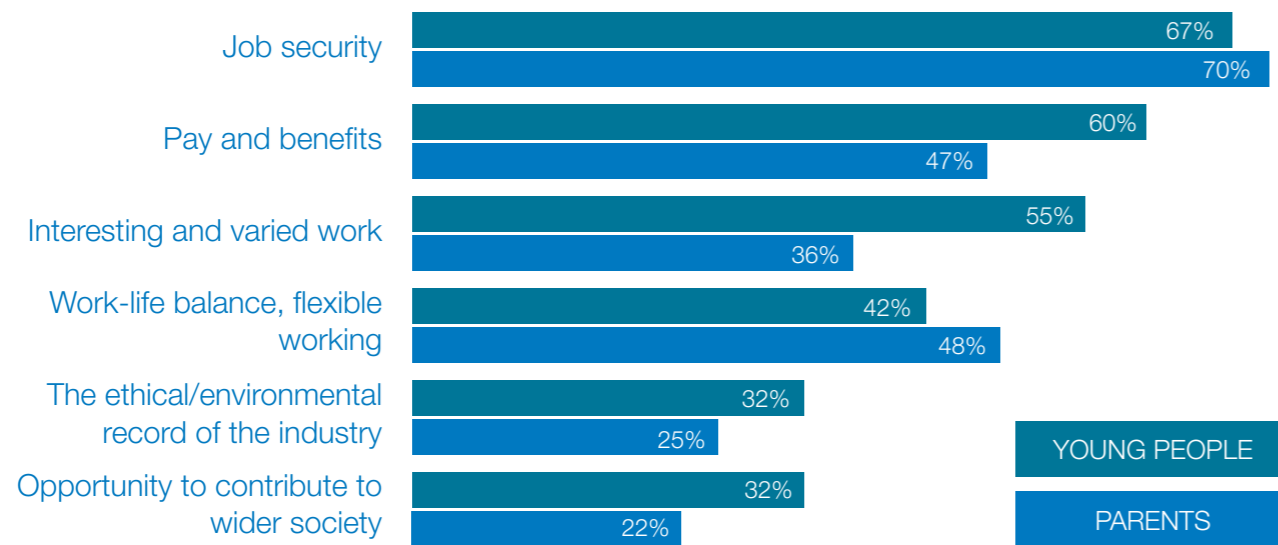


Base: All Young People (552), Brunswick Research

The statistics reinforce that job security and pay are crucial when deciding on a career for both young people and their parents. Young people place a greater emphasis on pay than their parents (the parents consider work-life balance and flexible working just as important) and are also more influenced by ethical and environmental concerns and more inclined to want to contribute to the wider society.

Alongside this we also need to consider how outside events are affecting people's views on jobs and careers. We asked whether the same factors had become more or less important, given the current economic climate. A substantial majority of young people and parents feel job security has become more important (76% of young people and 71% of parents).

Q. I'm going to read out a list of factors which people may or may not take into account when deciding on a particular job or career. I'd like you to tell me how important each is to you.



Base: All Young People (552) and all Parents (532), Brunswick Research

### Media amplification

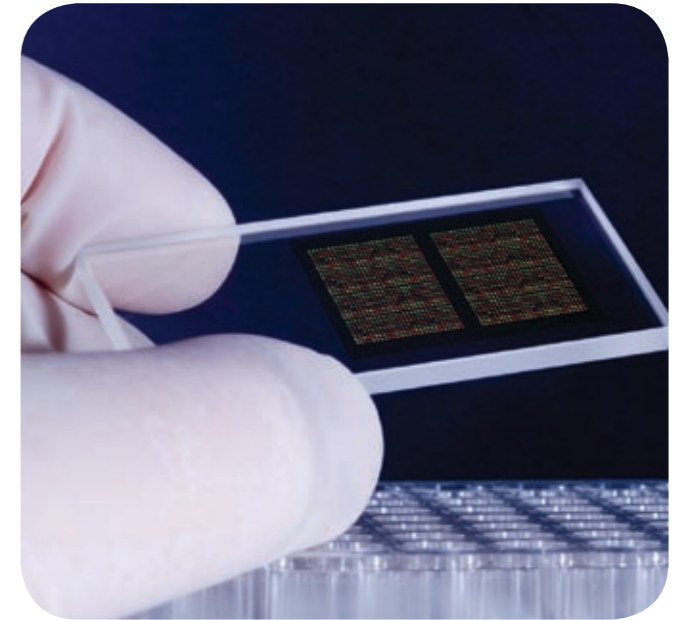
As well as a focus on messages that can inspire young people there are calls for greater media coverage of engineering. Teachers and parents believe the media has a huge impact on perceptions around careers and job choices.

Those teaching Business Studies see a positive impact from programmes such as Dragons' Den and The Apprentice. Programmes such as Spooks, a TV show about MI5 agents, and legal dramas are thought to add kudos and allure, and CSI: Crime Scene Investigation has sparked young people's interest in science and forensics.

Engineering needs to find appropriate media vehicles to reach young people and the wider public, and help make engineering real and credible for them.

"They need a role model. They need an engineer role model. If you watch soap operas they all work in pubs or they're all cleaners or they all work in a factory." (Teacher, London)

"My lad seems to go with whatever is on the television at the moment. I mean when it's the OC he wanted to be a lawyer, when it's Scrubs he wants to be a doctor." (Parent, Birmingham)



# Considering interventions

If young people are to be encouraged into engineering we need to raise awareness and shift perceptions. Specific interventions are required to create exposure to engineering and engineers and stimulate the interest of young people, and the teachers and parents who advise them.

## Creating exposure

In-depth discussion reveals a clear need for first-hand experience. In enabling young people to meet engineers, visit their places of work and see what they do in their day-to-day roles, we can counter the myths and misconceptions that exist.

“You can actually get in there and see what it means to be an engineer. It is better to meet engineers than hear it from teachers.” (Young Person, Birmingham)

The young people, teachers and parents had some clear advice for those intending to run schemes like this. Work experience needs to be meaningful and offer a real insight into the job or career. It has to be more than tea-making, photocopying or sweeping the floor. Talks in schools should be by engaging, dynamic, and preferably young, engineers. They should be people who students in schools and colleges can identify with and aspire to be like.

A comprehensive list of potential activities was developed and tested with young people, to see which would stimulate their interest in engineering most. By far the most popular is work experience in engineering roles; 61% thought it would have the most impact. Their top four options all included direct experience of real engineering roles or contact with real engineers.

### Work experience

Offer real insight and connections  
Young people in vocational routes - often stay with those that first offered experience  
Must be more than tea-making!

### Open days

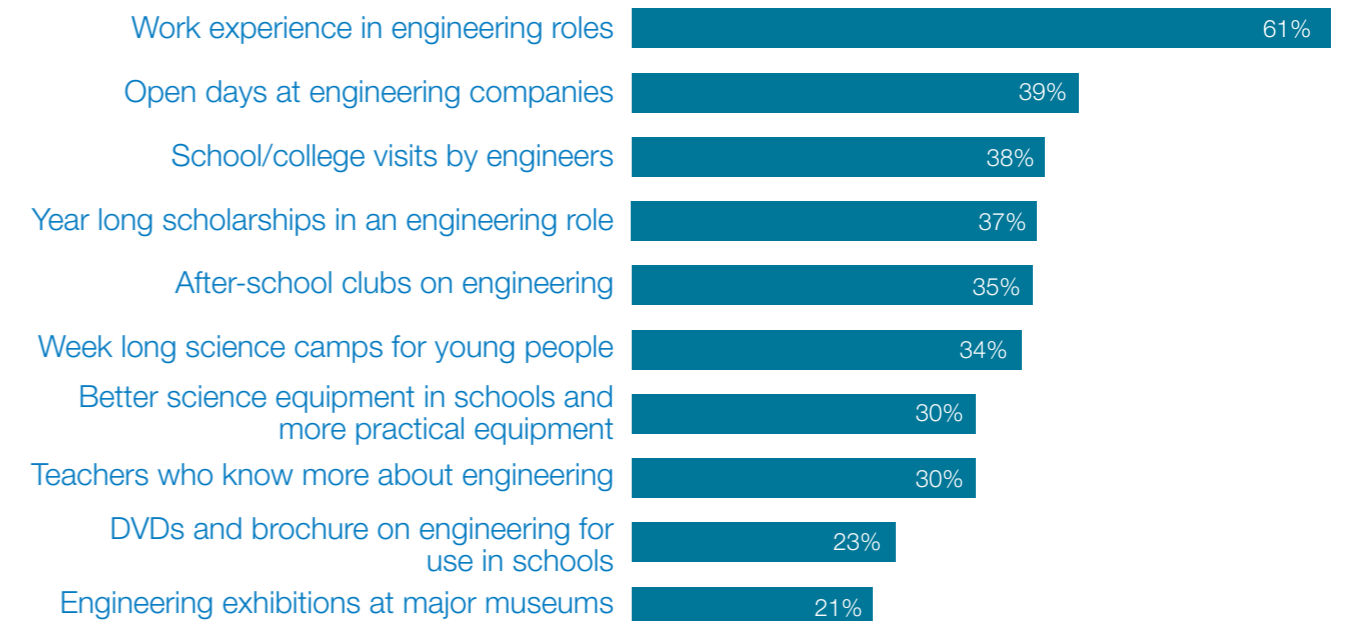
Powerful tool to inspire  
Anecdotes of successful examples (BA, TfL, Jaguar)  
Shows practical and aspirational side of engineering

### Talks in school by engineers

Can stand out and inspire  
Need to be young, engaging, dynamic and non-patronising  
Practical tasks  
Show relevance of STEM



Q. Here are some ways to get more young people interested in a job or career in engineering and I'd like you to tell me which, if any, you think will best stimulate their interest.



Base: All Young People (552), Brunswick Research

Perhaps reflecting boys' greater interest in engineering, they tend to be more willing to say a potential intervention will help stimulate their interest. However girls' priorities do match the boys, they are also most likely to have their interest sparked by work experience at engineering companies.

Teachers have higher expectations that various interventions will enhance young people's interest in engineering. Like the students, they also believe that work experience is most potent (97% expect this to be effective). 95% of teachers think that year-long scholarships would be helpful, while at least 90% think that school visits, open days and teachers who are more knowledgeable about engineering would be helpful.

### National Grid's Point of View: Disadvantage

We are not surprised that work experience is viewed as one of the main ways to engage young people. Seeing first-hand the work and role of engineers is very effective at inspiring young people. We already offer work placements at National Grid, and intend to do even more in the coming years.

But, the onus is clearly on businesses to make sure work experience placements are high quality, and give young people a proper and well thought-through experience.

What is critical too is that work experience opportunities are open to all. We heard in our stakeholder roundtables that there is a danger that there is an inbuilt bias towards young people from middle-class backgrounds when it comes to knowing about and securing work experience. We need to find ways to ensure those from a more disadvantaged background get the same chances and opportunities.

To this end, we intend to use the insights from the research to broaden our existing work with disadvantaged groups. National Grid has pioneered business involvement in the rehabilitation of offenders. **The Young Offender Programme** we lead in partnership with others provides skills training and sustainable employment to young people nearing completion of their sentences. The programme has now been adopted across major industry sectors and is operational in more than 22 prisons in the UK. The output from the programme reduces re-offending from approximately 70% to 7% and rehabilitates the offenders into productive members of the community.



### Potential barriers to interventions

Despite holding higher expectations of the power of interventions, teachers often emerge as the most sceptical voices around interventions, and can be quick to raise barriers and obstacles to change.

Teachers voice scepticism around engineering businesses' willingness to offer work experience placements, often based on their own experience. They anticipate companies will use the excuse of health and safety issues or lack of time and resource. Teachers also foresee that the work experience may turn out to involve sweeping up and making tea. They contrast this with the attitude of retailers, who they see as much more willing to offer 'proper' work experience.

Beyond this, teachers are not keen on interventions that involve them spending more time with business and industry. They candidly acknowledge that their performance is judged on their students' exam results not on the careers they subsequently pursue, so must judge extra-curricular activities like these as less important.

### Scalability of activities

The people we spoke to felt strongly that interventions need to be implemented on a national scale for a 'tipping point' to be reached.

Those with greater awareness, including some teachers and engineers, feel that many of the proposed interventions do currently happen, for example work experience and visits to schools by engineers and trips to engineering companies. However, they express concern that these are too piecemeal and randomly-implemented to have a substantive effect. This is strongly felt by a number of engineers.

"This needs to be a national effort, or otherwise it doesn't really have an impact. Having an engineer go into one school here and there won't change things." (Teacher, London)

There is agreement that success is dependent on a large-scale national programme, with cross-industry co-operation, along with an alliance between government and business.

Two campaigns were highlighted as successful models for engineering: the current Armed Forces campaigns and the *'Those who can, teach'* advertising campaign.

### At what age?

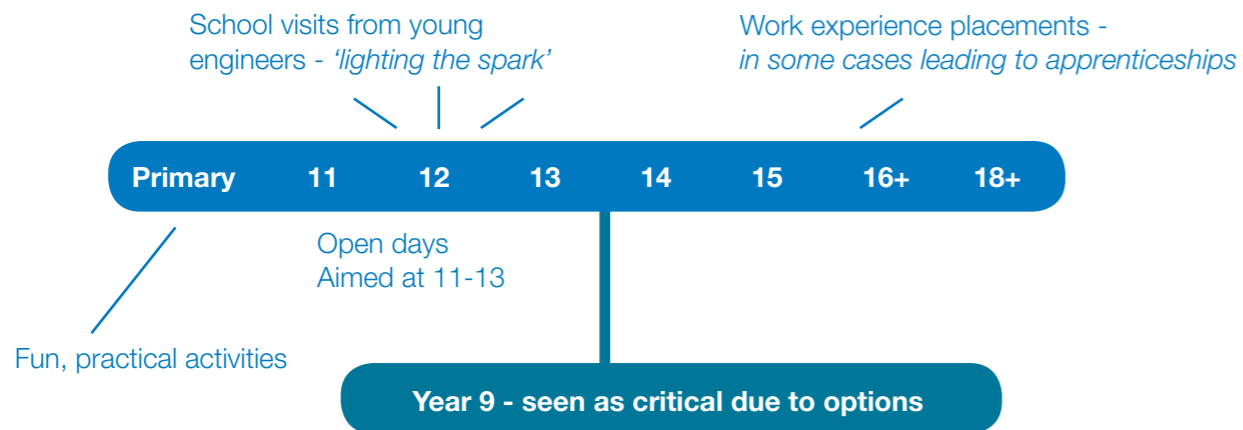
There is no consensus about the single best age to engage with young people. Instead, this research indicates that different interventions are required at different stages. In broad terms:

- ◆ Primary school: Interest in STEM subjects can be stimulated by fun, practical activities.



- ◆ Age 11-13: Interventions should be designed to maintain an interest in STEM subjects. It is also an appropriate time for young people to attend open days at engineering organisations, so they can understand the opportunities in engineering available to them. School visits from young engineers will also help light the spark; they are keen to understand what engineers are like and what they do, and how much they are paid.
- ◆ Age 13-14: Year 9 is seen as critical due to 'options', when students select the GCSEs they will sit. Young people should have the information and advice they need to choose appropriate courses, for example awareness of where STEM subjects might lead.
- ◆ Age 14-16 and 16-18: This is the time when young people are beginning to think about careers and further study in a much more considered way, and when work experience placements in engineering will have most impact. In some cases placements can lead directly to apprenticeships.

"It's too late to talk about engineering when you are doing A-Levels. It would be better to do it when you are thinking about options." (Young Person, Birmingham)



### National Grid's Point of View: Journey

Something we have thought long and hard about is at what age you best engage with young people on engineering. Our view, based on our conclusions from the research and the roundtable discussions with stakeholders, is that this is not about a 'one off' intervention with young people, but is about ensuring young people experience a range of interventions throughout their life at school and college.

That is why we currently participate in a range of schemes, including *Imagineering* for 8 to 16 year olds, *Headstart* presentations for 16 and 17 year olds and industrial placements for university students. This research will allow us to build on what we already do: to offer an integrated programme of initiatives across the educational journey.

### The Engineering Diploma

The Engineering Diploma is not yet clearly established in the minds of young people, parents and teachers. There is limited awareness, with teachers most familiar with it.

Teachers report that the main concern voiced by parents is that of *'not wanting to be a guinea pig'*. There is also confusion about its relative status compared to other qualifications, both against other vocational qualifications and GCSEs and 'A' Levels. This uncertainty is voiced mainly by young people, who are also concerned about over-specialising at an early age.

Although some see the Engineering Diploma as a good way to raise the profile of engineering, they

also raised questions around whether it will make engineering seem less rigorous.

"It just seems a little flimsy. Aren't they like BTECs and weaker than the 'A' Level? Is it as strong as the alternative?" (Young People, London, STEM academic)

A few FE teachers raise issues around a shortage of qualified teachers who are able to teach an Engineering Diploma, feeling currently there is an over-reliance on DT (Design and Technology) teachers to teach engineering courses.

## Our next steps



This research has proved thought-provoking and inspiring and has provided the groundwork for a major review of our education and skills strategy.

As a major global business based in the UK, we are very concerned about the relatively poor profile of engineering among young people, and the wider societal attitudes towards science, technology and maths. The future success of UK business, and our ability to tackle the challenges we face, is dependent on new waves of engineers joining the workforce.

At National Grid, we have debated the findings extensively, and together with the Royal Academy of Engineering, we have shared the results with like-minded organisations and individuals from business, academia and the education community. This partnership approach has helped improve and strengthen our own thinking, and we are grateful to all those who have taken part in these discussions

The research findings, stakeholder discussions and debate within National Grid has led us to develop the following initiatives

#### ◆ National Grid: Tackling Social Exclusion

We were struck by the comments on how work experience and the chances to enter engineering can seem limited to the well-off and affluent. As a business active in communities across the UK, we also know how damaging social exclusion can be, and how it hampers aspiration and opportunities, and harms the nation as a whole.

As a result, we will pioneer a new programme aimed at providing entry points into engineering for young people living in areas of social exclusion in the UK. This will be a set of interventions for children and young people of different ages, and will be intended to provide ideas, inspiration, and practical help to young people.

This autumn, we will start a pilot project in Manchester where young people will be offered a one year paid work experience placement at National Grid, which has the potential to turn into a full apprenticeship. Moving forward, we will work with local schools in areas of social exclusion in Manchester, Birmingham and London, in order to provide routes into engineering and information about career opportunities

Our intention is to grow the programme, so that within a few years around 40 disadvantaged young people every year will get the chance to have a year's paid work experience. We will partner with the Royal Academy of Engineering, The Brightside Trust and Aston University to make this happen.

#### ◆ National Grid: School Power

The research underlined the value in having engineers go into schools and colleges to talk about the profession and the impact of what they do. At present, many of our engineers volunteer to go into schools, and we have seen first-hand how inspirational and rewarding this can be.

We are now committing to bolstering this programme and making it truly national. We will encourage all our engineers to visit local schools, and we will develop a set of powerful presentations and practical activities for our engineers to use. As an initial commitment, 100 volunteers from National Grid will start to work with up to 50 schools.



Building on the success of the current 'Imagineering' programme which helps kids learn about engineering through fun activities, we will now partner with STEMNET to roll out a national programme of after school clubs focusing on science and technology.

#### National Grid: Open House

We saw from the research the value of opening up engineering businesses to young people – in order for them to see first-hand the work, impact and role engineers play in the country; whether that's in transport, the car and aviation industry or the energy sector.

As a result, we will hold 10 open days at National Grid sites every year, which will be aimed at showcasing technology, careers and opportunities to young people, parents and teachers. Alongside this, we will hold 5 open days solely aimed at teachers, and will continue our involvement with The Big Bang – the UK's national science and engineering fair aimed at teenagers.

We will start dialogue with other engineering-related companies, to identify opportunities to increase the number of Open Days the broader industry can provide.

#### National Grid: Work Experience

As the polling and focus groups showed, high-quality and impactful work experience placements are one of the best ways to engage young people and to show them the benefits of a career in engineering. However, we also note the complaints and criticisms voiced about the quality of a lot of work experience placements – which can mean the experience is counter-productive.

Together with the Royal Academy of Engineering, we will develop and implement a blueprint for best practice for engineering work experience placements. We will make this available to power companies and other engineering businesses.

We commit to developing and offering over the next 3 years 100 work experience placements every year, and we will also implement a mentoring and coaching programme aimed at teachers and careers advisors.

Together with our existing skills and education programmes, we believe these initiatives can help improve the status of engineering in the UK, and offer a range of ways to engage young people in the coming years.

We don't pretend to have all the answers, or to be able to solve the problem on our own, but as a business, we are committed to playing a part in re-shaping how people view engineering in the UK. We also know the best interventions and programmes are based on partnerships, and with partners of the calibre of the Royal Academy of Engineering, we are confident we can make a difference.

## Appendix: Methodology

The research was conducted by Brunswick Research, the opinion research practice of Brunswick Group, a corporate communications consultancy. Brunswick Research specialises in exploring opinion leader and public attitudes towards companies and topical debates. If you have questions about the research please contact Brunswick Research on 020 7404 5909 or at [brunswickresearch@brunswickgroup.com](mailto:brunswickresearch@brunswickgroup.com).

#### Qualitative research with young people, parents, teachers and National Grid engineers

Fieldwork ran throughout November 2008 and was preceded by a scoping phase in late October 2008.

- ◆ Twelve qualitative focus groups with young people who sat their GCSEs in summer 2008. Of these twelve groups, two were with young people who were Black African or Black British African and two were with young people of Pakistani or Pakistani British origin. Among the twelve groups, there was an equal split between those who were pursuing an academic qualification (A or AS levels) and those studying for a work-related qualification or taking part in work-based training. Groups were also split between those studying STEM related subjects and those who opted to study any other subjects. Participants were studying at either a secondary school, a sixth form college or at a Further Education (FE) college. Groups were held in London, Manchester and Birmingham.

- ◆ Ten qualitative focus groups with parents of young people who sat their GCSEs in summer 2008. Of these ten groups, two were with parents of young people of Black African or Black British African origin and two groups were held with parents of young people of Pakistani or Pakistani British origin. The group set-up, in terms of STEM vs. non-STEM subjects and academic vs. vocational/work-based training, was the same as for the young people's groups. Groups were held in London, Manchester and Birmingham.

- ◆ Six qualitative trios groups with trios of teachers of STEM related subjects, teaching pupils in Year 12 or equivalent. Teachers in four trios taught GCSEs and A-levels. Out of these, teachers in three trios were teaching in schools, and teachers in one trio were teaching in a sixth form college. Participants in the remaining two trios were teaching work-related qualifications at a Further Education college. Trios were held in London, Manchester and Birmingham.

- ◆ Four qualitative focus groups with National Grid engineers working either as an apprentice, a foundation engineer, a power system engineer or who had recently joined as a graduate engineer. Groups were held at National Grid's offices in Warwick, Wokingham and in Eakring.

- ◆ Focus groups with BME parents and young people were included to provide an additional perspective on the issues and challenges.

	Young people	Parents	Teachers	BME young people	BME parents	Engineers	TOTAL
<b>Participants</b>	<b>8 groups</b> (with those who sat GCSEs summer '08: 4 studying AS-levels, 4 who took a work-related route; groups are either STEM or non-STEM)	<b>6 groups</b> (whose children sat GCSEs summer '08: split between academic and work-related routes; groups are either STEM or non-STEM)	<b>6 trios</b> (GCSEs and A-level at 3 schools and 1 sixth form college, plus work-related qualifications at 2 FE colleges; all teach STEM subjects)	<b>4 groups</b> (2 per ethnic group, split as for main young people's groups)	<b>4 groups</b> (2 per ethnic group, split as for main parents' groups)	<b>4 groups</b> (apprentice & foundation, recent graduate & power system engineer)	<b>32</b>
<b>Location</b>	London, Birmingham and Manchester					Warwick, Wokingham and Eakring	-

### Quantitative opinion polling with young people, parents and teachers

Fieldwork ran from 12 January to 6 February 2009.

◆ A face-to-face survey with a nationally representative sample of 552 young people aged 14 to 18 living in Great Britain. Data has been subsequently weighted to the national population profile based on age, gender, region, socio-economic group.

◆ A telephone survey with a nationally representative sample of 532 parents of young people aged 14 to 18 living in Great Britain. Data has been subsequently weighted to the national population profile based on age, gender, region, socio-economic group.

◆ A telephone survey of 300 teachers teaching young people in Years 10-13 in Great Britain. Half of the teachers taught STEM related subjects and half of them taught non-STEM related subjects. A quota was placed on region to ensure a spread of interviews across Great Britain.

*Where percentages do not add up to exactly 100% this may be due to computer rounding, the exclusion of 'don't' knows' or because of multiple answers.*

# Acknowledgements

This report would not have been possible without the young people, parents, teachers and engineers who participated in our research.

National Grid would like to thank Brunswick Research for conducting the focus groups and polling and for working with us to understand the implications for our business.

National Grid is also grateful to The Royal Academy of Engineering for their continued advice and support, and in particular for their role in bringing together the engineering community.

The following organisations participated in the round table discussions and we would like to thank them for their many insights on the topic of engineering and skills.

- ◆ Aston University
- ◆ British Science Association
- ◆ Business in the Community (BITC)
- ◆ Cambridge University
- ◆ Campaign for Science & Engineering (CaSE)
- ◆ Confederation of British Industry (CBI)
- ◆ Council for Science & Technology
- ◆ Engineering Technology Board (ETB)
- ◆ Energy and Utility (EU) Skills
- ◆ Gatsby Charitable Foundation
- ◆ Higher Education Academy Engineering Subject Centre
- ◆ Headteachers and Industry (HTI)
- ◆ Institute of Engineering & Technology (IET)
- ◆ Institute of Gas Engineers & Managers (IGEM)
- ◆ Institute of Mechanical Engineers (IMechE)
- ◆ Imperial College
- ◆ INFOHRM
- ◆ National Employer Service (NES)
- ◆ Nuffield Foundation
- ◆ The Sector Skills Council for Science, Engineering & Manufacturing Technologies (SEMTA)
- ◆ STEM Advisory Forum
- ◆ STEMNET
- ◆ The Brightside Trust
- ◆ The Council for Industry & Higher Education (CIHE)
- ◆ UK Resource Centre for Women in Science, Engineering & Technology (UKRC)



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