

Views from UK energy professionals



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Foreword from the Chief Executive



Louise Kingham
OBE FEI

For over a century, the Energy Institute (EI) has developed and shared knowledge, skills and good practice towards a safe, secure, affordable and sustainable energy system. As the professional membership body for the energy sector, we support over 21,000 individuals working in, or studying, energy in over 100 countries. Our members hold a wealth of expertise and experience, and the EI has a responsibility to use this to enhance understanding of energy issues.

To both fulfil this responsibility and share our members' knowledge for the public benefit, the EI has launched the Energy Barometer. This aims to voice the views and insights of energy professionals, helping them to inform the energy debate. It also demonstrates the value of their knowledge and expertise to governments, influencers, the industry, and the public.

With a primary focus on the UK energy system, the Energy Barometer will be produced annually from surveys of our membership, covering both topical issues and regular subjects for year-on-year comparison. The surveys will be conducted among our newly formed EI College, a group representing professional EI members.

Members of the EI College have been asked for their views on the UK energy system, and their perception of the challenges and opportunities facing the industry. By capturing these views, it is our aim to provide a conduit to the knowledge of those at the heart of the industry, the energy professionals.

It is my sincere hope that the Energy Barometer can become a tool for all those involved in shaping our energy system. I invite all those with a responsibility for, and interest in, energy to consider these expert insights and talk to us about how, together, we can make the most of this resource.

Louise Kingham OBE FEI
Chief Executive, Energy Institute

Presidential remarks



Professor Jim Skea
CBE FRSA FEI

The EI's membership is at the heart of the Energy Barometer initiative. We have assembled a College of 850 professionals and graduates to represent this membership. I am extremely grateful to those who have agreed to take part for their generosity in sharing both their time and knowledge.

To form the EI College, individuals were invited from across the professional membership grades of Fellow (FEI) and Member (MEI), as well as pre-professional Graduate members (GradEI). This process has ensured that a wide range of sectors, disciplines, and seniority levels are represented. The qualifications of this group provide a robust backbone for the findings presented in the following pages.

The questions for this year's survey were researched and developed by the EI Knowledge Service, with guidance from the EI's Energy Advisory Panel and a survey expert based at Cardiff University. The questions cover a wide range of topics, including energy policy, skills, investment and innovation. The survey was completed online in February 2015 by 543 College members.

The EI Knowledge Service analysed the responses, extracted key messages and drafted this report. We intend the report to be a helpful resource for policy development, a useful gauge of industry trends and a chance for self-reflection by the UK's energy industry. As we plan to repeat the exercise on an annual basis, this report establishes a baseline for measuring the changing perceptions of energy in the UK. The 2015

Energy Barometer report represents a first step in creating an informative, and useful picture of the energy industry painted by the people closest to it.

I extend my sincere thanks to the Energy Advisory Panel, the EI Knowledge Service and Dr Dimitrios Xenias from Cardiff University for their help in the design and execution of the survey and the preparation of this report. Most importantly, I would like to thank the members of the EI College who participated in this important work. The publication of this report would not be possible without their commitment to sharing their knowledge. The UK energy sector, and society more widely, can only benefit from their commitment.

Professor Jim Skea CBE FRSA FEI
President, Energy Institute

Executive summary

Energy professionals have unique insights into how the energy system operates and how the industry and policymakers can effect change. Energy forms a complex system. The impact of any intervention or change of practice will ripple through the entire system. Today's prices and bills may dominate the headlines, but actions taken today will also affect future prices, employment and economic opportunities, safety, the environment and wider society. The Energy Barometer initiative elicits the views of professionals within a new EI College, which represents a cross-section of the EI's membership. The Barometer covers a wide range of questions, and this new report distills the responses under four main themes: the policy framework; energy investment and innovation; knowledge and skills; and public engagement.

Policy continuity

EI members see policy continuity as an essential component to reduce investment risk and encourage a long-term view, while promoting better use of existing technology and increasing innovation. They also believe the complexities of the energy system, driven by competing priorities, necessitate clearly-communicated policies that are consistent over time and with each other. Recognising the challenge for policymakers of balancing the sustainability, security and affordability priorities, EI members offer themselves as a resource to help deliver solutions.

Low carbon investment

EI members believe greater levels of investment in energy technology and infrastructure are required. This investment, centred on the transition to a low carbon energy system, should focus especially on energy efficiency and upgrading ageing system infrastructure. These areas are also identified, along with energy storage, as having the greatest scope for innovation. EI members think increased funding for innovation should come from a range of public and private sources, without increases being passed through to consumer bills.

Forward planning and knowledge transfer

Forward planning and the necessity to build capacity for the future is also a priority area for EI members. This includes both physical infrastructure and skills and capabilities within a changing workforce. Establishing programmes to retain knowledge is seen as a requirement to ensure experience is not lost and good practice is shared between established and emerging sectors. Industry will need to attract and retain capable people, across demographics, by appealing to a new generation of professionals.

Engaging the public

People are at the heart of the energy industry, whether as the resource upon which it relies or the consumers that it serves. EI members believe the industry is not effectively communicating with the public. Adoption of new technologies,

acceptance of major projects and changes in behaviour are expected to rely on the industry's ability to communicate well. To improve perceptions of the industry, EI members recognise the need for meaningful engagement with the public, to support better understanding of the challenges faced by both parties.

This will necessitate clear, positive messaging to meet the compound challenges of energy security, affordability and sustainability.

Introduction

The global energy system is going through unprecedented change to make the transition to a low carbon world. The pressures on the energy system are as much social and environmental as they are economic, leading to calls for countries to secure supplies of energy affordably and sustainably. Nations each have their own social contexts, technical challenges and competing priorities, which contribute to a constantly shifting and uncertain landscape. In this complex, changing sector, industry leaders as well as policymakers must make decisions for the future based on the best information available.

In the UK, the energy conversation regularly shifts focus: from consumer bills, fracking, and global climate change, to wind power, the price of oil, and job opportunities. In addition, the UK energy industry faces many challenges, such as managing capacity constraints in the gas and electricity grids to match demand, reforms to the electricity market to encourage low carbon investment at unprecedented levels, and finding new business models that fully use innovative technologies, including smart meters and appliances.

We are all challenged with identifying the significant trends within a constantly shifting conversation to make robust, long-term decisions. To better inform these decisions, new relationships are being formed between all parties; the public, policymakers, and industry professionals are all becoming more engaged in the debate.

The EI has called upon its members to provide insights into the industry's current and future challenges. Members have identified their biggest issues, with themes emerging on policy continuity, investment and innovation needs, skills, and public engagement. These have been used to frame this report.

“The exam question on energy is in four parts: How do we get the energy we need, while avoiding dangerous climate change, at least cost, and with a high likelihood of success? These four requirements are strongly evident in the EI's Energy Barometer. The skill and creativity of EI members are crucial contributors to passing the energy exam.”

– James Smith CBE HonFEI Former President, Energy Institute

Ten key messages from energy professionals

EI members were asked to identify the biggest challenge facing the energy industry in 2015, as well as any other challenges they anticipate. Their responses provide the context for the more detailed analysis undertaken in this report. The top ten challenges identified span the entire industry, and demonstrate the broad range of issues affecting the energy industry.

“Addressing and showing a strategic way forward for a secure energy future”

“Developing and applying a realistic balanced energy policy”

“Justifying investment given political uncertainty and weak fossil prices”

Energy policy

Signals from government and regulators can have significant effects on the energy industry as it strives to meet today's challenges and plan for the future. EI members are vocal regarding the need for clear, coherent and stable energy policy within a strategic framework. This is vital for enabling a progressive energy future and enhancing UK competitiveness. EI members acknowledge and understand the difficulties of balancing policies to accommodate issues of supply security, sustainability and affordability.

Investment and cost

EI members highlight new low carbon energy supplies and electricity generation infrastructure to replace ageing assets as priority areas for investment. There is also a significant level of support for increased investment in energy efficiency measures. EI members are concerned that the current low oil price, price volatility and uncertainty following the General Election will have a negative impact on investment in the short to medium term.

“Infrastructure improvements and developments are always put-off for the next generation. This must change”

“Maintaining balance between security of supply and climate change obligations”

Supply security

EI members see security of the UK's energy supply as the top 'biggest challenge', and support the increased development of indigenous resources. A particular concern for EI members is the issue of short-term electricity supply, as legacy assets come to the end of their life. The current financial strain on the oil and gas sector due to the low oil price is also highlighted, particularly within North Sea production. The perceived tensions of energy security with sustainable development priorities are also recognised.

Low carbon energy

EI members recognise the transition to low carbon energy production is critical, but acknowledge that a number of challenges must be overcome, including low hydrocarbon prices, low investor confidence, and for some technologies, wider public acceptance. However, members suggest that this transition can be enabled by providing a framework that encourages long term planning to ensure effective integration of new technologies.

“Developing the smart grid and viable and safe storage linking to electric vehicles, hybrid and hydrogen next generation transport fleet”

“Transition from independent reliable North Sea self-supply”

Public engagement

EI members identify public engagement as necessary for building understanding, trust and consumer confidence in the energy industry. There are many areas of misunderstanding, such as the costs and timescale of investment and infrastructure projects, the risks of dependence on single energy sources, the real scale and impacts of a transition to a low carbon energy system, and the opportunities for innovation and jobs in balancing sustainability, cost, and security priorities.

Natural gas and oil

EI members recognise that a balance must be struck between economical and efficient use of remaining natural gas and oil resources and the transition to cleaner energy sources. These indigenous resources are seen still to have an important role to play in meeting future energy needs.

“Trying to go greener whilst still trying to make profit”

“Building trust and having effective dialogue with consumers”

“Not to be seen as villains in climate change debate”

“Shale oil extraction must be properly regulated particularly with regard to monitoring of water quality and regulation of chemicals used”

“North Sea oil and gas cost efficiency”

Ten key messages from energy professionals

“Long-term sustainability. Meeting energy demands sustainably”

“Developing a pipeline of energy professionals to tackle future challenges”

“Reducing the peak load on the electricity and gas grids”

“Trust in an environment of relatively low prices”

“The new EI Energy Barometer zones in on the biggest challenges facing our sector, and society, over the next few years. From energy security and low oil prices to maintaining trust, these are the issues highlighted by people working at the heart of the energy industry. They will resonate as a timely contribution to the policy debate”

– Brent Cheshire UK Country Chairman, DONG Energy

Sustainability and climate change

EI members are mindful of the need for energy demand to be met sustainably and see the importance of a positive outcome from the 2015 Conference of the Parties (COP21) in Paris. A number of members point to the need to consider life-cycle emissions from technologies, projects and products.

People and skills

Respondents emphasise the urgent need to maintain the supply of skilled workers into established and developing sectors. They also express the need to preserve and transfer the knowledge of those preparing to leave the industry to a new generation of energy professionals.

Energy demand and efficiency

Demand reduction, energy efficiency, energy management and behaviour change are seen as important areas by EI members, particularly in relation to the UK building stock. They highlight the contribution that reduced energy demand can make to meeting the challenges of security, sustainability and affordability.

Low oil prices

EI members express concern about the impact of low and volatile oil prices on essential planning and investment in the UK’s energy system. Specifically, they acknowledge that current low oil and gas prices may negatively impact investment and jobs, security of supply and the competitiveness of and focus on low carbon technologies.

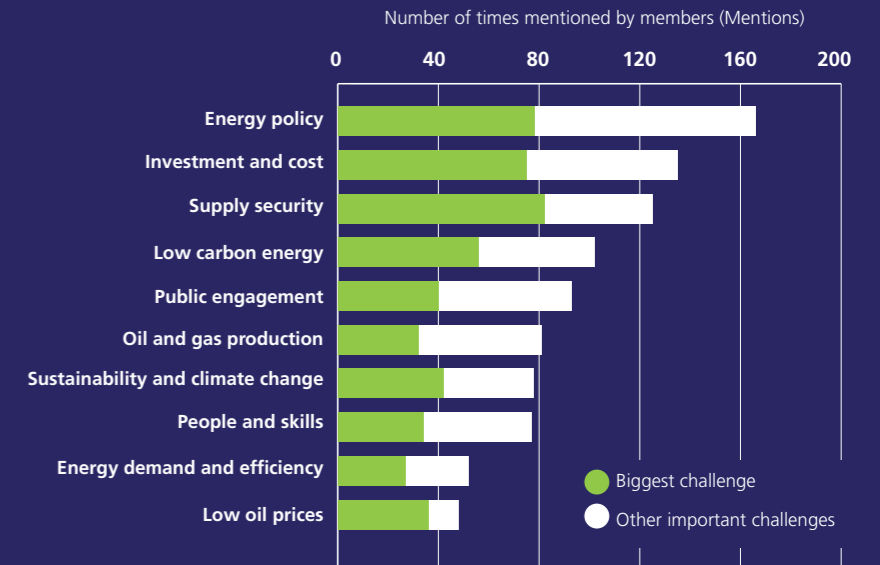
“Having a holistic and circular economy approach”

“Skills challenge – attracting, retaining and motivating people to join the industry”

“To promote energy efficiency both in commercial and Industrial world”

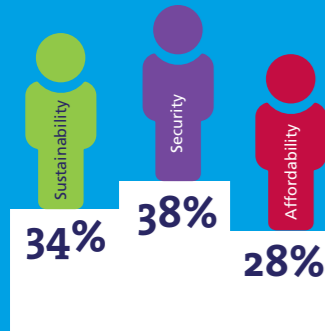
“Manage long-term commitments in the face of short term price volatility”

Q Free responses coded and consolidated from two questions: **What do you think is the biggest challenge for the energy industry in 2015?** N = 475 (N = number of respondents); **Please list any other challenges you think the energy industry will face in 2015.** N = 390

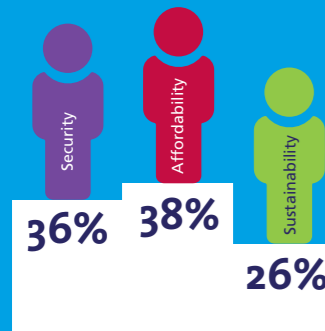


Priorities versus perceived priorities

Q In what order would you prioritise the three elements of the Energy Trilemma (security, affordability, sustainability)? How do you expect UK policymakers to prioritise the three elements of the Energy Trilemma during the next 3 years?
N = 543. Answers ranked by priority and shown as a percentage.



Members' priorities



Perceived policymakers' priorities



POLICY

Policy continuity

The policy landscape has a significant influence on planning and decision making across the energy industry. EI members recognise the industry and policymakers must work together to help one another achieve the mutual aim of delivering secure, sustainable energy at least cost. Policy continuity is identified by EI members as essential to reducing investment risk and enabling long-term planning, as well as promoting better use of existing technology and fostering innovation.

Competing priorities: Security, sustainability and affordability

Industry professionals and policymakers share an ongoing challenge in balancing the sometimes conflicting priorities of energy security, sustainability and affordability. EI members acknowledge that all three elements are important and must be given attention, and generally feel that policymakers share this stance. A slight discrepancy arises between members' priorities and their perception of policymakers' priorities regarding affordability and sustainability; however, they are broadly in alignment.

Distinctly, GradEI members are inclined to place sustainability as their number one priority, although graduates' perception of policymakers' priorities matches that of other professionals. This suggests a generational shift in priorities.

Carbon budgets

The general perception among EI members is that, given current UK emissions policies, the impending 3rd and 4th carbon budgets will not be met. The anticipated shortfall grows as the timelines are extended to 2050, by which time more than 8 in 10 members expect the UK to fall short of the 80% reduction required. Whilst policies are deemed to deliver little effect in achieving these targets, the reality of the global downturn and related economic factors are likely to help to achieve the shorter-term targets. The recent economic situation aside, members' views demonstrate the extent to which those working in industry believe significant additional effort is required to meet the UK's climate targets.

“Meeting the UK’s environmental obligations will require profound changes in the production and consumption of energy across all sectors of society. Policymakers, industry and other experts will need to continue to work together to develop the forward-looking policies which give business the financial and regulatory stability for investment decisions, while supporting the economy onto a low carbon, sustainable growth path.”

– Erik Bonino Chairman, Shell UK

Emissions targets measures

Best measures to meet UK emissions targets



Will COP21 agreement keep us below 2°C temperature rise?

Similarly, members are not confident a binding agreement from the 2015 Paris Conference of the Parties (COP21) will be sufficient to keep global temperature increases below 2°C. That said, they also feel that such an agreement will have little impact on the UK's economic competitiveness, should it come into effect.

Measures to reach UK emissions targets

The transition to a low carbon energy system and associated emissions reduction will require a combination of different approaches. When asked which single measure, to be taken by a new government, would be most effective in helping to reach the UK's emissions targets, EI members preferentially supported actions and broader frameworks to develop nuclear energy, energy efficiency and energy from renewable sources.

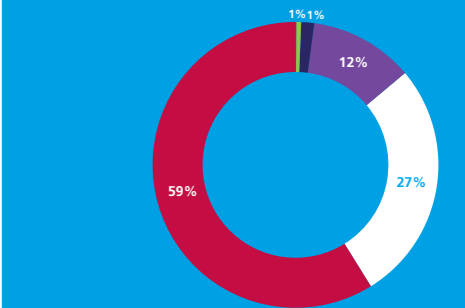
Q What single measure would be best taken by the next government to reach these UK emissions targets?
N = 452. Free responses coded and consolidated.

Rank	Measure	Mentions
1	Build more nuclear capacity	81
2	Focus on energy efficiency	69
3	Build more renewable energy capacity	63
4	Develop carbon capture and storage (CCS)	40
5	Increase direct investment in energy technologies	33
6	Transition to low carbon	33
7	Decarbonise across the economy	29
8	Maintain consistent and stable policies	25
9	Provide incentives	25
10	Reduce transport emissions	20

● Action ● Framework

Carbon budgets 2050 climate target expectations

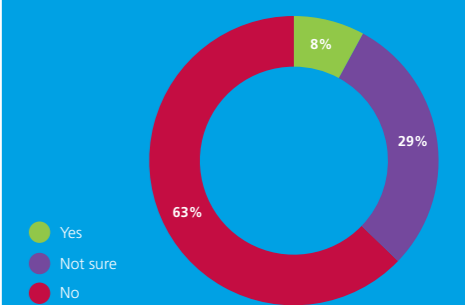
Q The 2050 UK climate target is to reduce emissions by at least 80% (from 1990 levels). Given current UK emission reduction policies, respondents were asked to select the expected outcome. N = 543.



● Significantly exceed the target (88% or larger reduction)
● Exceed the target (83–87% reduction)
● Meet the target (78–82% reduction)
● Fall short of the target (73–77% reduction)
● Fall significantly short of the target (72% or smaller reduction)

Binding agreement Agreement at COP21 preventing a 2°C rise

Q If a legally binding agreement (i.e. “a protocol, another legal instrument or agreed outcome with legal force” – UNFCCC) is agreed upon at the 2015 Paris Conference of the Parties (COP21), do you think it will be sufficient to keep global temperatures below the targeted 2 degree Celsius rise?

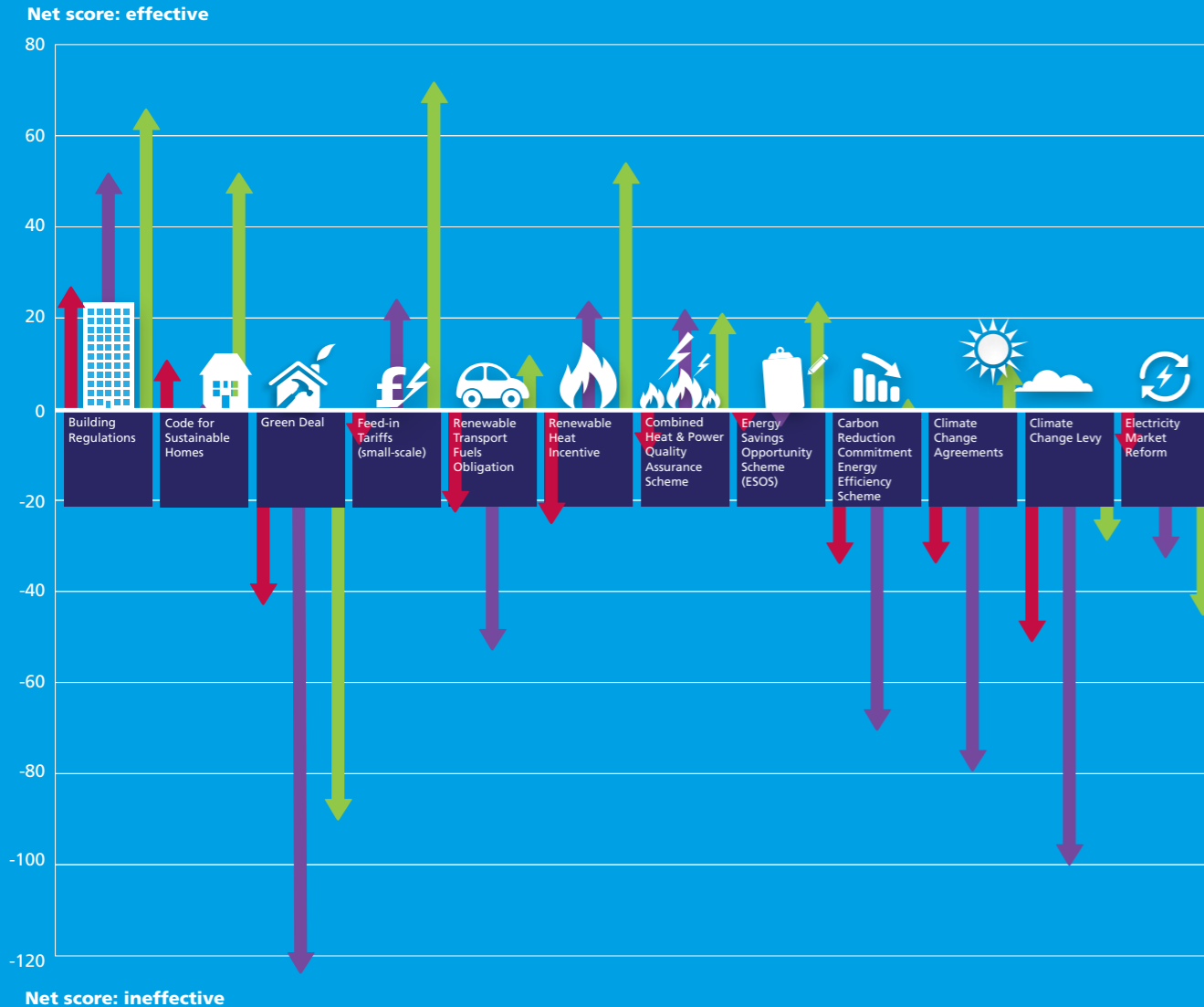


● Yes ● Not sure ● No

UK energy policy effectiveness

Q How effective do you think each of the following UK energy policies is at meeting your top Trilemma priority?
 N = 543. Responses segmented by security, sustainability, affordability priority ranking. Net effectiveness score calculated by subtracting 'ineffective' and 'counter-productive' responses from 'effective'.

- Affordability
- Security
- Sustainability



Policy effectiveness: What's working and what's not

Effectiveness of UK policies at meeting respondents' top trilemma priority

A number of existing policies have been examined for effectiveness based on how well they contribute to each respondent's top priority, either security, sustainability, affordability, or affordability. Overall, the Building Regulations relating to the conservation of fuel and power are perceived to be an effective mechanism, scoring well in each priority area. This highlights the positive light in which this policy is held. Some members believe these regulations could be further strengthened.

Feed-in Tariffs (FiTs) are also cited as being effective, particularly from a sustainability and security perspective, by providing long-term assurance for investors while delivering increased generation capacity. However, members are less sure of their benefits from an affordability standpoint. In fact, for those prioritising affordability, most policies are regarded as being more ineffective than effective. This is particularly interesting in the light of members' perception that affordability is the number one priority for policymakers.

EI members are critical of the Green Deal across each of the three priority areas. It is regarded as complicated to understand and apply for, and lacking sufficient financial incentives (specifically, competitive interest rates) to be taken up at scale. Whilst it should be noted that not all of these policies are likely or intended to address every priority directly, the Green Deal, Climate Change Levy and Electricity Market Reform

have a net ineffectiveness for every priority category. The indication from members is that to be effective, policies should provide sufficient clarity, incentives or assurances to make an impact and draw participation from investors. They should also be easy to implement and well-communicated to stakeholders.

“Feed-in tariff has worked well both in the UK and elsewhere. This is a simple intervention that reduces the risks for the investors and delivers the capacity”

“Green Deal: need to build demand with supporting policies that bring home the value of energy efficiency (e.g. differential council tax / Stamp Duty and, in the long term, Part L Building Regulations applying to ALL buildings). Need also to encourage finance offerings at attractive rates of interest”

– Survey responses

Electricity Market Reform

Electricity Market Reform (EMR) was reviewed in more detail to ascertain how well each of its four mechanisms is stimulating low carbon investment. These components are predominantly seen as effective, and FiTs with Contracts for Difference have the strongest positive response. The capacity mechanism and carbon price floor are seen as having a broadly neutral overall impact.

Interestingly, responses from those working in the electricity and power generation sectors indicate broadly similar trends to the general responses, except for the capacity mechanism, which is viewed as moderately less effective. This suggests some misgivings about the capacity mechanism from those closest to it.

The high number of members expressing uncertainty about this question is likely a result of the relative infancy of this set of policies, implying that more time will be needed to determine their reception by investors and their subsequent impact. This could also be a result of the complicated nature of this specific set of incentives.

“Electricity Market Reform has led to a reduction in strategic thinking for the UK and delays in investment”

“EMR... has been constantly tweaked and has become an enormously complex set of rules. The risks on developers in getting a project through to consent without knowledge of whether they can get a CfD contract or at what price will outweigh any theoretical advantages”

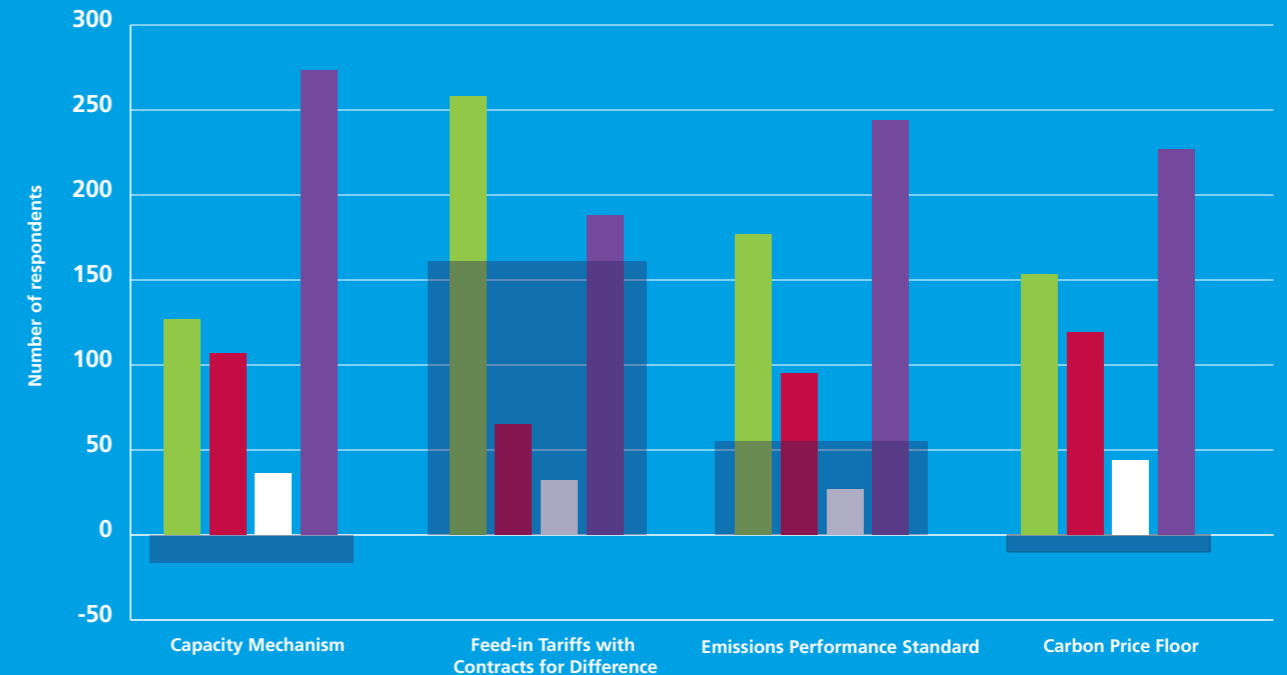
“Whilst the economic principles are sound, there is far too little liquidity in relation to each of the component market solutions – as a result the objectives are achieved at much too high a cost to consumers”

“Carbon floor price is vital to put a cost on CO₂ emissions, [and it is] an effective counter to the failure of [the EU Emissions Trading Scheme], has progressive application, and pragmatic adjustment”

– Survey responses

Encouraging low carbon electricity generation – Electricity Market Reform














Q How effective do you think each of the following Electricity Market Reform (EMR) mechanisms will be in encouraging investment in low carbon electricity generation?
 N = 543. Net effectiveness score calculated by subtracting 'ineffective' and 'counter-productive' responses from 'effective'.



- Effective
- Ineffective
- Counter-productive
- Not sure
- Net efficacy score

UK investment risk

Q How do you think UK investment risk due to policy uncertainty has changed for the following low carbon technologies in the last 12 months?
 N = 543. Answer options: 'Risk increased', 'risk decreased', 'stayed the same', 'not sure'.
 Net risk score calculated by subtracting 'risk decreased' from 'risk increased' responses.

Perceived risk (Net score)		Risk increased
 Coal with CCS		215
 Onshore wind		198
 Natural gas with CCS		141
 Offshore wind		115
 Marine		99
 Hydrogen		92
 Nuclear		49
 Solar		42
 Hydro-power		17
 Energy storage (electricity, heat)		13
 Small-scale renewables		12
 Transport efficiency (and enabling infrastructure)		6
 Energy efficiency		51
		Risk decreased

These numbers represent the difference between the number of 'risk increased' and 'risk decreased' responses.

Investor confidence

“The Barometer results underline how much investment depends on policy continuity and how much policy uncertainty in the recent past has impacted confidence in technologies such as carbon capture and storage and onshore wind. The lesson for the government is clear – it must make clear to project developers the size of the future market for this technology in the coming years”

– **Joan MacNaughton CB HonFEI**
 Former President, Energy Institute

EI members were asked to assess the impact of policy uncertainty on investment risk over the past 12 months for a number of low carbon technologies. Overall, investment risk due to policy uncertainty is seen to have increased for most low carbon technologies, with the notable exception of energy efficiency. At the time of responding, members suggested this was mainly due to the proximity of the General Election, combined with wider geopolitical issues.

Impact of policy uncertainty on investment risk

The greatest increases in investment risk are observed in electricity generation from coal and gas using carbon capture and storage (CCS), and onshore wind. The development of CCS is seen to be inhibited by lack of incentives for its deployment. Members link onshore wind risk to public opposition to its development in many areas of the UK.

Policy uncertainty is regarded as having a relatively neutral effect on investment risk for several other low carbon technologies, including energy storage, small-scale renewables and hydro power.

Energy efficiency is perceived to have become less risky for investors over the past 12 months. This is true for the efficiency sector as a whole, including sub-sectors such as transport efficiency. This could be due to a number of reasons, for example the introduction of the European Energy Efficiency Directive in late 2012 or the intended impact of the Green Deal.

Continuous improvement

Members agree that policy continuity and certainty are critical for sustained investment in (and therefore the propagation of) energy technologies. A long-term, holistic approach to energy policy will give industry and investors the confidence to plan, ensure capital can be raised to support major projects and developing technologies, and allow sufficient time for the results of policies to take full effect.

In many instances there are high numbers of members unsure about the impact of energy policies, particularly recent policies, such as EMR. These findings suggest that even for the professionals working in the sector, there is a need to better understand the implications on specific technologies.

The EI can make a significant contribution to understanding the potential impact of technologies by sharing knowledge at an early stage, amongst energy professionals and policymakers. This will benefit wider society by testing the hypotheses that underpin proposed policy and by challenging thinking, helping to uncover any unforeseen consequences of proposed policy and helping lay the ground for robust policies in future.

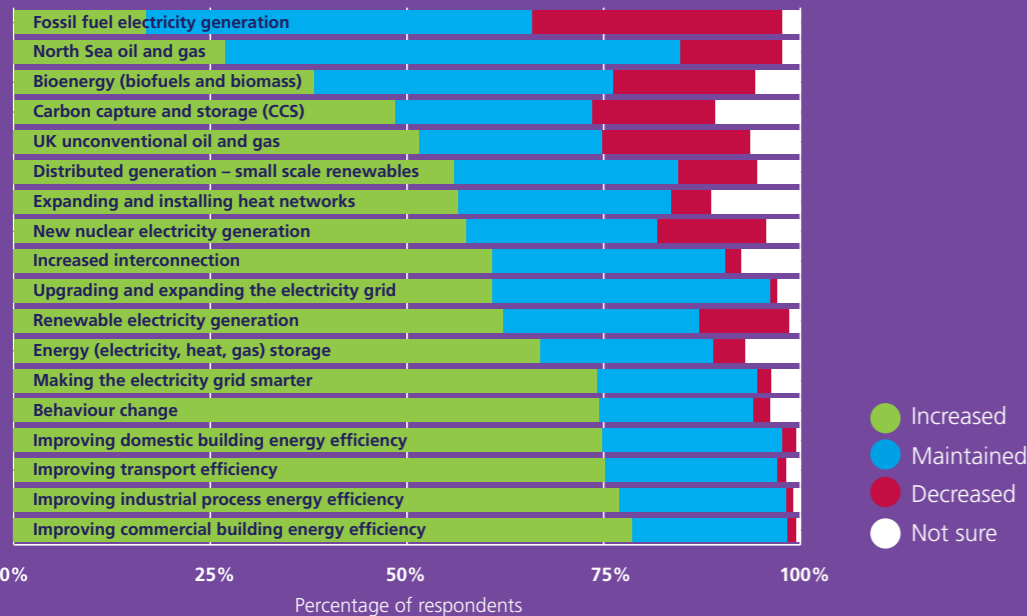
Investment levels

Changes in investment levels

“The most pressing need is for a global focus on the development of technologies to produce energy from clean, reliable, competitively priced primary sources. Climate change, very largely attributable to fossil-fuel burning, provides a looming but avoidable catastrophe, but the co-benefits in energy security, health and wellbeing, and long-term prosperity alone justify the investment of funds needed for these exciting low carbon innovations”

– Sir David King FRS HonFEI Special Representative for Climate Change, Foreign Office

Q In order to maintain security of supply and meet environmental goals affordably, what do you think should happen to UK investment levels (from all sources) for the following areas over the next 3 years? N = 543



Decarbonisation: The five technologies perceived to have greatest potential



Investment and innovation

There is consensus among EI members that greater levels of investment are needed across all energy technologies and sectors, with an emphasis on securing our supply while also driving the transition to a low carbon energy system. This investment will be integral to expanding and updating infrastructure, advancing new technologies while making better use of existing ones, and improving efficiency at all stages of the energy chain.

Future investment

When asked how investment in the energy system should change over the next 3 years, EI members call for increases across the board in low carbon generation. Strongest support is shown for low carbon measures and those linked to security of supply, including all forms of energy efficiency (in buildings, industrial processes and transport), upgrading and expanding the grid (including the roll-out of smart technology), behaviour change and energy storage. This strong trend for low carbon support comes from respondents irrespective of the industry sectors in which they work.

Investment in the extraction of oil and gas from the North Sea should also be maintained or increased in the short term, according to EI members. It is noted that investment in the North Sea will need to continue for the foreseeable future, to support both maintenance of the current infrastructure and, in the longer term, end of life decommissioning activities.

Fossil fuel electricity generation is the only sector in which respondents prefer investment levels to decrease than increase. However, the picture for fossil fuel power generation is complicated, as demonstrated by the moderate support for increased investment in CCS and recognition of its potential to make a contribution to cost-effective decarbonisation.

Technology potential

The longer-term question of technology potential by 2030 shows the importance members place on energy efficiency, with 6 in 10 mentioning the value of these measures. Transport infrastructure and efficiency also featured amongst the top cited measures. Of energy supply technologies, nuclear power is seen to have greater potential than other low carbon sources, followed by natural gas with CCS. The emergence of energy storage and the weight placed on this new technology by EI members is significant, with respondents also highlighting the opportunities for innovation in this area.

Q In the UK, which technologies have the greatest potential to make a cost-effective contribution to decarbonisation, without subsidies, by 2030? N = 543, selecting multiple answers (av. 3.8 technologies selected).

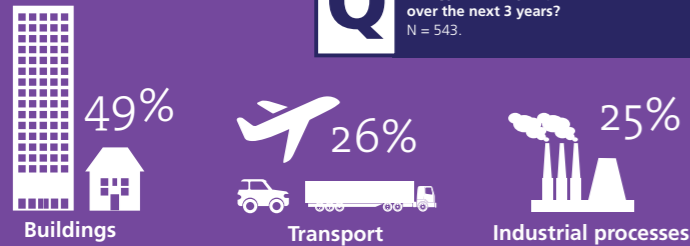
Rank	Technology	Percentage
1	Energy efficiency	61%
2	Nuclear	42%
3	Transport efficiency (and enabling infrastructure)	37%
4	Natural gas with CCS	31%
5	Energy storage	31%
6	Solar	30%
7	Offshore wind	27%
8	Onshore wind	24%
9	Small-scale renewables	24%
10	Hydro-power	21%
11	Coal with CCS	17%
12	Marine	15%
13	Hydrogen	10%
14	Other	7%

“There remains a strong need for sustaining high investment into the North Sea oil and gas sector. There is only a short window of opportunity to maximise output from existing production and to find and develop remaining smaller prospects, whilst the ageing production infrastructure is still in place and operable. The UK will be a major net oil and gas importer for many decades, so maximising our own North Sea production has huge economic and employment benefits”

– Malcolm Brinded CBE FEng FEI Vice President, Energy Institute

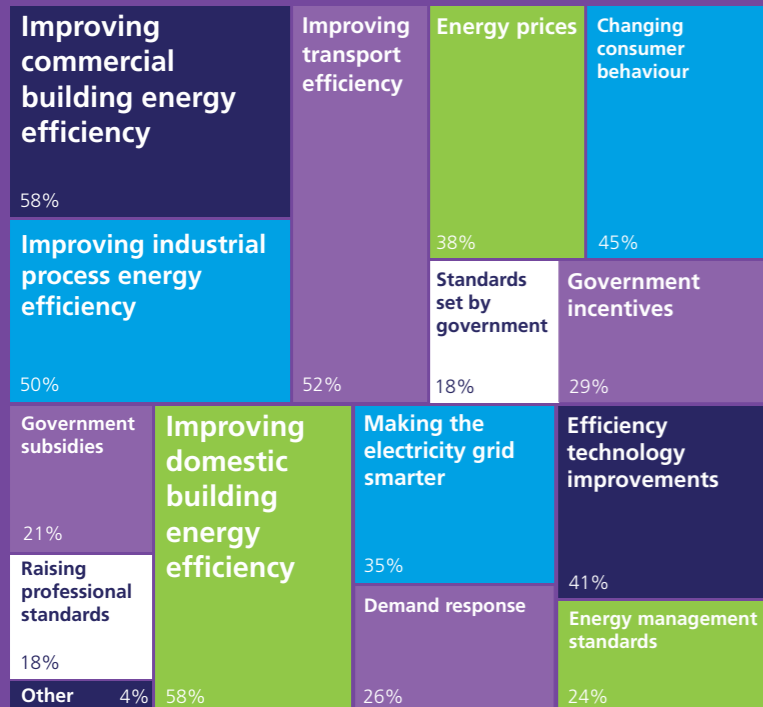
Greatest scope for energy efficiency improvements

Q In which sector do you think the GREATEST energy efficiency improvements can be made over the next 3 years?
N = 543.



Reducing energy demand

Q Which factor(s) do you think will have the GREATEST impact on reducing UK energy demand in the next 3 years? Please tick all that apply.
N = 543.



Focus on energy efficiency

Energy efficiency is consistently identified as a top priority for investment and for its potential to deliver cost-effective decarbonisation. To provide additional insight into this sector, EI members were asked to identify which factors have the greatest potential to reduce UK energy demand.

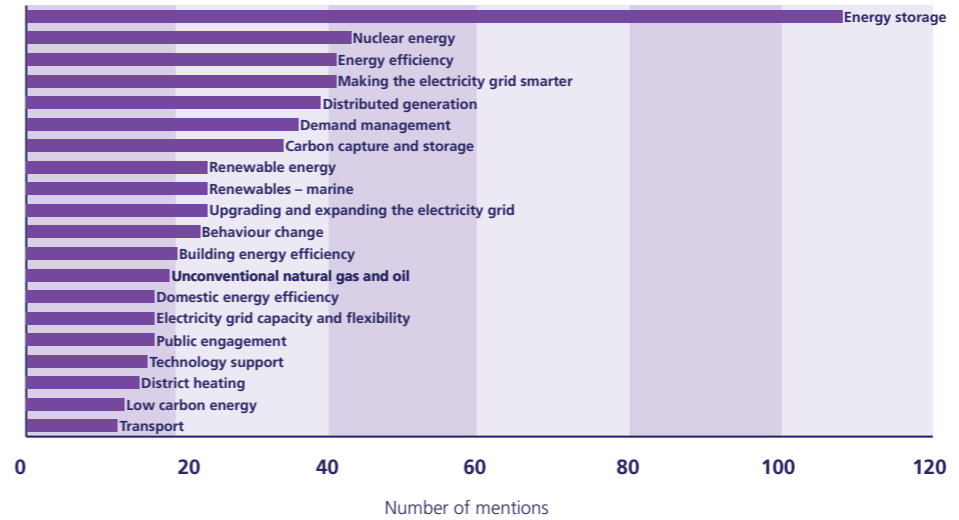
Respondents think the greatest short-term gains can be made through greater efficiency in the built environment, across both domestic and commercial properties. A combination of improved building fabric in new structures, retrofit and insulation of existing building stock, and better management and control of energy use are specified as ways to reduce energy demand within this sector. Improving transport efficiency and changing consumer behaviour are also seen as key to reducing demand in the short term.

Whilst the potential for energy efficiency improvements in buildings is emphasised by 49% of members working across the energy industry, for those working on the demand side, this trend is even more pronounced. 59% of members who manage energy or who work in the demand sector single out buildings as having the greatest potential over transport or industrial efficiency.

Focus on innovation

Respondents reiterate strong support for a transition to a low carbon energy system and the protection of the UK's security of supply in their innovation priorities. Energy storage stands out by a significant margin as having the greatest scope for innovation, with EI members acknowledging the potential for this new technology. Energy efficiency, a smarter electricity grid, distributed generation and demand management, all of which are closely related to energy storage, are also highlighted as in particular need of innovation.

Greatest need for innovation



Nuclear energy innovation is the highest ranked large scale energy supply technology, although it should be noted that this includes suggestions related to both fission and fusion technologies. CCS is also identified as in need of innovation, although as previously stated, the broader conditions for development of these supply technologies is still uncertain.

EI members were asked how they hope to see funding levels for innovation change over the next three years. Respondents agree overall innovation support should be increased, with many sources of investment needed, but are conscious that any funding should not come directly from consumer energy bills.

Enabling the low carbon transition

These investment and innovation priorities highlight the consensus among EI members around the UK's shift to a low carbon energy system. Secure investment will be needed to stimulate and deliver innovation.

However, driving innovation, upgrading grid infrastructure and improving efficiencies cannot be achieved by an injection of funds alone. The industry will need a substantial supply of skilled workers and entrepreneurs equipped with the capabilities to develop and deploy new technologies, make better use of existing ones and adapt to a rapidly changing energy system.

EI members are consistent in calls for increased investment across low carbon energy technologies. The EI can provide a forum for investors and policymakers to engage with industry in order to facilitate and encourage long-term strategic investment towards a low carbon economy.

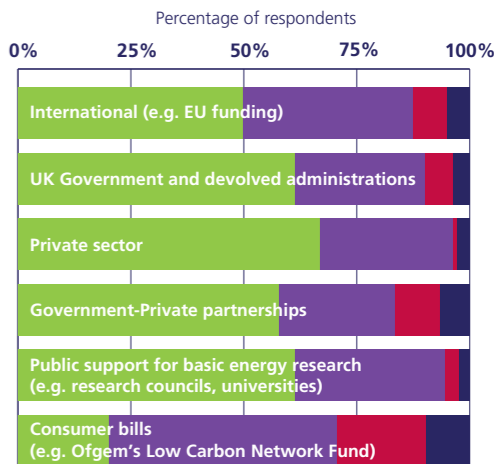
Q Where in the energy system do you think is the greatest need for innovation?
N = 469. Free responses coded and consolidated.

“Significant investment in energy efficiency across the whole economy will deliver warmer homes and more competitive businesses, as well as contributing to cost-effective achievement of energy security and carbon emissions reductions. A consistent and robust energy policy framework is required to support energy efficiency market development through appropriate regulation and incentives for investment”

– Dr Joanne Wade FEI Chair, EI Energy Advisory Panel

Preferred sources for additional innovation funding

Q What should happen to support for UK energy innovation from the following sources over the next 3 years? N = 543.



Qualified workers in 2015 and 2020: surplus or shortage?



Q Can you identify any existing surplus or shortage in qualified workers in any of the following energy sectors.
 N = 543. Answer options: Surplus, neutral, shortage, not sure. Perceived supply calculated by subtracting 'shortage' from 'surplus.'

● Surplus
 ● Shortage

The numbers shown represent the difference between the number of 'surplus' and 'shortage' responses.



Jobs, knowledge and skills

Planning ahead and building capacity are priorities if we are to meet the challenges of a changing energy system. This applies to both the physical infrastructure and to the provision of skills and capabilities within the workforce. Having already identified a real need for investment and innovation to drive forward the low carbon transition and provide secure sources of energy, members are keen to ensure adequate numbers of skilled workers are in place to achieve these goals. This will involve attracting and retaining capable people across demographics by appealing to a new generation of professionals. At the same time, the knowledge of those retiring from the workforce must be retained to ensure experience is not lost and good practice is shared between generations and across established and emerging sectors.

Supply of expertise

The resounding message from EI members is that there are shortfalls of qualified workers across most parts of the energy industry. Low carbon sectors, including new nuclear power, CCS, plus unconventional oil and gas production are among those with the greatest current perceived shortages. These are expected to persist over the next five years.

The sectors identified as having the largest skills shortages are also those thought to be most vulnerable to investment risk. Unfortunately nuclear power and CCS, the energy supply technologies earmarked as having the greatest potential to meet

climate goals, are also the areas thought by the largest number of members to be experiencing a skills shortage. Only electricity generation from fossil fuel bucks this trend, with EI members detecting only a minor deficit both now and in five years' time.

The North Sea oil and gas sector is seen to have better access to a well-equipped workforce, with a perceived surplus of labour. Several members attribute this to low oil prices and associated job losses.

Interestingly, there is a perception that shortages of qualified workers in the built environment are relatively low in comparison to other areas, suggesting that a lack of talent is not anticipated as a significant barrier to improving energy efficiency in buildings.

Messages describing the advantages of working across the energy industry will play a big role in attracting and retaining new entrants. It will be important to appeal across demographics and career

stages, to support those returning from career breaks or qualified professionals from other industries. This boom in job opportunities is attributed not only to growth and innovation in many sectors, but also the impending retirement of many senior professionals. EI members stress the importance of retaining the knowledge of these professionals and putting systems in place to successfully transfer it to new entrants.

“Although awareness of the sector and the many career opportunities it offers has increased over the years, more will be required to showcase the benefits and attract more into this exciting, growing sector”

– Jaz Rabadia MEI Chartered Energy Manager Senior Manager of Energy & Initiatives, Starbucks

How can we best retain knowledge?

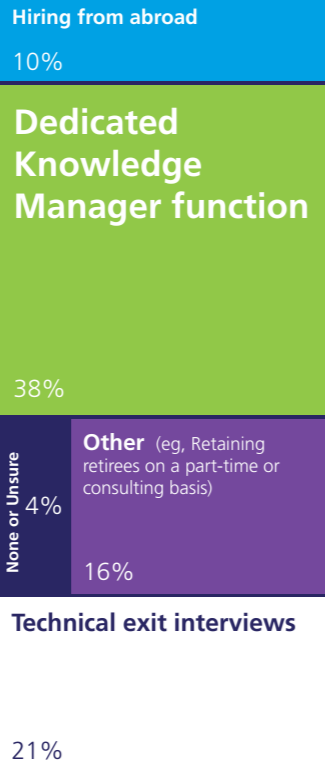
Q Which of the following do you think is most important and effective for retaining knowledge? Please tick all that apply
N = 543.

Mentoring programmes

83%

Graduate programmes

54%



Knowledge retention

“In all sectors of the industry we need to do more to attract and retain an engaged and skilled workforce. Particularly in the offshore oil and gas sectors, we need to retain the knowledge and expertise of those who have helped build the industry over the past 50 years whilst renewing our workforce to deliver solutions for the next 50”

– **Trevor Garlick** FEI Regional President, BP North Sea

It is well understood that there is a risk of knowledge being lost as professionals retire. EI members have suggested specific courses of action which will transfer the knowledge held by these professionals and make it more widely accessible. It is especially important to share this knowledge with graduates and young professionals who may not yet have had sufficient experience to acquire it first-hand, thus enhancing business efficiency.

Mentoring and graduate programmes are strongly preferred by EI members for retaining professional knowledge. Dedicated roles and structured communities or networks, both physical and digital, are also cited as effective strategies to ensure knowledge is transferred. The advice from many members is that long-term planning, including advance succession planning, is integral to knowledge retention and improving the overall skill level of the industry.

A strong message voiced by those retiring or recently retired is their desire to continue to contribute in some capacity, either by continuing to work on a part-time or consulting basis, or by participating in mentoring or public speaking schemes. Importantly, several members stress that the communication of best practices should not be seen as anti-competitive, and new channels and collaborations between organisations may help to advance the industry as a whole.

Valuable human resources

The challenge for employers is to compete for and retain new talent. The EI also sees a need for the industry to showcase itself to new graduates and those able to bring in skills and experience from other industries. There are opportunities for these individuals to work at the forefront of innovation whilst tackling some of society’s biggest challenges. Such positive messages should be clearly articulated to portray the energy industry as a desirable and rewarding sector with prospects for growth, to encourage potential energy professionals and prospective science, technology, engineering and mathematics (STEM) students to enter the energy profession.

The EI intends to undertake further research into skills issues affecting the energy sector to better link into schools, colleges and universities and to support individuals as they move from one sector to another. Institutes such as the EI can make a significant contribution to helping the industry reflect the diversity of society.

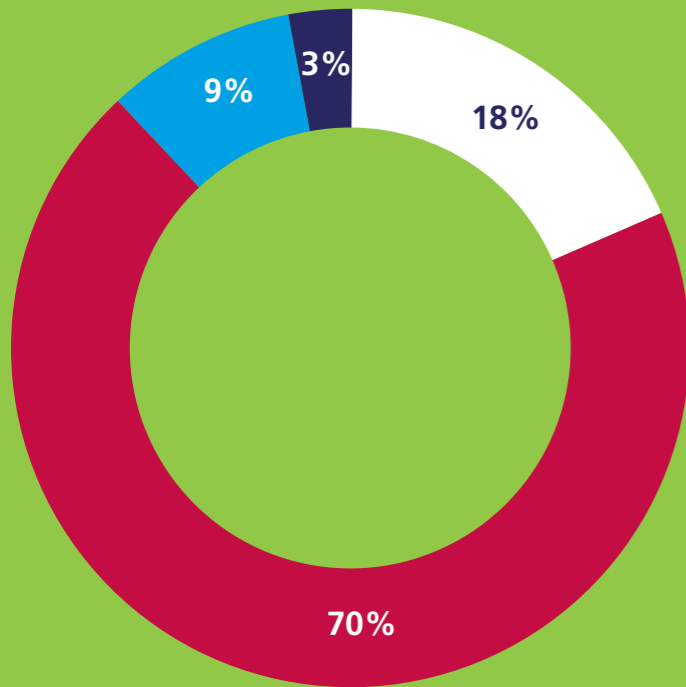
“Experience is something that is not easily transferred without a lot of time so planning many years ahead is crucial”

– **Survey response**

The case for effective communication

Q How well do you think your area of the energy sector is communicated to the public?
N = 543.

Overall

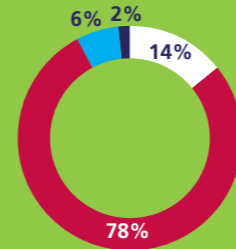


- Effectively communicated
- Ineffectively communicated
- Communications are counter-productive
- Other

By industry sector

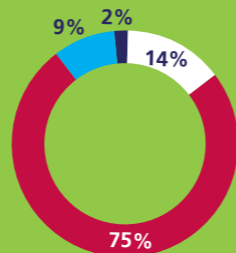
Electricity and energy transformation

N = 182



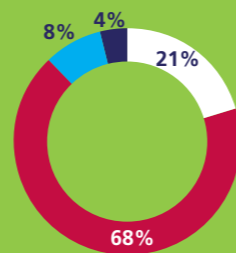
Energy demand and utilisation

N = 168



Natural gas and oil

N = 234



Engaging with the public

ENGAGEMENT

People are at the heart of the energy industry, both as the resource driving its delivery and the consumers that it serves. Communication is integral to keeping the public abreast of rapidly changing energy sources and technologies, attracting skilled workers to the diverse opportunities in this burgeoning sector, and engaging consumers throughout the energy system. EI members identify clear, positive communication between people on all sides as fundamental to meeting the compound challenges of energy security, sustainability and affordability. However, there are concerns among respondents that the energy industry is not always communicating as effectively as it might.

Room for improvement

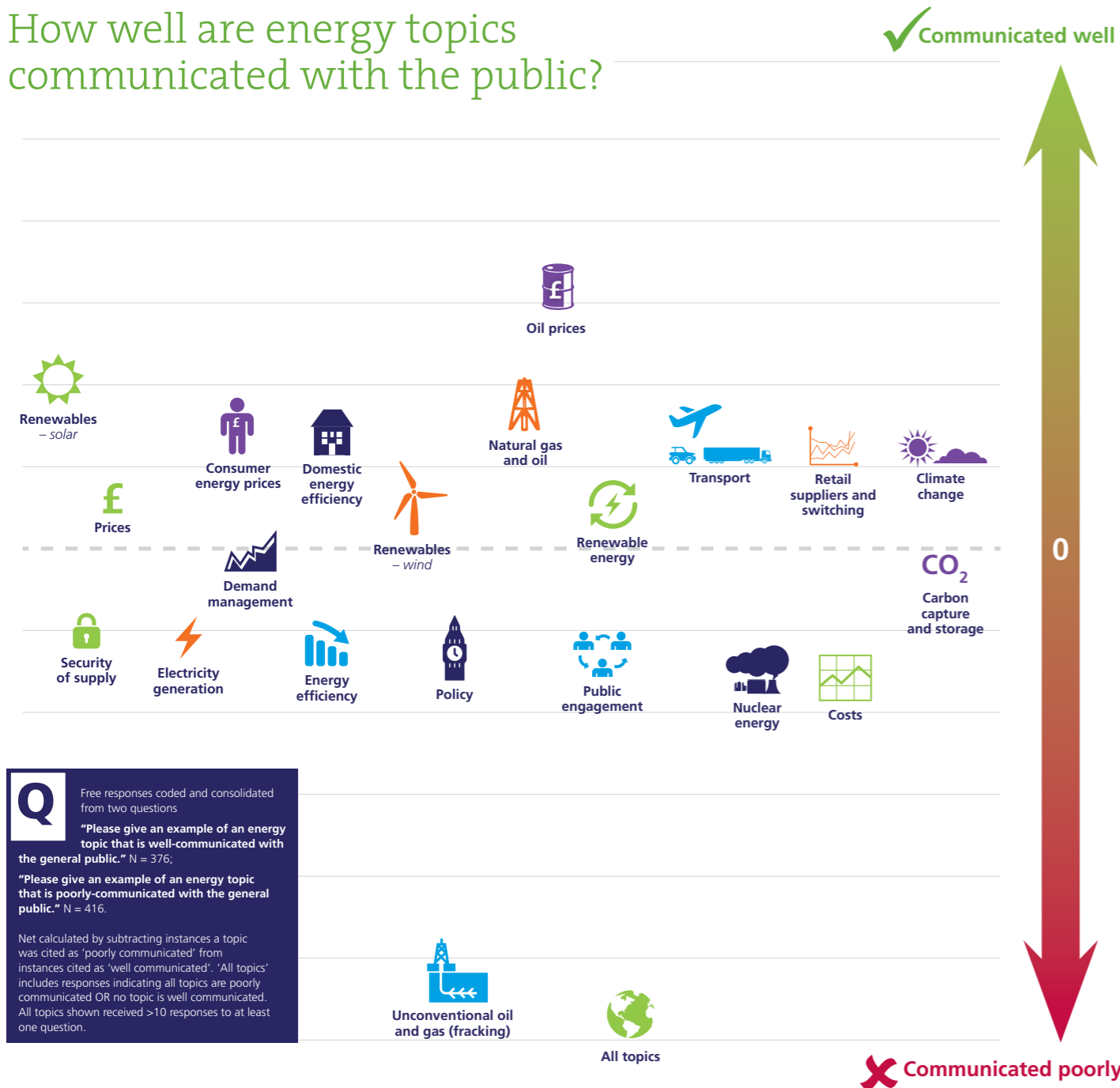
Having cited public engagement as a major challenge for 2015, respondents across the industry consistently feel their sector is ineffectively communicated, leading to public apathy towards and lack of understanding of energy issues. This coincides with an acknowledgement that public perception, acceptance and trust are factors influencing the success or failure of new energy projects. These areas of engagement are therefore viewed as important areas for future improvement.

This is a consistent concern voiced by members throughout the industry. Messages from industry are believed to be misunderstood, at times contradictory or simply not reaching enough people.

“The energy industry urgently needs to communicate more effectively, and actively engage with the public by listening and responding to their concerns. However, rebuilding trust will require persistent action on the part of the energy industry and others, due to the legacy that has been created. Yet without such action, distrust will likely have serious consequences for the UK achieving current and future policy targets”

– Dr Karen Parkhill Lecturer in Human Geography, York University

How well are energy topics communicated with the public?



Q Free responses coded and consolidated from two questions

“Please give an example of an energy topic that is well-communicated with the general public.” N = 376;

“Please give an example of an energy topic that is poorly-communicated with the general public.” N = 416.

Net calculated by subtracting instances a topic was cited as ‘poorly communicated’ from instances cited as ‘well communicated’. ‘All topics’ includes responses indicating all topics are poorly communicated OR no topic is well communicated. All topics shown received >10 responses to at least one question.

Getting the message right

EI members were asked to cite examples of well- and poorly-communicated topics. Again, EI members agree there is room for improvement in most areas, with ‘all are poorly communicated’ the most common answer.

Prices feature strongly as well communicated, specifically oil prices and consumer energy prices along with ‘prices’ more generally. This is in marked contrast to the costs of energy, which are not perceived to be well communicated; while the former is the price paid by consumers for energy, the latter is the cost and investment required to deliver energy to the consumers. Also frequently cited as well communicated, and tangentially price related, are the actions of retail suppliers and opportunities to switch suppliers.

Electricity generation is another area where members have strong, but differing opinions, with the overall perception that it is a topic that is poorly communicated. Members express clear views on the quality of solar power (well-communicated) and nuclear energy (poorly-communicated) messaging, but are divided about renewable energy, and wind in particular.

Despite extensive media coverage, unconventional oil and gas, and notably fracking, stands out for members as the topic with greatest need for improved communications. Three in four members are supportive, with caveats, of further development of unconventional gas in the UK, and recognise a lack of public acceptance as the most likely barrier to its development.

New models for engagement

These findings suggest that EI members recognise the need to involve energy users more directly in dialogue about the energy system. This will require a two-way process of both sharing and listening between private companies, government, industry bodies and the public. To inform the debate, EI members are eager to take part in meaningful engagement between these parties, and improve understanding of the challenges faced by all sides.

The EI, in fulfilling its duty to the energy profession and society, has a role to play in delivering more opportunities for stakeholders to meet and engage with one another. Our members confirm what many in industry, government and the public already understand – that professionals, policymakers, and consumers have important insights to bring to the debate, but a new approach is needed to facilitate the conversation. All players must be involved to effectively deliver a safer, more secure and sustainable energy future.

“High energy prices always seems to be the one topic that reaches everyone even if not strictly true”

– Survey response

Method

The 2015 Energy Barometer is the first in a series of annual surveys of the EI College, a group designed to be representative of EI professional and pre-professional members. Invitations to join the 2015 College were sent to 3,807 randomly-selected members, and accepted by 857 EI members in January 2015. This included the professional member grades of Fellow (FEI, N = 304), Member (MEI, N = 398), and pre-professional Graduates (GradEI, N = 155). This process was designed to ensure that a diverse range of sectors, disciplines, and seniority levels were included in the sample. Membership of the College is on a 2-year rolling basis, with half the College to be refreshed each year.

The survey questions were decided by the EI Knowledge Service (EIKS), under the guidance of the EI's Energy Advisory Panel (EAP) and wider industry experts. The questions within the survey were both quantitative and qualitative. Some questions will be repeated annually to form trends over time; others cover topical subjects which will change year-to-year. The survey focuses on the UK's energy system, and encompasses a wide range of topics, including energy policy, investment and innovation, emissions targets, skills and knowledge retention, communication and engagement and energy prices. The questions were refined with the help of Dr Dimitrios Xenias at Cardiff University before being disseminated to the EI College.

A total of 543 participants fully completed the survey online in February 2015. The responses were analysed by the EIKS to

assess key findings and interpret themes from the results. The findings represent the views of the EI's professional and pre-professional members. In some cases, the views of subsets of respondents (where N \geq 100) have been included. The headline results have been compiled in this report, which represents the initial step in creating an informative, useful picture of the energy industry based on the views of those working within it.

The complete set of data used in this Energy Barometer is available online at www.energyinst.org/energy-barometer Supplementary reports covering subject-specific results (e.g. unconventional oil and gas, energy efficiency) will be released by the EI later this year.

About the EI

The Energy Institute (EI) is the chartered professional membership body for the energy sector, supporting over 21,000 individuals working in or studying energy and 250 energy companies worldwide. The EI provides learning and networking opportunities to support professional development, as well as professional recognition and technical and scientific knowledge resources on energy in all its forms and applications.

The EI's purpose is to develop and share knowledge, skills and good practice towards a safe, secure, affordable and sustainable energy system. A registered charity, it serves society by offering scientifically-sound information on energy issues and a neutral platform for debate. As the only industry-wide professional body, covering all disciplines and forms of energy, the EI has great strength in the diversity and expertise of its members.

The EI's ambition is to:

- help improve understanding of energy and the quality of the debate;
- support energy professionals and help deliver the skills the industry needs
- drive up standards, promoting excellence in practice.

In doing so, the EI adheres to core values of independence, professionalism, integrity and sound science.

www.energyinst.org

Acknowledgements

The EI extends its sincere thanks to the Energy Advisory Panel and Dr Dimitrios Xenias from Cardiff University for their help in the design and execution of this project. Especially, the EI would like to thank its members for their contributions of both time and expertise to make this report possible. The generosity of EI members in sharing their views is very much appreciated.

Energy Institute
61 New Cavendish Street
London W1G 7AR, UK

t: +44 (0)20 7467 7100
e: info@energyinst.org

www.energyinst.org

 Follow us:
@EnergyInstitute

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