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OPTIONS FOR HSE REGULATION OF EMERGING ENERGY TECHNOLOGIES

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Issue

1. To present the Board with preferred options for regulating emerging energy technologies, seeking their views on strategic direction and priorities.

Timing

2. For the HSE Board meeting on 15 December 2010.

Action

3. The Senior Management Team is asked to:
 - i. Approve the attached paper for submission to the HSE Board, subject to any final amendments proposed by SMT;
 - ii. Note revisions to the regulatory strategy, made to reflect developments since this element was presented to SMT in October.

Background

4. The attached Board paper comprises material discussed by the SMT in October (SMT/10/114) and November (SMT/10/120). In addition to minor revisions to reflect comments made at those meetings, more substantive changes have been made to the regulatory strategy to reflect the current position with respect to the extension of HSWA offshore. Further work has been undertaken on cost recovery and marshalling our resources which is also factored in. A decision on where to allocate ongoing strategic oversight of the high level EET agenda beyond April when the EET programme finishes will be taken by HSE early next year.

Consultation

5. Consultation has taken place with. OPSTD, PFPD, TSOL, CSAG, HID, FOD and CCID. In addition the paper has been reviewed by the EET Programme Board.

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Options for HSE regulation of emerging energy technologies

Purpose

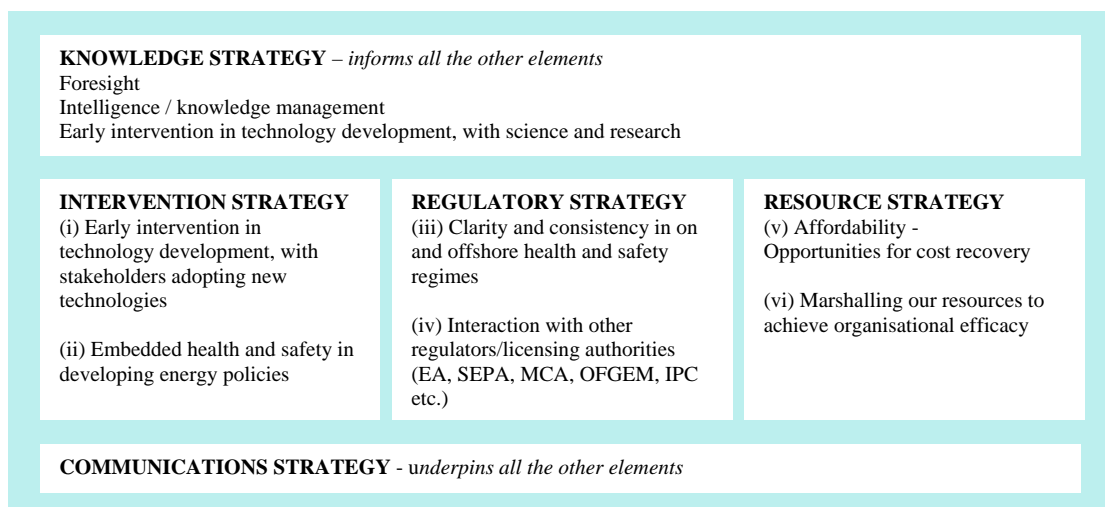
1. This paper invites the Board to agree actions and options for regulating the emerging energy technologies (EET). This will support integration of non-nuclear emerging energy work into ‘business as usual’ for HSE, ahead of the closure of the EET programme by April 2011.

Background

2. The EET programme is on track to deliver, by 2011, a coherent organisational strategy for HSE’s regulation of the non nuclear EETs. This paper represents the conclusion of that work. We are also developing a framework of guidance and other products to support HSE divisions to plan and deliver against this strategy.

3. The Board considered EET at its April meeting – paper HSE/10/41. It agreed the broad thrusts underpinning the development of an organisational strategy for EETs, i.e. HSE has a key role as an enabling regulator in these areas and our participation is not optional. The Board acknowledged the need for a ‘fit for purpose’ regulatory framework and a coherent structure in HSE to support its work in this area.

4. We were asked to return with intervention, regulatory and resourcing options in order to: (i) secure better early interventions with industry and (ii) do the same with policy formers; (iii) achieve consistent regulation; (iv) get effective interaction across government ; (v) afford it; and (vi) marshal our resources to get the best alignment in HSE’s structures. The strategies, which align with HSE corporate approaches, address the following:



5. The wider perspective: Energy supply and climate change remain important policies under the Coalition Government. In July, it published its first annual energy report¹. Its stated mission is to “support the transition to a secure, safe, low-carbon, affordable energy system in the UK, and mobilise commitment to ambitious action on climate change internationally.”

6. DECC’s Business Plan 2011-2015² places safety explicitly on it’s agenda, ie “Reform the energy market and work internationally to ensure the UK has a diverse, safe, secure and affordable energy system and incentivise low carbon investment and deployment” and “Ensure public safety and value for money in the way we manage our nuclear, coal and other energy liabilities.”

7. Their actions stimulate the entire EET landscape, from micro-scale energy projects up to full blown (and major hazard) carbon capture and storage projects. DECC also published an initial “Pathways to 2050” document which analyses a range of theoretical permutations for achieving tough climate change targets³: what is clear is that there is no single potential path.

8. Given the wide coverage of this Board paper, and in order to keep the main paper to a reasonable length, there are a number of attachments. Annex 1 gives an overview of the UK energy sector characteristics and health and safety priorities. This is derived from an extensive report by the EET team that captures all the research and analysis accumulated in 2009 and 2010. This report will be posted on the intranet site when we have assessed the impact of the Board decisions and comments. A lay summary of the report is attached at the back of this paper for Board members’ information and future reference.

9. Annexes 2 to 4 support the arguments for the main strategic issues presented below. A timetable for action is at Annex 5.

10. Finally, Annex 6 gives a brief summary of the high level of EET activity since the April Board paper. The EET team has been leading or supporting a wide range of work with the new sectors, providing opportunities to share expertise across traditional HSE boundaries. In some areas, HSE is integrating EET business into mainstream work (e.g. electricity policy). The knowledge strategy for EET (which will maintain HSE’s position as an expert, learning organisation for EET) and the communications strategy (which supports HSE’s position as an independent, responsible enabling regulator for EET) have been developed to underpin the EET strategy outlined in this paper and support its deployment.

Argument

Intervention strategy

11. The intervention strategy (Annex 2) addresses our aims and objectives, and the activities which will secure them. It is aligned with HSE’s wider sector strategy development work, in which EET appears as a cross-cutting topic marbled through several sectors. The main intervention options for EET relate to:

(1) **What our priorities should be.** In Annex 2 Table 2.1 we set out objectives for securing effective performance in each priority technology area, using the approach promulgated

¹<http://www.decc.gov.uk/publications/basket.aspx?filetype=4&filepath=what+we+do%2fuk+energy+supply%2f237-annual-energy-statement-2010.pdf>

² http://www.decc.gov.uk/en/content/cms/news/pn10_85/pn10_85.aspx

³ <http://www.decc.gov.uk/en/content/cms/consultations/2050pathways/2050pathways.aspx>

by HSE's Strategy Team and showing the line of sight back to HSE strategy goals. The Table summarises the types of intervention proposed, rationale, potential for success, challenges for delivery, timing and resource constraints.

- (2) **How we should intervene.** In summary, we propose that HSE takes a proportionate and enabling stance with small-scale EET operators and installers, focusing our intervention activity for these groups on trade bodies, industry groups, technical centres of excellence and standards bodies.

On the other hand, we propose a proactive approach with operators of larger scale installations and those that involve major hazards or other significant occupational health and safety risks. Partnership working with corporate leaders, regulatory agencies and sponsor organisations is proposed as the primary approach, to build sector culture and high reliability organisations.

- (3) **How we should assess performance.** We propose supplementing the approach in (2) with cross-cutting pilot intervention programmes in four of the priority topic areas⁴ in the period 2010 to 2014, to assess the best means to regulate major and significant hazards and risks across the range of activities without appearing to unnecessarily restrict EET activity.

- (4) **How we should equip our staff.** We propose to support interventions, across the range, through the provision of topic packs for HSE front line, specialist and policy staff, and the application of the communications and knowledge strategies. This is important for the EET sectors given the unfamiliar nature of many of the EET installations – large and small.

- (5) **The extent of regional focus.** Thus far, as part of its role as an enabling regulator, HSE has sought to have early influence with DECC as the department setting energy policy. But energy policy is a devolved matter for the Scottish Government, and may well become so next year in Wales giving England, Scotland and Wales different practical priorities for delivering energy change. Within the overarching EET interventions plan, the emphasis will be different in different regions, and our success in engaging and influencing the Scottish Government, Scottish licensing and planning agencies, and Welsh Assembly Government is likely to be at least as important as it is with DECC. There are increasing signs that this is the case.

Q1: Do the Board agree with these intervention approaches?

⁴ See Table 2.1. in Annex 2. In summary the four cross cutting programmes are: wind farm lifecycle risks (on- and offshore); LNG regasification directly into the national grid where there are off-site risks (with MCA); technical assessment of the CCS demonstration competitions (DECC lead); and lifecycle risk assessment of large (e.g. civic) waste to fuel schemes

Regulatory Strategy

12. The regulatory strategy (Annex 3) addresses HSE's vires for and approach to regulating new work related energy technologies. Its aims are to provide clarity and consistency across both on- and offshore regulatory regimes; and optimise interactions with other regulators and co-regulators involved in the energy industries. The suggested principles are:

- Application of HSWA to all work related energy activity
- The general provisions of HSWA as the starting point for regulating EET, [where other regulations do not apply] unless obviously insufficient (and evidence is available to go further)
- Being clear to staff and stakeholders where we do not intend to intervene proactively
- Addressing the better regulation agenda

Leaving aside the regulation issues attaching to cost recovery in HSE's future regulation of EET, on which the Board will have taken a view at its special meeting last month, we suggest there are five limbs to the regulatory strategy as follows.

- (1) **Extending the Act offshore to EET.** The better regulation agenda and signals from the Minister suggest a staged approach to extending HSWA beyond the territorial seas line (12 miles offshore) only to activities that are imminent. We suggest 'imminent' as meaning activities that will take place between now and 1 April 2012. It is thus intended the current revision to the Application Outside Great Britain Order 2001 (AOGBO) will continue (under the stewardship of HID's policy team). This will limit the extension to activities in the Renewable Energy Zone (in practice offshore wind farms). Other pending activities – wave, tidal, CCS, coal gasification, etc. – under this approach could be covered by a variation to the AOGBO at a later stage, possibly in more than one further go. A potential impact on this suggested way forward emerges from limb three (below) .

The suggested reasons for this approach are to avoid the appearance of pre-emptive regulation (e.g. it is unlikely CCS would 'go live' before 2014) and to avoid extending the cost burden at each stage against which we have to compensate under the 'one in one out' rule⁵ (OIOO – see limb three below). However, we think that it would be right to be clear with Ministers and with industry from the outset (stage 1) that this is part of a progressive roll out.

It should be noted that the application of a number of statutory instruments made under the Act will also be extended when the AOGBO is amended unless specifically disapplied in each case. Some of these secure compliance with EU directives (Work at Height; Management regulations) others implement UK policy alone (RIDDOR; Ionising Radiation regulations). HSE has not considered disapplying the SI 'bundle' from EET activities wholesale or selectively before re-making the variation order for next April, but this could be considered when looking to streamline HSE regulations.

- (2) **Regulating higher hazard EET⁶ under the broad generic framework of the Act.** By also applying better regulation principles and the Coalition Government's views on burdens on industry, the starting point for regulating any emerging energy work activity - even a high hazard type – could be to apply the broad framework of the Act's provisions.

⁵ OIOO/One in one out: whereby any new regulatory cost is at least matched by cuts to the cost arising from existing regulation.

⁶ We suggest for EET these are: all offshore activities; all large flammables and toxics facilities (e.g. coal bed gas extraction; hydrogen); all large hazardous pipelines, storage and terminals (e.g. CO₂)

In certain situations (e.g. offshore wind farm construction, CCS) we would apply the principles of specific regulation (e.g. CDM and COMAH) as relevant good practice through which the employer may demonstrate compliance with the general duties under the Act.

It is recognised that this is a significant change of policy and that there are risks to this approach⁷. To operate under the broad framework alone requires clear guidance on the standards expected by HSE of duty holders, and for this to be agreed by key industry stakeholders (and supported by sponsor departments and co-regulators). For EET, this has obvious implications for HSE's position on including CO₂ within the renegotiation package of Seveso 2, and for the longer term offshore regulations.

It follows that the implementation of this approach will need to be kept under review as knowledge on the intrinsic hazards and industry's ability to control the risks becomes available. We will need to develop a clear statement of the necessary tests to be met when determining that the general provisions of the Act are insufficient and that specific legislation should be considered⁸.

- (3) **Clarifying OIOO in relation to the Act.** In parallel with the above, we have been exploring whether any extension to the Act should be subject to OIOO. This impacts on new activities (not upstream oil and gas) in the renewable energy zone (REZ) and gas import and storage zone (GISZ) both of which are outwith the 12-mile limit. The logic behind this is that the Act does not increase the burden on existing industry and sets the level for new entrants – i.e. it creates a level playing field in the economy. Looked at in reverse, EET sectors starting work onshore where the Act applies will automatically be covered and OIOO will not feature. An initial signal along this line has been sent to BIS in Judith Hackitt's response to Vince Cable's invitation for HSE to join the OIOO system.

This work is urgent. We must have a feel for the likelihood of securing government consent to this approach before we consult on limbs one and two above, and before we make a submission to Ministers. We do have support from industry and DECC for extending the Act offshore but this is not the same as having an understanding that OIOO ought not to apply there.

- (4) **Being clear where we will not proactively intervene.** There are three areas in particular where HSE would not wish to proactively intervene, and would want to avoid being drawn in as a regulator of last resort. These are micro-generation⁹, supply/demand management¹⁰ and transport¹¹. In order for all stakeholders to be clear on this policy we

⁷ Even with demonstration projects where we have agreements on the regulation approach – the DECC CCS competition - we are experiencing some difficulties e.g. with cost recovery, and securing suitable quality of safety case submission

⁸ This preferred approach also presupposes the prerogative is not taken out of our hands by an EU initiative to regulate. This is a further reason for circumspection in our approach now to regulating EET i.e. to avoid potential for a mismatch with EU in the future.

⁹ For example domestic solar panels or small wind turbines. This refers to regulation of the generator/consumer, and not the installers where duties under HSWA already exist.

¹⁰ For example, consumer options enabled by smart meters in homes. As with micro-generation, HSWA duties would apply to installers and network operators.

¹¹ For example we suggest HSE would not regulate hydrogen vehicle standards (but would regulate hydrogen refuelling facilities)

suggest drawing up position statements and to agree these with key industry stakeholders, other departments and our co-regulators. We suggest the statements take account of relevant regulatory activity elsewhere, particularly in the EU and USA, and have included some information on this in the regulatory Annex 3

- (5) Streamlining HSE regulations.** Finally, as part of the long term objectives, we believe the EET agenda encourages HSE to continue working on the case for streamlining regulations. We are not in a position to present in this paper evidence to support a root and branch overhaul of the high hazard regulations. It is clear from his report that Lord Young's focus is on the bundle of occupational regulations around the Act rather than the major hazards/permissioning suite which tend to be a response to wide public concern in the wake of catastrophic accidents. A review of 'the bundle' has begun.

We (in EET) have already begun discussions with BR colleagues as to how we can support ongoing activity in this area, and how to play in the large volume of research we have conducted into the energy sectors. We would need to put some flesh on the bones, carry out an assessment of what would be needed, and the costs/benefits etc. It clearly aligns with the Coalition Government's better regulation agenda in a generic sense. Moreover, for EET it aligns with DECC's commitment in its most recent statements on joining up the energy agenda across government.

Q2: Does the board agree these five approaches to HSE's regulation of the emerging energy technologies?

Resource Strategy

13. The resource strategy (Annex 4) addresses the challenge of meeting the anticipated demand for significant new work in the energy sector and marshalling our resources to deliver it effectively.

Cost recovery

- (1) We are working with PFPD and TSols on viable options, following up on the evolving cost recovery strategy as [agreed recently by the Board]. There are a number of options for pursuit of cost recovery but in the light of PFPD's assessment of the position with our Minister, we suggest option 5 in the annex - to stratify energy installations into proactive and reactive categories - is basically right. Higher risk installations would be placed in the proactive category based on a significant hazard, or public concern. Lower risk premises and activities would be regulated on a reactive basis. This approach reflects the segmentation of our proposed intervention strategy and so delivers coherence to the overall organisational strategy for EET, which is a key aim of the Board.
- (2) The reactive approach to small and low risk installations also aligns with the current HSE approach to initially amending the Health and Safety (Fees) Regulations to recover costs where there are breaches of duty under HSWA in non-major hazards sectors (where cost recovery already applies of course).
- (3) For larger or high-risk installations, it is proposed in this Board paper that only HSWA supported by agreed practice based on our experience in major/high hazard regimes will apply. We propose recovering all costs as this proactive work will be as complicated to plan, arrange – gain access to when located offshore - and follow-up as for current permissioning regimes. This approach would fit with the approach by other regulators

like EA/SEPA and conform to the size classifications applied by CLG to nationally significant infrastructure projects (NSIP's).

- (4) Within this approach, we envisage recovering costs for giving elective advice at early stages of projects. There are strong indications that industry would be willing to pay HSE's costs for such advice as a significant net benefit to them. We also envisage pressing DCLG hard to begin recovering costs for advising on NSIP's.
- (5) It may prove to be the case that the proposed regulatory strategy for regulating high hazard EET's under HSWA alone proves insufficient but this will take time to show through. Therefore, cost recovery will need, initially, to be linked to HSWA. We envisage working with PFPD on this tranche for completion in October 2011 or April 2012 at the earliest. Work on this needs to begin soon and consultations with PFPD have begun.

Q3: Does the board agree with these cost recovery approaches?

Marshalling our resources

- (6) Options for better marshalling of resources acknowledges uncertainties of CSR effects and staged introduction of EET. As requested by the Judith Hackitt, we convened a small working group of SMT to explore structural options. We identified that the key drivers to our contribution to the coalition's economic strategies for secure, affordable energy supplies and for climate change are better regulation and early, consistent engagement with EET stakeholders. To do this efficiently there needs to be :
 - ownership of key functional relationships;
 - leadership of the four key emerging energy programmes (KEEP's) that form part of the intervention strategy;
 - maintenance of major systems e.g. supporting the knowledge strategy.
- (7) All the EET sectors cut across the structural divides in HSE. Because, by its nature, the new energy economy is not fully formed and known to HSE there is no basis for a significant change of the structure at this time. In Annex 5 we indicate how HSE intends taking ownership of the key components of EET.
- (8) It was also determined that continued strategic oversight of EET and associated leadership, coordination and monitoring of the strategy is essential to capitalise on the base and networks that the EET programme has built. The capability in question is not the relatively specific functions that are assigned in Annex 5, but the capability to give oversight to the broad strategic and policy issues that will arise over the next 5 – 10 years and to make the necessary linkages and ensure HSE responds in time to any new challenges. There would be an important additional role for this location to act as the address of last resort for orphaned EET matters (the forwarding address the EET programme leaves behind on the last day). It is expected HSE will determine where to locate the relict of the EET team at some stage in the New Year, when the future model for the organisation as a whole is more clear.

Key actions and timetable for deployment

14. A summary of the key actions for incorporating EET into HSE's business as usual as the EET programme closes down at the end of March 2011 is attached at Annex 5. Refinement

of the plan and more detailed impact assessment (where needed) will be done once the Board has provided steers as requested below.

Action

15. The Board is invited to:

(a) Note the attached EET paper giving a lay summary of what is required of HSE for regulating emerging energy activities.

(b) Comment on the intervention strategy (paragraph 11 and Annex 2), noting the approach and its alignment with the HSE strategy. The Board is asked to indicate whether it endorses the priorities, approach, objectives and actions in the intervention strategy **(Q1)**.

(c) Comment on the regulatory strategy (paragraph 12 and Annex 3), noting the principles and the five regulatory 'limbs', which are: Extending HSWA offshore; applying the principles of specific regulation as relevant good practice; clarifying OIOO in relation to HSWA; being clear about where we will not intervene; and working on the case for streamlining HSE regulations. The Board is asked to indicate whether it endorses these five elements of the regulatory strategy **(Q2)**.

(d) Comment on the resource strategy (paragraph 13 and Annex 4), noting the approaches to securing organisational efficacy and cost recovery. **(Q3)**.

(e) Note HSE's plans for integrating emerging energy work into HSE's business as usual as the EET programme closes. (paragraph 14 and Annex 5).

Consultation & clearance

19. Chair, CE/DCE, all SMT and divisional staff; and EET programme team/board have been extensively consulted. Wide consultation has been undertaken with external stakeholders on the evidence underpinning this paper.

Annex 1: The UK ENERGY SECTOR – Characteristics and emerging sector priorities

Characterising the energy sector

1. In Table 1.1 we clarify what we mean by ‘the energy sector’, identify the technologies that are ‘emerging’ within the sector, and propose where limits should be set on the scope of HSE’s remit in regulating the energy sector.

Table 1.1: The UK Energy Sector

Energy feedstocks	Power/fuel generation	Transmission, distribution and storage
Existing mature energy technologies within HSE’s remit:		
<ul style="list-style-type: none"> • Nuclear fuels • Oil and gas production and import • Coal mining and import • Landfill and sewage gas 	<ul style="list-style-type: none"> • Nuclear power plant • Oil refining • Hydroelectric plant 	<ul style="list-style-type: none"> • Liquid fuels distribution and storage • LPG distribution and storage
Existing energy technologies within HSE’s remit that are undergoing rapid transformation:		
<ul style="list-style-type: none"> • LNG and LPG production and import 	<ul style="list-style-type: none"> • Fossil fuel power stations (large combustion plant) 	<ul style="list-style-type: none"> • Electricity distribution, demand management and storage • Gas distribution and storage
Emerging energy technologies within HSE’s or LA’s remit:		
<ul style="list-style-type: none"> • Unconventional gas reserves – CBM, shale gas • Biomass production including algae • Biomass import • Agricultural and food wastes and slurries • Solid municipal and industrial wastes • Wind, waves, tides, geothermal, solar, hydro energy 	<ul style="list-style-type: none"> • Above ground and under ground coal gasification • Production of hydrogen fuel cells and turbines • Biomass power stations, incinerators and CHP plant • Syngas processes (eg gas to liquids, gasification, pyrolysis) • Biofuel processes (eg fermentation, distillation, transesterification) • Biogas processes, eg anaerobic digestion • Onshore and offshore wind energy • Large-scale solar thermal and PV plant • Workplace micro generation • Wave and tidal power • Carbon capture technologies 	<ul style="list-style-type: none"> • Hydrogen distribution and storage • CO2 transmission, storage and sequestration
Emerging technologies that could fall outside HSE’s or LA’s remit		
	<ul style="list-style-type: none"> • Domestic micro generation (wind, biomass, hydro, solar, geothermal) - except for installation • Hydrogen fuel cell powered vehicles - except for refuelling stations, vehicle manufacture and repair 	

According to official statistics, the UK energy sector directly employed more than 150,000 people in 2009, plus an additional 239,000 people worked in industries that supported the sector. The energy sector accounted for 3.7% of GDP, 10.1% of total investment, 49.6% of industrial

investment and 2.1% of industrial R&D spend. The sector is growing strongly, much faster than the economy as a whole.

Trends in the energy sector and impact on related hazards and risks

2. Changes in energy technologies are having an impact way beyond the traditional large power generation sector, for example:

- An increase in the use of renewable sources and distributed generation will embed power generation into other industrial, agricultural and service sectors, adding a new dimension to their current hazard profiles.
- The transformation will increase construction activities on and offshore, and require work to extend, connect and maintain a more complex energy infrastructure. An increase in manufacturing, agricultural and transport activities, as we import more biomass, utilise agricultural and food wastes as energy feedstocks, use docks for offshore renewables assembly, and manufacture equipment needed for the new technologies.
- The offshore energy sector is expanding well beyond oil and gas production to include renewable electricity generation and transmission, carbon dioxide and increased natural gas storage.
- Incentives for domestic and community-scale low carbon power generation.
- The move to SMART metering which will require the installation of 47 million new gas and electricity meters by 2017.

3. As well as expanding offshore work activities beyond the traditional oil and gas production sectors, we anticipate that changes in the energy economy will increase work activity in sectors of the UK economy that have high fatal, major injury and disease rates:

- Waste and recycling
- Construction
- Agriculture and forestry
- Manufacturing
- Transport (which includes docks).

4. Our assessment of the main hazards and risks across the EETs show they present:

(a) Familiar occupational hazards in unfamiliar environments, with the potential for an increase in the number of incidents and fatalities due to the high volume of work activities attached to energy activities, eg

- Wind turbine construction and maintenance activities, on and offshore, including the risk of falls from height, electrocution, machinery guarding etc.
- Construction and excavation risks attached to cable laying, substation construction on and offshore.
- Electrical hazards during connection of new power sources or maintenance work including risks of electrocution and burns from flashovers.
- Chemical and biological hazards from handling waste and other biomass.
- Asphyxiation risks in confined spaces (eg anaerobic digesters).
- Fire and explosion risks from manufacturing biodiesel and other biofuels at small scale (e.g. on farms).

(b) New major hazards, and an increase in some existing major hazards, with low accident frequency but high impact consequences, eg

- CCS: early evidence indicates that the large volumes of carbon dioxide that will need to be compressed, transported and injected will have major accident hazard potential. This is because of its toxicity and the potential impact (through embrittlement) on the integrity of associated process plant if containment is lost.
- Natural gas storage and LNG import and regasification: large scale activities with known major hazard risks at transport, storage and regasification stages, onshore, offshore and in harbours. With greater storage and importation, the number of risk scenarios will increase.
- Large scale biofuel, syngas or biogas production has major hazard fire and explosion potential from gas and fuel production and storage.

(c) Increased potential for non-major hazard risks to the public, arising from an increase in renewable energy technologies and distributed generation, e.g.

- Potential for injuries or fatalities following turbine collapse or blade throw, e.g. from failure of a school or hospital turbine.
- Increased fire and explosion risks with more biomass boilers, combined heat and power facilities in hospitals, schools, hotels etc. and close to housing.
- Increased falls and manual handling risks with householders or contractors making connections to or repairing roof mounted micro turbines or solar panels.
- Increased electrical and gas risks with installation, maintenance and use of SMART meters in domestic premises.

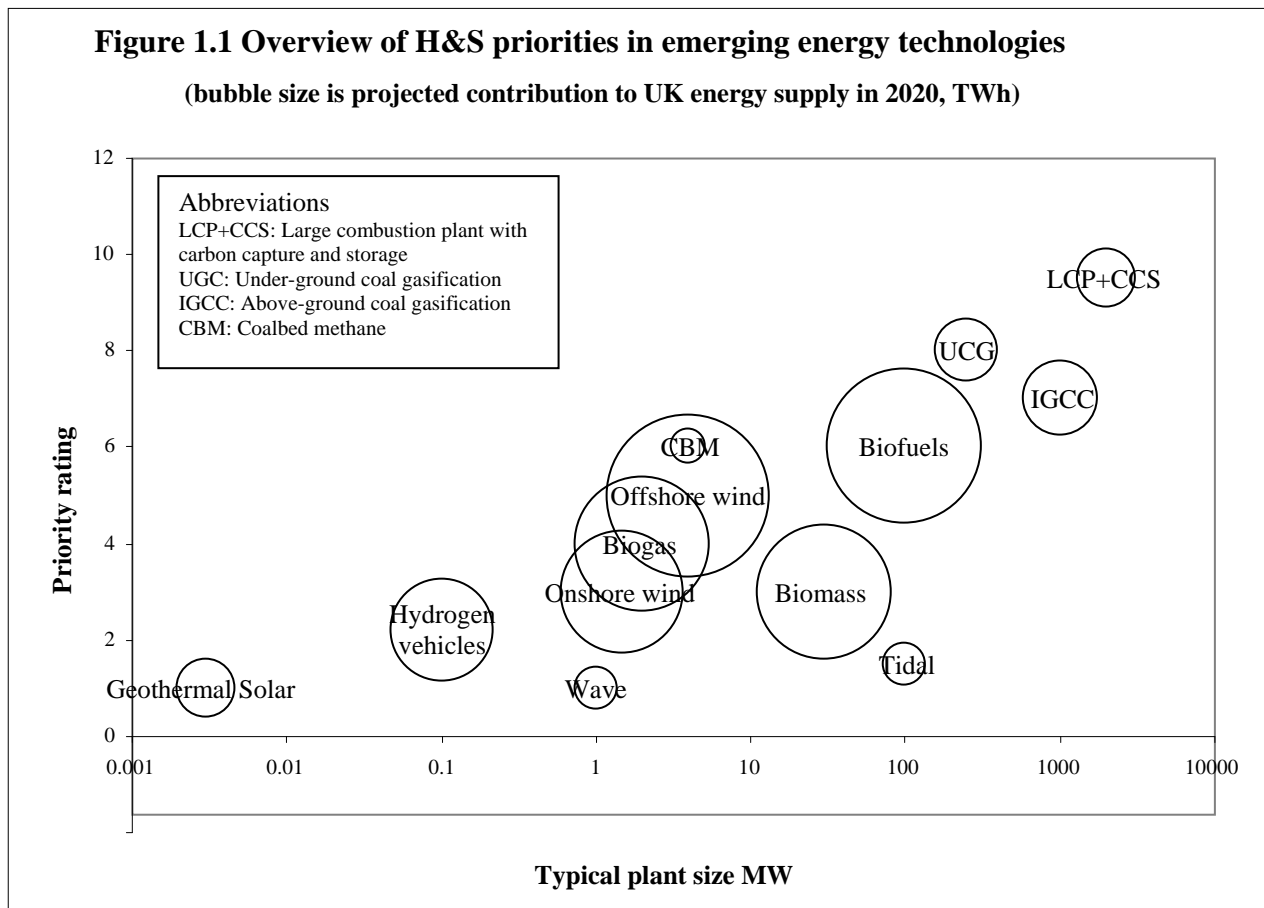
(d) There are also potential health and safety consequences of energy blackouts to all sectors from balancing a more complex energy infrastructure.

5. In addition to inherent hazards and risks, we know that other factors can affect a duty holders' ability to operate safely. These factors are found across the emerging energy sector:

- new and inexperienced entrants to medium and high hazard activities, both small and medium enterprises (SMEs) and large organisations
- inexperienced or under-skilled workers;
- firms handling new and unfamiliar technologies;
- time pressures affecting the pace of work;
- multiple contractors and contractor interfaces;
- retrofitting, upscaling and expansion of plant;
- use of poor quality or unsuitable materials and/or asset sweating.

Priority issues within power/fuel generation technologies

6. Figure 1.1 gives an overview of the potential health and safety risks associated with emerging energy technologies. For each emerging power/fuel technology, the priority rating on the vertical axis is plotted against a typical generating capacity in MW on the horizontal axis. The anticipated contribution that each technology will make to total UK energy demand in 2020 is indicated by the size of the bubble. As a reference point, the contribution to energy demand from 'biomass' is similar to that expected to come from nuclear power in 2020.



7. In this diagram, if the plant size is large and the bubble size is large, we expect there to be a *small* number of *large* installations of this type, usually operated by large companies. If the plant size is small and the bubble size is large, we expect there to be a *large* number of *small* installations of this type, often operated by small companies. Note that in the case of onshore and offshore wind, the MW figures relate to individual turbines, not to wind farms, which could be made up of hundreds of turbines and exceed 1GW capacity (for offshore wind). Large wind farms will be operated by large companies.

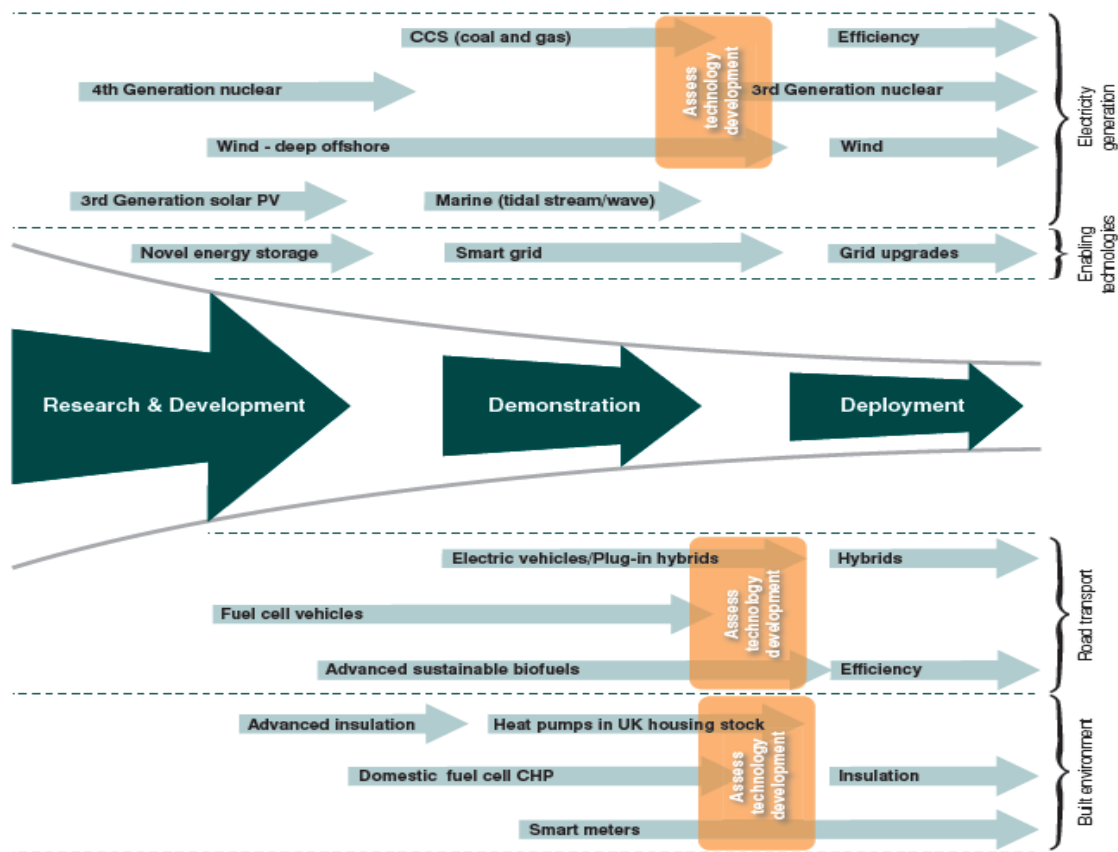
8. The priority ratings have been assigned from estimated incident probabilities and consequence data, using expert knowledge and judgement to read across from evidence for similar processes in other industrial sectors. Risks during both construction and operation of facilities have been considered to calculate quantitative estimates of accident risk per installation and potential fatalities over a 10 year period, up to 2020. Because these predictions are uncertain they have been used mainly for ranking risks. Our final priority ratings were adjusted to reflect *tolerability*

of the risk. We have done this by increasing the relative priority for those technologies that have major accident hazards, with the potential for multiple fatalities and off-site consequences.

9. Emerging Energy Priorities: Technologies with high priority rating and large bubble size have the greatest potential for interventions to have a beneficial impact on risk prevention, risk control and risk reduction. However, in considering *how* to intervene, the structure and attitude of the industry, the maturity of the technology, the tractability of the issues and likelihood of success have all been taken into account (Annex 2).

Timeline for technology development

10. The following diagram has been reproduced from a report entitled ‘Energy Innovation Milestones to 2050’ published by the Energy Research Partnership in March 2010. It shows the development pipeline for selected energy technologies, indicating the progress that will be needed by 2020 if the UK is to meet its energy goals.



11. Between 2010 and 2020 the focus for emerging energy technologies will be on demonstration, i.e. characterised by rapid growth in the number of installations, with many different competing designs being deployed, on increasing scale during the 10 year period, before market leaders emerge and best practice is established in design, installation and operation.

Annex 2: Intervention strategy for Emerging Energy Technologies

Summary description of the sector and priorities within it

1. Annex 1 gave a brief contextual overview of the energy sector, highlighting which technologies within the sector are ‘emerging’ and the main health and safety issues associated with those technologies. The evidence base and rationale for prioritisation within the sector were also summarised.

2. Health and Safety policy is set at national level but energy policy is set regionally; UK energy policy is diverging, with the Scottish Government and the Welsh Assembly adopting specific priorities. This EET intervention strategy recognises the need to build policy relationships with Wales and Scotland as well as with DECC. The proposed EET operational interventions are likely to have a regional focus.

HSE Strategy goals and destination statements

3. The characteristics of the emerging energy sector – new technologies, new entrants, rapid growth and development – make it particularly important to engage early with stakeholders to ensure that health and safety risks are recognised and effectively managed at or before their inception. The HSE strategy goals that are particularly relevant are:

Strong leadership, to champion health and safety and to ensure learning, improvement and sharing of good practice;

Build competence to identify and proactively manage risks, both in the industries themselves and in the regulators of the sector;

Setting priorities – developing the means to recognise new risks early on and to take appropriate, proportionate and prioritised action;

Reducing the likelihood of low frequency high impact catastrophic accidents.

4. The emerging energy sector is developing in response to strong economic and political drivers and incentives. Health and safety must be embedded within the wider framework of regulation and societal expectations that govern the energy economy. The relevant HSE strategy goal is to take account of wider issues that impact on health and safety in the energy sector.

Aims of the proposed intervention strategy

5. The aims of our intervention strategy are:

- Early intervention with stakeholders adopting new technologies in order to encourage best design and practice
- Embedded health and safety in developing energy policies

Objectives relating to each of these aims are given in Table 2.1.

Possible ways to achieve the aims and objectives

6. The intervention options for EET are informed by the state of development of the differing energy technologies, the characteristics of the dutyholders in the sector, other stakeholders in the health and safety system and a range of other factors that will affect the likelihood of success.

7. There is nothing in the EET domain that requires the introduction of novel approaches to intervention; tried and tested intervention methods can be applied. There are significant challenges in bringing together the skills that will be required from different parts of the organisation. The pace and scale of technological development is such that new ‘hybrids’ can emerge, for example underground coal gasification combined with hydrogen fuel cells. HSE needs to deploy its resources flexibly to respond to these challenges,

Three intervention approaches are proposed:

8. First, to work with those in the health and safety system who have maximum leverage to raise the profile of health and safety in the industry, develop high standards of technical excellence, good operational practice and exert influence through the supply chain. HSE’s role is to encourage the development of effective trade bodies/training providers and to nurture leadership and ownership of H&S in the industry.

9. Second, to take a proactive approach to regulating the large-scale installations that involve major hazards, or other significant risks of fatalities and major injuries, through carefully targeted proactive inspection and follow-up. HSE’s role is to ensure that risk control measures are adequate, to identify and disseminate best practice and to develop benchmarks for enforcement. For small-scale or low risk installations a reactive approach to inspection is proposed, to follow up complaints and incidents and to take enforcement action where necessary. Learning from inspection work should be fed back into the industry via trade bodies etc for use in their own guidance and good practice codes. Capturing and exploiting this learning will also be vital to the development of HSE’s intellectual capital.

10. Finally, to work with other stakeholders in the health and safety system whose policies and actions shape the environment in which the energy sector operates – sponsor departments, other regulators, sector skills bodies, academics – to embed health and safety considerations throughout the technology life cycle, within policy and incentivising frameworks, and to work towards better regulation of the industry across government.

11. The balance of activity proposed over the period 2011 to 2014 is to prioritise partnership working with key stakeholders (including policymakers across government) in each of the priority EET subsectors. In addition, four pilot interventions involving proactive operational work (including inspection) are proposed in this period for CCS, wind farms, LNG regasification and waste-to-fuel installations. These pilot projects are denoted **Key Emerging Energy Pilots** (KEEPs).

12. In Table 2.1 we propose interventions that address each of the two EET aims and their associated objectives. The table includes an assessment of the potential for success, impact and rationale for HSE intervention, considering the tractability, scale and importance of the issues concerned. Timings are indicated in Table 2.1 as: Immediate – work is already underway or should be started within 3-6 months;

Short term – work year 2011/12; Medium term – 2-3 years; Long term – 5 years +.

Annex 2 Table 2.1: Proposed Interventions for prioritised EET subsectors

Priority area / aims to be addressed	Objectives / Type of intervention	Potential for success/ rationale	Challenges for delivery / timing and resource constraints
<p>CCS</p> <p>- Early intervention with stakeholders</p> <p>- Embedded health and safety in energy policy</p>	<p>To work with early adopters and industry bodies to encourage them to demonstrate leadership on H&S matters, plug key knowledge gaps, develop appropriate H&S indicators, and produce guidance, training standards and good practice codes.</p> <p>KEEP1: To provide H&S regulatory oversight of the DECC CCS competition; to ensure the learning from this exercise is fully integrated into future developments and codes and standards for implementing CCS.</p> <p>To work with EU, DECC and EA/SEPA to clarify the regulatory regime for CCS and to identify and develop approaches (regulatory and other) for ensuring control of MH risks during the development of CCS infrastructure and implementation of the CCS chain.</p>	<p>Good potential for success given the profile of the industry and the nature of the companies involved.</p> <p>HSE is already committed to this critical work.</p> <p>Essential work to ensure that major hazard risks are effectively controlled, with or without legislative change.</p>	<p>High political profile, scale of investment involved, plus major hazard risks, make this an area where HSE needs a high level of political awareness in addition to sound technical knowledge. Uncertainties around HSE's research budget may affect delivery. <i>Timing: Immediate</i></p> <p>Challenges in joined-up working across organisational boundaries must be overcome to present a unified HSE face to stakeholders. The DECC competition adds challenges for information flow. <i>Timing: Immediate</i></p> <p>Regulatory and cost recovery issues need to be decoupled. Risk that HSE could be seen as deterring development. <i>Timing: Immediate</i></p>
<p>Renewables: Wind, wave and Tidal</p> <p>- Early intervention with stakeholders</p> <p>Wind, wave and Tidal continued</p> <p>- Early intervention with stakeholders</p>	<p>To undertake leadership work with industry bodies as above. Encourage government and industry bodies to develop and embed H&S requirements within design, licensing and supply chains.</p> <p>KEEP2: To pilot 'cradle to grave' inspection of a range of wind farm operations including shore-side construction for offshore farms, to a) verify key H&S risks; b) identify good practice; c) develop benchmarks. Investigate incidents and feed back learning to industry stakeholders.</p> <p>To identify key stakeholders the wave and tidal industry, build effective relationships and to embed H&S into technology and infrastructure development.</p>	<p>Good potential for success if the right partners are selected.</p> <p>Important and timely work in an industry with a very high accident potential. Many deaths and injuries could be prevented.</p> <p>The industry is in its infancy but growing rapidly and is likely to</p>	<p>There are a number of groups operating in this sector and HSE needs to choose its partners carefully in order to maximise leverage. <i>Timing: Short term</i></p> <p>Difficult to locate 'ownership' of work on offshore renewables within the current organisational structure. Requires expertise in shortage topics from disparate parts of the organisation. Serious practical challenges and high costs of inspection offshore. <i>Timing: Short term</i></p> <p>Wave and tidal energy is a priority technology for Scotland. No clear focus in HSE at present. <i>Timing: Short term</i></p>

Priority area / aims to be addressed	Objectives / Type of intervention	Potential for success/ rationale	Challenges for delivery / timing and resource constraints
- Embedded health and safety in energy policy	To work with DECC, Ofgem, Scottish Government, Crown Estate and MCA to clarify the regulatory regime for offshore renewables activities, and to develop approaches (regulatory and other) for ensuring control of H&S risks during construction and operation of installations. Clarify regulatory boundaries for micro-generation.	involve significant construction risks. Essential work to provide a framework for H&S regulation of offshore renewable energy generation.	Complexity of interactions with the other regulators involved. Need to build effective links with devolved administrations. <i>Timing: Immediate</i>
<p>Electricity & electrical infrastructure</p> <p>- Early intervention with stakeholders</p> <p>- Embedded health and safety in energy policy</p>	<p>To work with industry bodies, companies and other partners to identify safety issues arising from new energy sources, distributed generation and supply/demand management, including any effects on infrastructure integrity and legacy networks or equipment.</p> <p>To contribute to safe standards for design and specification for new equipment and systems for use in generation, connection and utilisation of energy.</p> <p>To investigate incidents and take enforcement action where necessary. Feed back learning to industry stakeholders.</p> <p>To work with appropriate partners to ensure that competent people design, construct, install, operate and maintain systems, in areas such as microgeneration, CHP, smart metering and smart grids.</p> <p>To work with DECC and Ofgem to ensure that price control regimes and incentives encourage safe operation and maintenance of electrical systems.</p>	<p>Good relationships in place with many of the key stakeholders. Opportunity to align issues of safety and security of supply.</p> <p>HSE keeps a watching brief on developments and directly participates in only a few carefully chosen fora.</p> <p>Good partnership working already in place must be maintained.</p> <p>Essential work though difficult to get the H&S message embedded.</p>	<p>Key challenge is the pace and scale of change and the resources available for this work. <i>Timing: Immediate</i></p> <p>Shortages of specialist expertise in several key areas means that capacity for proactive work is limited; however <i>not</i> intervening early will increase later demands for reactive investigation. . <i>Timing: Immediate</i></p> <p>Incident investigation places demand on the same resources (electrical specialists) needed for wind energy. The boundary where HSE responsibilities end needs to be carefully policed. <i>Timing: Immediate</i></p> <p>Massive planned roll-outs of new technologies such as Smart meters will hugely expand the workforce. <i>Timing: Medium to long term</i></p> <p>Risk that HSE could be seen as a brake on development. Requires deft and politically astute handling. <i>Timing: Short term</i></p>
Gas import and storage	To work with industry bodies to encourage them to demonstrate leadership on H&S matters, develop appropriate	HSE has a developed relationship with the	Important but business-as-usual activity that is covered

Priority area / aims to be addressed	Objectives / Type of intervention	Potential for success/ rationale	Challenges for delivery / timing and resource constraints
<p>- Early intervention with stakeholders</p> <p>- Embedded health and safety in energy policy</p>	<p>H&S indicators. To work with industry leaders and other regulators to ensure that competent people design, construct, operate and maintain systems, and that the H&S risks are properly understood and controlled.</p> <p>KEEP3: To work with MCA to examine and clarify the regulatory interfaces for LNG imports and regassing into the national transmission system. To review options for better regulation across the ship-shore boundary.</p>	<p>major companies in this industry.</p> <p>HSE has an existing MOU with MCA that requires updating to encompass EET issues.</p>	<p>by existing major hazard regulations. <i>Timing: Immediate</i></p> <p>MCA lacks process safety expertise and is not best placed to regulate major hazard risks to off-site (i.e. onshore) populations. <i>Timing: Short term</i></p>
<p>Renewables (Biomass, biogas and biofuels)</p> <p>- Early intervention with stakeholders</p> <p>- Embedded health and safety in energy policy</p>	<p>To undertake leadership work with relevant industry bodies and contractors. To encourage trade and industry bodies to raise awareness of H&S risks, develop guidance, identify best practice and raise operator competence standards.</p> <p>KEEP4: To pilot inspection work of larger-scale plant to identify key H&S risks, e.g. in feedstock handling, during emergency shutdown and regular maintenance activities, identify good practice and develop benchmarks. Investigate incidents and feed back learning to industry stakeholders.</p> <p>To work with National Grid, DECC and Ofgem to review GSMR and to understand / control H&S risks in injecting biomethane to the gas grid. Clarify regulatory boundaries for workplace and micro-generation.</p>	<p>Good potential for success as HSE can build on existing work, e.g. in waste and recycling.</p> <p>Important and timely work in an industry with major hazard potential, undergoing rapid proliferation and technological change.</p> <p>Good potential for success: strong relationships already in place.</p>	<p>There are a range of groups operating in this sector. Industry bodies are at an early stage of development so there is an opportunity to exert considerable influence. <i>Timing: Immediate</i></p> <p>No single point of ‘ownership’ for biomass renewables in HSE. Wide range of technologies and risks requires joined-up thinking and flexible deployment of scarce resources such as process safety expertise across organisational boundaries. Biomass renewables are a priority for the Welsh Assembly and energy policy may be devolved to them in the near future. <i>Timing: Short term</i></p> <p>Risk that HSE could be seen as a brake on development even though HSE’s responsibilities are limited. <i>Timing: Immediate</i></p>
<p>Cleaner coal technologies</p> <p>- Early intervention with stakeholders</p>	<p>To work with companies and industry bodies to monitor progress with new developments in the UK and to develop / disseminate / benchmark best practice approaches for the UK context.</p> <p>To work with industry leaders to ensure that competent people design, construct, operate and maintain systems, and that the H&S risks are properly understood and controlled.</p>	<p>Good potential for success with willing partners.</p> <p>Opportunities currently exist to influence developments at a very early stage.</p>	<p>Industry bodies are willing partners and recognise that good H&S is critical to their business success. High expectations of HSE. <i>Timing: Short to medium term</i></p> <p>Requires skills from several disparate parts of HSE, crossing the oil and gas, coal and chemicals sectors. An investment of time and effort now could avert serious H&S problems later, but will be difficult to resource due to shortages of specialist expertise, eg wells inspectors.</p>

Priority area / aims to be addressed	Objectives / Type of intervention	Potential for success/ rationale	Challenges for delivery / timing and resource constraints
- Embedded health and safety in energy policy	To encourage government and industry bodies to develop and embed H&S requirements within design, licensing and supply chains.	Good relationships are already in place with key stakeholders in EA/SEPA and the Coal Authority. Less so with DECC.	<i>Timing: Medium to long term</i> Effective liaison with partners will require a single focal point to coordinate HSE's activity with the subsector, which is currently lacking. <i>Timing: Short to medium term</i>
Hydrogen - Early intervention with stakeholders - Embedded health and safety in energy policy	To identify key stakeholders in government and industry, work with them to build effective relationships and to embed H&S into hydrogen technology and infrastructure development. To work to establish HSE's boundaries and regulatory responsibilities for hydrogen-fuelled -transport related issues.	Currently maintaining a 'watching brief' but there is a need to gear up for a more proactive approach in future years. Existing relationship with DfT provides the basis for tackling this issue.	Area of rapid technological development with many pilot projects. Diverse interests and expertise on this topic across HSE, hence no clear focus for proactive work at present. <i>Timing: Short to medium term</i> If boundaries are not clear HSE may end up as regulator of last resort. <i>Timing: Medium to long term</i>

Annex 3: Regulatory Strategy

Purpose

1. This strategy sets out HSE's approach to regulating the work-related activities of the (non-nuclear) emerging energy technologies sector. The Coalition's better regulation environment is challenging and evolving and the suggested regulatory course in the main paper is a balanced judgement. This annex provides a brief insight into the analysis and arguments that went before.

2. It is a response to what we conclude of the risks presented by emerging energy technologies. The main body of evidence will be placed as a key knowledge resource on HSE's intranet, and a condensed version is placed alongside this annex. This work led us on to an assessment of regulatory gaps which was undertaken against the array of health and safety regulation that has developed under the Health and Safety at Work etc. Act since 1974. For clarity we have included supporting background to HSE regulation at the end of this annex (paragraph 30 onwards).

3. Key conclusions from this analysis are:

- HSE is capable of regulating emerging energy technologies, in a proportionate manner, where there are duties under the general provisions of the Act.
- New activities offshore in the REZ and GISZ are either not covered by the Act or where they are covered that cover expires in April 2011.
- There are a number of regulatory anomalies i.e.
 - new energy industries with major accident hazard potential are not covered by existing major hazard legislation
 - aspects of the generic onshore regulatory framework are not extended offshore beyond the territorial seas, so do not apply to new activities in what is a high hazard environment.

4. The **aims** for the strategy, agreed with the Board in April 2010 (before the general election), are:

- To provide clarity and consistency across the on- and off-shore regimes; and
- To optimise interactions with other regulators and co-regulators involved in the energy industries.

5. The strategy sets out the overarching principles and more detailed solutions to steer a course between the demands of the new Better Regulation agenda and the findings of the Lord Young Review on one hand, against more familiar drivers for HSE (the hazard/risk profile of industries and the incident history; HSE's current regulatory principles informed by experience and foresight, and EU regulatory activity) on the other.

6. The **objective** is to provide a level playing field for workers, employers and stakeholders in the emerging energy economy and to give adequate public assurance. We will do this by ensuring the timely application of the Act, with appropriate supporting measures that provide protection to standards comparable with existing sectors, while addressing better regulation. The strategy will not address regulation for cost recovery issues because this is best considered alongside HSE's corporate cost recovery project (annex 4).

OVER ARCHING PRINCIPLES

- HSE will regulate new high hazard EET work activities applying the broad generic framework of the Act supported by agreed clear guidance of standards expected of duty holders to discharge their duties under the Act
- The general provisions of the Health and Safety at Work etc. Act 1974 and associated core regulations are sufficient to regulate the emerging energy technologies sector unless there is a clear demonstration to the contrary.
- The introduction or extension of process/activity specific regulations will only be considered where:
 - there is a compelling body of evidence to support the regulations and
 - it has been established that the broad generic framework of the Act is insufficient and
 - the requirements of OIOO policy have been considered in full.

Solutions

(1) Extending the application of the Act to new offshore activities

Timing: immediate

7. The Act and the generic regulations made under the Act (which implement EU legislation etc.) provide the basic regulatory framework in the UK. The application of the Act offshore to existing and future technologies is a fundamental requirement to maintain basic regulatory protection and a level playing field for energy companies across all sectors.

8. Where new work activities take place onshore the general provisions of the Act would automatically apply without the need to make legislation. However, in an offshore environment the Act is extended by the HSWA (Application outside Great Britain) Order 2001. The Order applies HSWA provisions to specific activities or types of premises. Therefore, as new industries move into the offshore environment it is necessary to update the Order to include new activities.

9. We propose a rolling programme of updating the Order to include new activities in line with the deployment of new technologies. Preparations to replace the 2009 variation order which expires in April 2011 are well advanced. A new variation order in the same terms as the current variation order will continue to extend the Act to offshore renewable activities in the REZ until April 2013.

10. By implementing a rolling programme HSE will only extend its regulatory remit when a new activity is about to commence, this will allow for more accurate impact assessments. In addition, where OIOO applies HSE will avoid unnecessary exposure to finding equivalent regulatory 'one outs' for costs to activities that may never come to fruition. However, this approach is not without its risks, given the pace of change within the energy sector HSE may find gaps in coverage if amendments are mistimed. In addition, there is uncertainty attached to any application for regulatory amendment, and increased administrative cost associated with a rolling programme of amendments.

11. Proposals to revoke the existing AOGBO and variation orders and replace it with a new restructured AOGBO are currently on hold. Such a new AOGBO could extend the Act to all known and potential activities offshore. A new format (an article for each new sector) would be more transparent and therefore easier for new entrants to understand. This option may be revisited once discussions with BRE and the Reducing Regulation Committee on the application of the OIOO rule to the Act have concluded.

12. It is worth noting that the application of many statutory instruments made under the Act will also be extended when the Act is extended unless specifically disapplied in each case. Some of these (26) SI's secure compliance with EU directives (Work at Height; Management regulations) others implement UK policy alone (RIDDOR; Ionising Radiation regulations). HSE has not had time to consider disapplying the SI 'bundle' from EET activities either wholesale or selectively before re-making the variation order for next April. However, this does present an interesting option for streamlining HSE's regulations in the future (see paragraph x)

(2) Clarifying the application of the OIOO rule to the Act

Timing: immediate

13. In considering the extended application of the Act offshore HSE has taken a view that the application of the OIOO rule need not apply to extending the Act. The extension of the Act will ensure that the existing, most fundamental level of health and safety legislation applies to new activities in the same way as it applies to activities which are currently carried out offshore. As such, this is not a new regulatory burden but rather the benchmark which applies to all UK work activities as is the case for other elements of UK criminal and civil law.

14. We have flagged our interest to explore this idea with BIS, in the response from the Chair to Vince Cable's invitation to sign up to OIOO. If HSE secures agreement with the Better Regulation Executive that the extension of the Act is outwith the OIOO policy, we will revisit the pros and cons of the options to amend or replace the current AOGBO.

(3) Regulating the higher hazard emerging energy sectors under the broad generic framework of the Act

Timing: immediate/short term

15. Analysis of the regulatory coverage for new energy technologies highlighted a number of regulatory anomalies i.e.

- new energy industries with major accident hazard potential are not covered by existing major hazard legislation (e.g. carbon capture and storage)
- although amendments to the AOGBO automatically extend a number of SI's made under the Act some relevant regulations are disapplied beyond the territorial seas (e.g. CDM)

16. HSE's policy objectives for achieving and maintaining adequate risk control in these sectors remain the same. However, rather than automatically extending the application of process/activity specific regulations to address the anomalies, as a first alternative, HSE will look to the general principles of the detailed regulations to provide models for compliance. For example, early adopters of CCS have been advised that they can best meet their duties under the Act by applying the principles of the major hazard regulations (COMAH, PSR &

Offshore Regulations); participants in the first DECC CCS competition have made agreements with DECC to this effect.

17. This approach is both

- consistent with better regulation principles which view regulation as a last resort and
- an acknowledgement that with emerging energy technologies HSE and industry are learning together particularly in areas such as CCS.

18. Whilst there is extensive supporting guidance for the relevant regulations HSE will need to set out an appropriate intervention strategy and clear guidance for relevant industries highlighting the principles that they should adhere to. Guidance will also need to be given to planning authorities and emergency responders who have a role in mitigating the consequences of potential major accidents. These are significant tasks, and input from co-regulators (e.g. environment, DECC) and industry stakeholders must be forthcoming.

19. New industries with no or a limited track record potentially merit greater regulatory scrutiny and public accountability, than existing industries i.e. the opposite to this approach. Mechanisms for monitoring the effectiveness of risk control achieved would be required alongside a clear statement of the necessary 'test's to be met when determining that the generic duties of the Act are insufficient and that more specific regulation is required.

20. Existing sectors operating under the full weight of major hazard regulation might feel unfairly encumbered by this approach to EET sectors. On the other hand the current approach will be something of a stress test for regulating high or major hazard sectors, the outcome of which will either extend specific duties for MAH control, or provide evidence for a review of efficacy of existing MAH regulations.

(4) Clarifying the limits of HSE's interests in energy technologies

Timing: short term to long term

21. As well as ensuring adequate coverage of the Act in the offshore environment, there are areas where HSE can clarify and limit its roles and responsibilities, in keeping with the Lord Young recommendations and new review of HSE regulation. There are areas of the new energy sector where HSE would not seek to proactively intervene, and would want to avoid being drawn in as a regulator of last resort. To ensure clarity, internally and externally, HSE may want to develop and publish agreed position statements as suggested below.

22. Micro generation: Clarifying the application of the Act and the limits of HSE's responsibilities in relation to domestic micro generation and feed-in to local electricity networks. This calls for us to review and clearly state publicly HSE's position on (a) on the application or not of HSWA (Section 2) to domestic electricity generators who benefit from the feed-in tariff; and (b) the application of section 3 (i.e. impacts on people not employed by the risk creator but affected by the activities – contractors, members of the public etc.) There are some work-related aspects, as with the professional installation and maintenance of SMART meters (see below), but potentially new incursions into the domestic sphere, where elsewhere government policy is increasingly de-regulatory (e.g. removing the need for planning consents). HSE runs the risk of over-regulating and/or become the regulator of last resort. *Timing: immediate/short term.*

23. Supply and demand management: the move to SMART technology for managing electricity (and gas) supply and demand, with SMART grids, meters and appliances, may introduce new duty holders. HSE may wish in due course to clarify duty holders under the Act in these areas. For example, Ofgem announced in August that the communication of data to and from household smart meters will be managed centrally by a new GB-wide function, covering both the electricity and gas sectors, known as the central data and communications entity ("DataCommsCo" or "DCC"). This will provide a two-way communications channel between smart meters and a central communications hub to which suppliers, network companies and other authorised third parties will have access for specified purposes.

Timing: Medium to long term (depending on technology uptake)

24. Transport: Transport issues are also on the borders of HSE's responsibilities, and the sector is expanding with new technologies, e.g. with greater use of hydrogen fuel cells, hydrogen refuelling, and electric cars and charging points. Again, there are benefits to working with other regulators and clarifying the limits of HSE's responsibilities to reduce the risk of becoming regulator of last resort. In the case of hydrogen fuel cell technology, HSE already regulates large scale hydrogen storage – e.g. for refuelling public transport vehicles - and it is difficult to envisage why this should not continue.

(5) Streamlining HSE regulations

Timing: short/medium term

25. The advent of the new energy sector presents HSE with encouraging opportunities to embrace the Better Regulation agenda.

26. A number of the major hazard regulations which apply to the energy sector are due for review (GSMR, BOSR etc.) In undertaking these reviews consideration will be given to simplifying duties and taking out unnecessary or duplicate regulatory burdens (e.g. on notifications; emergency planning; in areas of overlap with other regulatory bodies). The resulting reduced burden on existing industry may be sufficient to meet any 'one out' requirements where it has been demonstrated that new activities need to be brought within the scope of these regulations.

27. New activities offshore provide a discrete environment for HSE to consider new, non regulatory approaches to maintaining adequate standards of risk control e.g. by extending the policy of 'not introducing/amending regulations' to 'cutting away' the bundle of generic regulations (see paragraph 12). The extent to which regulations can be cut away will depend in part on whether they implement EU directives, but this would represent a significant shift in ideology. if implemented HSE would need to first set out the non regulatory mechanisms that it would adopt to achieve the same outcomes.

28. Lord Young has made clear in his report that his focus is not on the major hazard regulations but on the – as some perhaps see it – plethora of occupational regulations. Major hazard regulations arise from inquiries into catastrophic events and/or respond to widespread concern about public safety. It is entirely conceivable that Government's attitude to operating under the broad generic framework of the Act is to be sceptical about the large bundle of occupational SI's but accepting of the desirability of specific permissioning regulations. A streamlining review of HSE regulation could ultimately discriminate between occupational and major hazards regulation in a way that transforms the landscape.

29. The EET Programme would need to work with HSE's Better Regulation Unit – bringing to bear our acquired knowledge and evidence - to consider whether there is material to support a more extensive overhaul of the regulatory suite. This work will link in to the HSE wide review of regulations instigated by the Lord Young Report.

Background

30. **Assumptions:** In assessing the regulatory coverage of the new energy economy, the Programme categorised the legislative landscape as the primary Act supported by three types of regulation (general management, hazard based, and activity or process based) plus HSE's role as a statutory consultee. This is illustrated in figure 3.1 below. We assumed that HSE will seek to regulate the emerging energy industries to the same standards as existing industries and identified regulatory inconsistencies are based on hazard and risk profiles.

31. **Principles:** The proposed regulatory strategy for EET is built around the following core principles:

- New activities or industries will achieve the same health and safety standards as existing industries with comparable hazard profiles.; and
- In light of Better Regulation requirements, striving for a consistent outcome does not automatically mean a uniform approach to regulation, nor does it mean that regulation is always necessary if there are other means to achieve the same outcome. The case for applying specific regulations over and above the HSWA would require compelling evidence that the Act alone is not sufficient.
- HSE should optimise its relationships with other regulators and licensing bodies having interests in the energy sector in order to maximise efficiency and reduce costs to business.

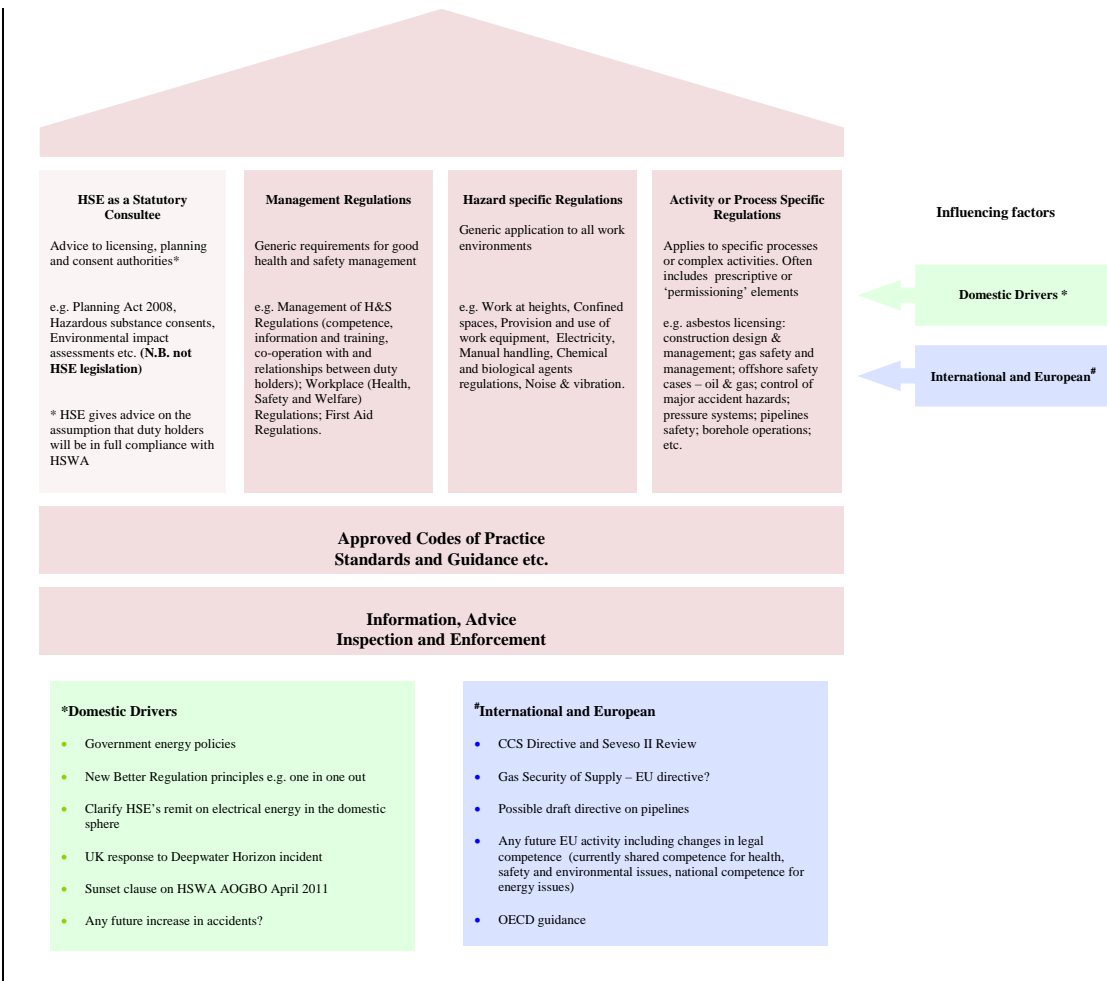


Figure 3.1. An illustration of the UK Health and Safety Legislative Landscape

Annex 4: Resource strategy for Emerging Energy Technologies

Aims

1. The aims of the resource strategy are:

- To maximise opportunities for cost recovery in all the EET areas;
- To maximise organisational effectiveness and benefits, by adoption of fit for purpose systems, interface management, and, where necessary, structural alignment with the key drivers for better regulation of EET sectors.

Options for cost recovery

2. The scale and pace of transformation of the UK energy sector is such that advisory and operational work in the sector has the potential to make significant new demands on HSE over the next 10 years. HSE's strategic capability to meet the needs and expectations of stakeholders in the sector relies on the availability of adequate resources and the means to deploy those resources effectively. Broader work that is underway on cost recovery across the whole of HSE's remit has provided the context in which we have explored options for resourcing new work in the energy sector.

3. Under the current regulatory position for EET there is limited scope to recover costs in the emerging energy industries. The picture is quite different in the 'traditional' energy sector where large parts of the sector – oil and gas, nuclear, LPG – are within permissioning regimes and hence subject to cost recovery. Five options for extending this cost-recovery to EET activities are:

Option 1: Do nothing – in which case cost recovery would only be extended to EET if a case has been made to extend permissioning regulations to EET. The regulatory strategy (Annex 3) discusses this option but makes it clear that it would require a compelling body of evidence that the hazard and risk profile warrants a permissioning regime; it should not be considered simply as a means to recover costs. On that basis, permissioning is highly unlikely to encompass all EET operations, and gathering the supporting evidence would be a medium to long-term project.

Option 2: Make a case to link formally health, safety and environmental regulations such that health and safety considerations are included in environmental permitting of energy installations. This would not cover the entire energy sector as EPR permits are not required for wind and wave projects. It would require a major review of regulation across the HSE/EA/SEPA boundary and would therefore be a medium to long-term project.

Option 3: Press DCLG for payment of HSE's costs relating to its role as a statutory consultee on nationally significant infrastructure projects in England and Wales. Resourcing this role properly adds value as timely early advice to those developing new energy installations can reduce the need for work by HSE down the line, and it could be difficult for HSE to later object to a development that has been given early consent. Note that in Scotland HSE is invited to comment on energy projects but is not currently a statutory consultee; different approaches to cost recovery may develop in the devolved administrations. This option would only recover costs for one minor aspect of HSE regulation of EET and would be a short to medium-term project.

Option 4: Make a special case to introduce cost recovery across the entire energy sector. The rationale for this would be:

- Creation of a level playing field for all energy industries, since much of the energy sector is already subject to charging for regulatory oversight;
- Energy security and continuity, which is now a major public priority. An incident in a large generating, storage or distribution plant has the potential to disrupt supply, with damaging and possibly dangerous consequences for other industries or vital public services. HSE's role in regulating the industry provides assurance and contributes to the wider public good.

Sector-specific charging that is not based on hazard and risk considerations would be a new departure for HSE and would require a compelling case that the benefits to the public outweigh the costs to industry.

Option 5: Stratify energy installations into 'proactive' and 'reactive' categories, applying different intervention approaches *and* cost recovery approaches to each category. EET installations could be categorized using the following criteria:

- Potential H&S risk. Higher-risk installations would be placed in the 'proactive' category by considering the potential for the activity to involve significant hazards, catastrophic incidents or public concern. Our analysis of potential H&S risks in EET installations shows a clear association between the generating capacity (*size*) of an emerging energy installation and potential H&S risk (see Annex 1).
- Cost-effectiveness. Recovering a small cost from a small company is less cost-effective than recovering a large cost from a large company. This reinforces the case for size-based stratification but with boundaries that vary for different *types* of installation. For example regulatory oversight of offshore installations should recover costs regardless of size, because of the high cost of offshore inspection as well as the high value of H&S benefits gained from regulating the industry.

4. A primary size-based and secondary type-based stratification by HSE (Option 5) would align with approaches to regulating the energy sector in other government departments. New energy installations with a generating capacity exceeding 50MW (or 100MW in the case of offshore wind farms) are already classed as nationally significant infrastructure projects and subject to special planning arrangements by CLG. The Environmental Permitting Regulations also stratify energy generation installations by size and type, and EA/SEPA regulatory charges vary according to both criteria.

5. Our intervention strategy (Annex 2) is aligned with a stratified approach to cost recovery:

- For small or low-risk EET installations we propose a mainly reactive approach with only very limited proactive inspection. For installations in this category initial inspection could be carried out without charge, but any work needed to follow-up previous adverse findings, investigate complaints, incidents, etc could be charged for, subject to cost-effectiveness considerations ;
- For large or high-risk EET installations we propose carefully targeted proactive interventions. For installations in this category, this planned intervention work could recover costs. HSE could also charge for time spent giving planning advice; for design and construction advice; for exercising statutory functions required by major hazard regulations; and - as for low-risk sites - for all inspection follow-up work as well as investigations and enforcement.

Impact of cost recovery

6. Full monetized impact assessment has not been carried out at this stage, but can be done once the preferred options have been identified. Depending on where the size/type boundaries are drawn for Option 5, an indication of the potential numbers of installations in 'proactive'/'reactive' categories is given in Table 4.1.

Table 4.1: Numbers of EET installations stratified by size and type

	Approximate numbers of existing installations of this size	Approximate numbers of new installations each year (at current growth rates)
Larger-scale installations:		
Combustion plant >50MW	200	10
Combustion plant 20MW to 50MW	10	1
Biogas, biomass etc 3MW to 50MW	125	50
Biofuel plant > 20MWe	5	5
Offshore wind farms >50MW	10	10
Onshore wind farms >50MW	20	20
Wave/Tidal schemes>50MW	0	10
Smaller-scale installations:		
Offshore wind farms <50MW	2	0
Onshore wind farms <50MW	250	175
Waste incinerators < 20MW	100	10
Biomass, biogas and others <3MW	1000	100

7. Indicative costs to industry of the proactive intervention approaches proposed for larger or high risk installations, and comparisons with EA/SEPA charges, are summarised in Table 4.2. To put these potential charges to industry into context, the following investment costs have been cited in the press for a range of new energy installations:

- Hadyard Hill Wind Farm, 52 x 2.3 MW turbines, cost £85 million in 2006.
- Quoted costs for offshore wind farms range over £2.6- £3.15 Million per MW, eg Thanet 1 - £780 million for 300 MW; London Array - £2,000 million for 630MW; Lincs - £725 million for 248MW.
- Tees Renewable Energy Plant at Teesport will generate 295MW, quoted as £500million.
- Stevens Croft (Lockerbie) biomass fuelled plant 44MW £95 million (operational 2007).
- Add-on costs for CCS plant at Longannet cited as £1 Billion on top of the existing power station cost.
- New IGCC power station at Hatfield cited as £800 million for the 900 MW IGCC element or £500 Million for the first 430MW unit.

Table 4.2: Estimates of resources and costs for regulating EET installations

Work at larger-scale installations	HSE resource estimate	EA comparisons
H&S advice [†] during planning, consents etc Cost to industry if charged at £150 per hour**	Estimate 15 hours per installation £2250 pre-construction advice	EA provides up to 15 hours free pre-application advice and then charges by the hour
H&S advice [†] during design and construction Cost to industry if charged at £150 per hour**	Estimate 50 hours per installation £9750 advice during construction	Permit costs depend on installation type. CCS capture plant £22k* Gas-fired power station £60k Coal-fired power station £100k
Operational verification Cost to industry if charged at £150 per hour**	Estimate 100 hours per installation per year for proactive inspection. Follow up work charged separately. £15,000 p.a. verification	Annual subsistence fees depend on installation type. CCS capture plant £11k* Gas-fired power station £30k Coal-fired power station £48k
Safety case assessment (rarely required for EET projects) Cost to industry if charged at £150 per hour**	Estimate 500 hours per installation (based on CCS competition data) £75,000 in cases where safety case assessment is required	Hourly charges as per HSE Similar costs

[†] Note 1: Advisory work could be elective for non-major hazard installations.

* Note 1: These are proposed charges following changes to EP regulations to include CCS in 2011.

**Note 2: HSE's hourly rate would be twice this figure for offshore work

8. Evidence from existing permissioning regimes suggests that most duty holders in larger-scale undertakings do want to engage with regulators and share information with them to get endorsement of their approach, which provides assurance to their investors. While value to the investors in these schemes is not a rationale for charging for HSE intervention, it is a recognised benefit.

Organisational efficacy

9. EET is HSE's non-nuclear response to Government policy for sustainable, secure, and affordable energy supplies. In practice, the Government's strategic energy and climate change policies cover a plethora of different technologies, all with their own strategies and drivers.

10. From a health and safety perspective the wide range of new technologies are characterised by a number of crossing cutting themes – engineering unknowns, new and inexperienced entrants etc, etc. The EET programme has effectively picked up these cross cutting themes and managed the matrix of responsibilities within HSE to ensure effective intervention at an early stage with external stakeholders on both a proactive and reactive basis. This coordinating and interface role has ensured that HSE learns from the rapidly changing environment whilst maintaining a consistent line on issues of real health and safety. It has also allowed HSE to build effective relations with key cross cutting stakeholders such as the IEA. Whilst embedding EET into business as usual it is important to recognise that we will need to

continue responding to a wide range of evolving issues and we should ensure that we do not lose the strategic overview.

13. The key drivers to HSE are better regulation, and adding value to the emerging energy economy by influencing these industries at the outset. We will align with these by being a responsible, independent, enabling regulator that supports the safe introduction and expansion of major, untested hazardous technologies.

14. The following necessary components of organisational efficacy are essential to the success of the EET strategy:

(1) Leadership, coordination and monitoring

- Light-touch, but some, continued HSE strategic overview of high profile and evolving government energy and related policy initiatives, to ensure HSE is sighted on potential opportunities and threats; its activities remain coherent and where appropriate, consistent.
- Effective leadership, coordination and monitoring, so that we review and learn from reactive work, capture essential intelligence about the effectiveness of our regulatory and intervention approaches, anticipate new developments, and refresh the organisational strategy for EET;
- Adoption, within HSE, of the relict of EET functions and recognition of the importance of H&S and the energy economy, both internally and externally (i.e. people know where to come if no other address is obvious);

(2) Ownership of key functional relationships

- Good stakeholder relationships with the early enablers (government departments, licensing bodies, other regulators), so we can understand and influence the regulatory and incentivising environment for EET;
- Good stakeholder relationships with early developers and adopters (key R&D bodies, major trade associations, industry groups, companies, standards-making bodies), so we can build H&S into the early design and construction of installations, as well as their operation;

(3) Leadership of the four KEEPs

- Effective delivery of the four pilot interventions or Key Emerging Energy Projects (KEEPs), for which we need access to specialist skills from different parts of HSE, working collaboratively under effective project leadership; and for lessons from these pilots to inform future HSE energy-related activities and approaches;
- Maintenance of the knowledge strategy, including horizon scanning, managing the bank of information (e.g. Status Report) and systems (e.g. EET website and ebulletin; and topic packs); and

(4) Maintenance of major systems.

- Maintenance of the communications strategy and support materials including the stakeholder lists and catalogues, communications materials and briefing packs.

15. Annex 5 indicates how HSE intends to take ownership of these key structural components of EET.

Annex 5: Timelines for action [DN: needs updating when regulatory strategy annex has been added]

What	When ^{§§§}				Who
	Immediate	Short term	Medium term	Long term	
EET programme closure					
EET organisational strategy					EET Programme Team
EET status report and technical chapters					
EET knowledge strategy					
EET communications strategy					
EET topic packs					
Assist sector strategy development					
Assist work planning for 2011-2012					
Handover central stakeholder relationships and systems					To CCID
Annex 2: Intervention strategy					
CCS stakeholders leadership/competence					HID
KEEP1: CCS competitions					HID
CCS x-govt policy liaison					HID Policy
Wind wave and tidal stakeholders leadership/competence					OPSTD lead
KEEP2: Wind farms pilot intervention					OPSTD lead
Wind wave and tidal x-govt policy liaison					CCID
Electricity stakeholders leadership / competence / standards					OPSTD
Smart grids installation / competence					FOD
Electricity x-govt policy liaison					CCID
Gas import and storage leadership / competence					HID
KEEP3: Ship-based LNG regas x-govt intervention					HID lead

^{§§§} Immediate – ongoing, completion due within 3/6 months; short term – work year 2011/12; medium term – 2 to 3 years; long term – 5 years +

What	When ^{sss}				Who
	Immediate	Short term	Medium term	Long term	
Biomass/gas/fuels stakeholders leadership / competence					OPSTD
KEEP4: Waste to energy pilot intervention					OPSTD lead
Gas distribution policy liaison					HID Policy
Cleaner coal stakeholders leadership / competence					HID
Cleaner coal x-govt liaison					HID Policy
Hydrogen stakeholders leadership / competence					OPSTD lead
Hydrogen x-govt liaison					OPSTD lead
Annex 3: Regulatory strategy					
(1) Extending the Act offshore					
Replacement variation order for the windfarm activities					HID Policy
Rolling programme to extend the AOGBO to other offshore activities					HID Policy
(2) Clarifying the application of the OIOO rule					
(3) Regulating higher hazard emerging energy sectors under the general provisions of the Act					
Clear guidance on the principles that relevant industry should adhere to					
Establishing mechanisms for monitoring the effectiveness of risk control					
Clarifying tests to determine when the generic duties of the Act are insufficient					
(4) Clarifying the limits of HSE's interests					
Micro generation				FOD/	CCID
Supply and demand management					
Transport					
(5) Streamlining HSE regulations					
					CCID

What	When ^{sss}				Who
	Immediate	Short term	Medium term	Long term	
Annex 4: Resource strategy					
Do nothing (option 1)					HID Policy
Link H&S to EPR (option 2)					CCID
Recover costs for NSIP (option 3)					CSAG
Special case for energy sector (option 4)					CCID / HID
Stratified charging (option 5)					CCID / HID

Annex 6: Update from April 2010

1. The pace of the emerging energy economy has quickened since April 2010, partly because the new government is clearly supportive and because some energy projects are proceeding with little involvement from DECC – e.g. coal bed methane extraction, shale gas extraction and underground coal gasification. At the start of the EET Programme last year HSE thought these ‘cleaner coal technologies’ to be a long way off, but in fact HSE is now working with the early enablers of this technology to embed safety and health into early project design.

2. Also since April, the EET Programme has published on its website a Futures Report which analyses future activity by 2020 as a diverse mix of conventional fossil fuels (transformed by CCS, novel storage of imports etc) and a significant and rapidly increasing on- and offshore renewables sector. The last decade was typically fossil fuel based, with few major power generators supplying all UK consumers via transmission grids first designed a century ago. At the end of the current decade we will see a many-to-many supply and demand system, and a significantly overhauled transmission and distribution (grid) system, monitored by computers and smart meters that control consumption and supply in homes and factories.

3. The work done by HSE under EET’s stewardship to assess the hazards and risks introduced by the new energy economy are summarised in a Status Report that explains what we currently know of the regulatory and practical issues associated with the safe deployment, operation and maintenance of EET. This report will be available on the Intranet and is in two parts. The first part is a comprehensive guide for managers and policy staff. A second technical part describes the technologies in more detail, presents the evidence base underpinning HSE regulation of EET, and is directed at front line and specialist staff.

4. In order to maintain HSE’s position as a learning organisation in EET, we have prepared a knowledge strategy which sets out how HSE can use knowledge based systems to get best performance / value from its staff in a rapidly changing energy economy. A communications strategy has also been prepared to support HSE’s role in regulating EET, and in communicating the sensible risk message without infringing HSE’s impartial role as a sensible enabling regulator. The Deepwater Horizon disaster in the Gulf of Mexico (which happened after the April SMT) has highlighted the value of independence of safety regulation from sponsor Departments. It also reminds us of the breadth of HSE’s capabilities to regulate across all industrial sectors, flowing from our role advising *all* government departments on health and safety matters. Together, the status report, knowledge strategy and communications strategies underpin the strategy for HSE’s regulation of EET and support its deployment.

5. In the April SMT and Board papers we reported the significant activity falling to the EET Programme in supporting or leading on contemporaneous EET projects and issues¹. These demands continue unabated, and the Programme team is supporting HSE divisions in both policy and operational areas to embed EET activity into their work plans for 2010 – 2012. In addition, we have produced a critical path map for integrating the overarching strategy for EET into HSE’s organisation by 2012/3/4.

¹ Examples of recent activity include: i. establishing x-HID arrangements for the technical assessment of CCS design submission ii. commissioning research to fill key knowledge gaps; iii. working with other regulators to identify suitability of regulatory interfaces (e.g. SEPA, MCA); iv. Bringing together early adopters to collaborate on training and standards (ADBA, UCGA)