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Paying for energy efficiency through the Energy Bill

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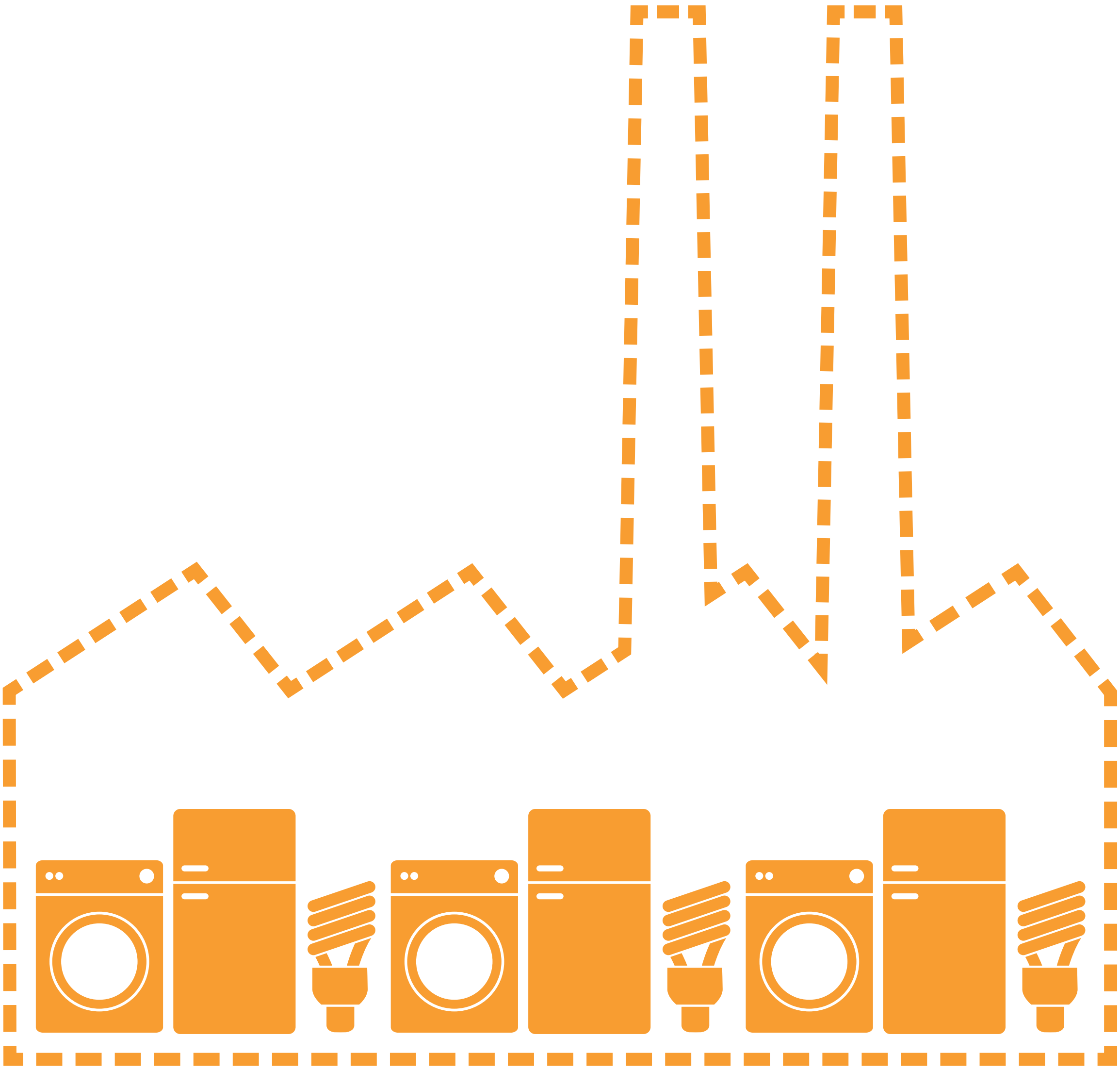

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ADVISING ON ENERGY EFFICIENCY TO HELP TACKLE CLIMATE CHANGE

Creating a market for electricity savings
Paying for energy efficiency through the Energy Bill

by Rachel Cary and Dustin Benton

Green Alliance
Green Alliance is a charity and independent think tank focused on ambitious leadership for the environment. We have a track record of over 30 years, working with the most influential leaders from the NGO, business, and political communities. Our work generates new thinking and dialogue, and has increased political action and support for environmental solutions in the UK.

This report is published under Green Alliance's Low Carbon Energy theme, which is focused on the renewal and rapid decarbonisation of the UK energy sector.

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Summary

Household energy bills are rising mainly due to increasing fossil fuel prices. The 2012 Energy Bill is an opportunity to reduce electricity bills while decarbonising the power sector. To cut costs and meet growing electricity demand, the bill must incentivise electricity demand reduction before supporting the purchase of higher cost power stations. In its proposed form, it will do the opposite.

Policy mechanisms encouraging consumers to reduce their electricity use have been successful abroad and are considerably cheaper than building new power stations. The potential is high: 40 per cent of electricity demand could be avoided by 2030, saving in excess of £10 billion per year[1]. Without amendment, the bill will reward the building of higher cost power stations ahead of the pursuit of lower cost efficiency, and consumers will pay over the odds for their electricity as a result. The Energy Bill must place equal importance on reducing electricity demand as it does on supporting the construction of low carbon power stations.

"40 per cent of electricity demand could be avoided by 2030, saving in excess of £10 billion per year."

It is, therefore, vital that government introduces a new policy mechanism to deliver demand reduction in its electricity market reform (EMR) via the Energy Bill and in this report we consider three possible options:

1) reform the proposed **capacity market** to incentivise demand reduction;

2) extend the existing **energy efficiency obligation** so that it requires suppliers to reduce their customers' electricity demand; and

3) introduce a new **electricity efficiency feed-in tariff (FiT).**

We have also looked at how the measures might fit within the existing policy framework. Our analysis has found that all three of these policy mechanisms would help to unlock some of the vast potential for electricity saving across the economy and would represent a significant improvement on the status quo.

However, while each has relative strengths and weaknesses, we conclude that an electricity efficiency feed-in tariff (FiT) would provide the best option overall for the British electricity market. It best fits the structure of the British electricity market because it allows for a market-based approach to energy saving, it targets the largest proportion of electricity users, provides the highest likelihood of encouraging innovation and is likely to enable new entrants to compete in the energy market. It would fill existing policy gaps and would also complement other efficiency policies already in place, such as product standards.

Our strong recommendation is that the Energy Bill is amended to enable an electricity efficiency FiT to be introduced, so that its huge potential for reducing electricity demand can be realised.

Creating a market for electricity savings

Reforms are missing the big prize

As demonstrated by the Energy and Climate Change Committee's report on the draft Energy Bill[2], reducing demand for electricity will be essential to minimise the costs of the transition to a low carbon energy system and ensure that consumers continue to support it. The government has committed to exploring energy efficiency options, but the draft Energy Bill lacks any mechanisms to reduce demand for electricity.

A huge prize is at stake. A report by McKinsey[3], commissioned by the Department of Energy and Climate Change (DECC), shows that electricity use could be reduced by the equivalent of 40 per cent of total electricity demand by 2030, a massive 155 TWh, by implementing electricity saving measures in the domestic, commercial and industrial sectors. The existing policy framework is, however, insufficient to deliver this. McKinsey estimates that existing policy will only deliver savings of 14 per cent, or 54 TWh, which is only a third of the total potential.

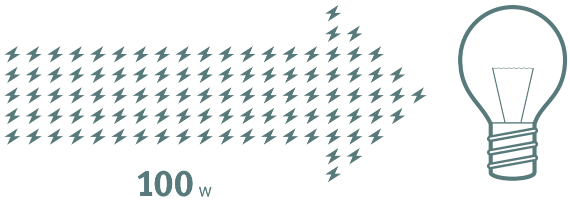
> "New policies that deliver electricity demand reduction, or 'negawatts', must be introduced to tap the massive potential for electricity savings across the economy."

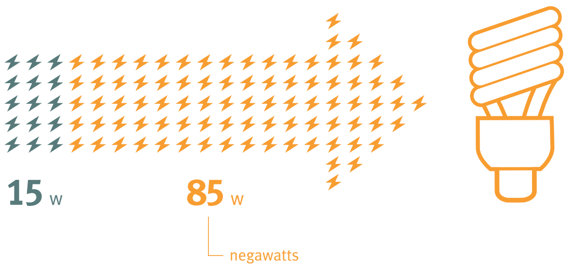
Even those areas targeted by existing policy, such as product standards, face challenges, as consumers buy bigger appliances with more features. And many areas of electricity use are not targeted by policy at all. New policies that deliver electricity demand reduction, or 'negawatts', must be introduced to tap the massive potential for electricity savings across the economy.

In this report we look at why new policies are needed to bring forward electricity saving projects within the electricity market reform (EMR) process, the relative strengths of different options, and the possible overlaps with other existing and emerging policies.

What is a negawatt, and why would paying for it benefit consumers?

To understand how energy savings can be integrated into the Energy Bill, it's helpful to think of these savings as 'negawatts'. These can be thought of by imagining a 15 watt light bulb replacing a 100 watt bulb. The 85 watts saved can be used elsewhere: these are negawatts.





Securing negawatts, rather than simply building new generating capacity to meet growing electricity demand, is much cheaper[4]. It does not require large and disruptive infrastructure, and can be delivered quickly. In contrast, paying for power stations may force consumers to overpay for decarbonisation with more, new renewable developments, fossil fuel power stations with carbon capture and storage (CCS) and nuclear power stations than are needed.

If we assume that typical low carbon supply costs £100/MWh[5] and that buying negawatts through demand reduction projects only costs £30/MWh (based on the cost of schemes in the US), reducing current electricity use by the 40 per cent by 2030 identified by McKinsey, then annual savings would be £10.85 billion.

Bundling together all the savings that can be delivered via demand reduction can be thought of as creating a 'negawatt' power station, which competes with building a new nuclear, CCS or renewable power station.

Learning from international experience

Policies to reduce demand for electricity have been introduced around the world in different types of electricity markets. Whilst none can be directly applied to Britain, they demonstrate two important aspects of demand reduction: it is measurable, verifiable, and genuinely saves consumers' money; and it is at least as reliable as building new power stations, meaning it can keep the lights on.

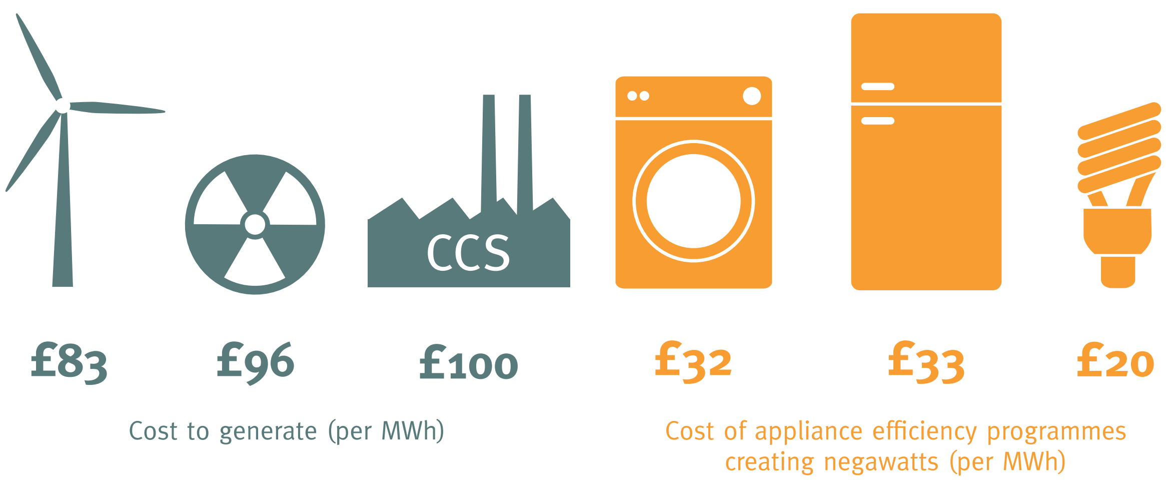
Programmes in the United States that have saved electricity include those offering rebates on energy saving appliances; replacing appliances for free, usually for low income consumers; providing free energy audits and no cost finance for efficiency upgrades; or using behavioural insights and comparing consumers' energy habits to their neighbours, encouraging them to use less energy (see page 4).

Over a decade of experience has seen significant improvements in how demand reduction is incentivised and measured. For example, the issue of 'cream skimming', where efficiency providers only deliver the cheapest savings rather than pursuing all cost-effective savings, has been recognised since 1991.[6] To address it, in 2011 the state of Texas graduated support provided for demand reduction, giving more support to deep retrofits (projects that involve several measures to reduce energy rather than only easy wins such as lighting).[7] This followed similar initiatives in California.[8]

> "Two important aspects of demand reduction: it is measurable, verifiable, and genuinely saves consumers' money; and it is at least as reliable as building new power stations, meaning it can keep the lights on."

The cost of these US schemes is much lower than building new power stations. Replacing inefficient appliances with efficient ones costs on average £33 per MWh of electricity.[9] Generating the same MWh from onshore wind, the cheapest low carbon source, costs two and a half times as much, at £83 per MWh. The expected long run cost of CCS and offshore wind is three times more expensive than negawatts.[10] In the short run, offshore wind and new nuclear are four and a half times more expensive than negawatts.[11] These comparisons are based on very conservative estimates of the cost of new nuclear; recent estimates put nuclear costs at over £160 per MWh.

Projected costs of low carbon supply vs negawatts



International examples that deliver results, saving electricity and money

Standard offer programme in Texas

Since 1999, a package of programmes to save electricity and reduce peak loads have been administered by the various transmission and distribution utilities in Texas, both preceding and following the privatisation of the Texas electricity retail market.[12] The package includes a 'standard offer' programme which is similar to an electricity efficiency FiT.

Eligible efficiency technologies include high efficiency lighting, lighting controls, heat pumps, refrigerators, motors, variable speed drives, and refrigeration units. Incentive payments are made for both energy and summer peak demand savings and are based on either deemed savings values, verified peak demand reduction or actual energy savings.

The programme mainly targets large commercial and industrial users as most of the utilities require customers to have a minimum peak demand of 100-250 kW. However, some suppliers also sponsor small commercial (less than 100-250 kW peak) standard offer programs, in which utilities incentivise contractors to retrofit small facilities, subsidising the rates at which they charge end users. Incentive payments range from $100 to $200 per kW reduction (at peak) and $0.05 to $0.07 per kWh of first year savings.[13] Efficiency programmes across Texas are currently saving electricity consumers over $300 million per year according to audited reports by US regulators.[14]

Supplier obligation in New South Wales, Australia

Both Victoria and New South Wales in Australia (along with 27 states in the US) provide examples of successful energy saving obligations that encourage the most cost effective energy efficiency measures.

The New South Wales Energy Saving Scheme (NSWESS) places an obligation on participants in the electricity wholesale market to provide evidence of energy efficiency savings to a regulatory body.[15] The current target is equal to 3.5 per cent of liable electricity sales and will increase to four per cent in 2014. Liable parties meet the target by undertaking energy efficiency activities or contracting specialist companies to undertake them.

The scheme creates a separate class of tradable certificates, Energy Savings Certificates (ESCs), which represent a tonne of CO_2 emissions displaced by an electricity saving activity. To comply, liable parties can either create these certificates themselves or purchase certificates from other parties.[16] The NSWESS applies exclusively to electricity, and the number of certificates issued is calculated by the MWh saved by the activity and the carbon factor of the New South Wales grid.[17]

> "Demand side resources have been shown to be more reliable than those on the supply side."

The scheme has been in operation, in its present form, since 2009 and is estimated to have saved 8.5 million MWh of electricity in the first four years.[18] Energy saved under the scheme costs around £20/MWh[19] and displaces the need to purchase energy from power stations costing £70/MWh[20] or more.

Capacity markets in the US

Forward capacity markets[21] in the US have successfully included demand side resources, both projects that reduce demand for given periods of time and energy efficiency projects that reduce demand permanently.

Indeed, demand side resources have been shown to be more reliable than those on the supply side: in the Independent System Operator New England (ISO-NE) forward capacity market, 98 per cent of demand response resources called upon in June 2010 delivered their services, compared to only 49 per cent of online generators and 72 per cent of start up generators in September 2010.[22]

Demand side initiatives have been bought to delay transmission or distribution upgrades. Some have been so successful that the intended network upgrade never happened.[23]

Policy options for delivering electricity savings in Britain

Although the draft Energy Bill does not include any demand side mechanisms, the government is considering three possible options for introduction into the bill. These are:

- An **electricity efficiency feed-in tariff** (FiT) to pay projects that can demonstrate measured electricity savings on a per KWh basis. Projects that reduce demand would be given a revenue stream via the FiT. Support levels would be determined the same way as they are for renewables and CCS, or could be determined by auctions, but would be lower than levels of support for supply.
- Enabling demand reduction to take place in the **capacity market**. The system operator would run an auction to ensure power supply meets expected demand at any given future time period. Any accredited participant would be able to bid into hourly slots, setting out the amount and cost of capacity they can provide. Energy efficiency projects that reduce demand can bid into the capacity market at any given hourly slot.
- A **supplier obligation** that would require large electricity retailers to demonstrate annual savings in their customer's energy use. British energy retailers above a certain size would be given an obligation to reduce existing customers' energy demand by a given percentage each year.

Below we consider the relative strengths and weaknesses of these three approaches, including how they would help to bring in new entrants.

Analysis of the three mechanisms to deliver demand reduction

Benefits	Electricity efficiency FiT	Supplier obligation	Capacity market
Mirrors the incentives in Britain's liberal energy market by aligning energy company profits with the reduction of electricity use	Yes	No	Partly
Each negawatt from demand reduction offsets the need to generate from new power stations, reducing overall system costs	Yes	Partly[24]	Yes
Maximises efficiency by supporting cost effective investments, including deep retrofits[25]	Yes	Yes	No
Maximises efficiency by rewarding all efficiency benefits	Yes	Yes	No
Helps to attract new finance for efficiency measures	Yes	No	No
Enables new entrants through simplicity and predictability	Yes	No	Partly
Guarantees a specified level of energy savings	No	Yes	No
Limitations	**Electricity efficiency FiT**	**Supplier obligation**	**Capacity market**
Restricted to existing energy companies	No	Yes	No
Caps maximum levels of demand reduction, even if further cost-effective demand reduction is possible	No	Yes	Yes

Capacity market

Projects that reduce demand for electricity can do so at all times, including at peak times where demand is highest. Incorporating demand reduction in the same mechanism that incentivises the bulk of Britain's new generation capacity will allow the delivery of permanent electricity demand reduction.

Whilst lowering demand for electricity will not remove peaks in electricity demand, and other flexibility options such as demand side response will still be needed, these peaks of demand will be at a lower level, reducing overall electricity generation capacity requirements. Reducing demand will also prevent the need for new transmission and distribution infrastructure, thus reducing overall system costs.

Energy efficiency projects are allowed to bid into some capacity markets in the US. In the ISO-NE capacity market (see page 4), for example, both energy efficiency and demand response projects are treated equally alongside supply side options, such as gas power stations. However, participation has been limited: although energy efficiency measures have grown from 26-35 per cent of the demand side measures bought in the auction between 2008 and 2010, this only represents around one to two per cent of the total capacity bought in the auction.[26]

There are a number of issues that may make a capacity market unsuitable as the main form of support for electricity demand reduction projects:

- Demand reduction offers more benefits than just helping with peak demand. The volumes bought in the capacity market auctions will be based on estimates of future shortfalls in capacity to meet peak demand. However demand reduction projects also offer a number of other benefits that need to be paid for, such as a reduction in baseload demand (and, therefore, the avoided cost of additional baseload generation), grid capacity required and long term carbon emissions avoided. Only rewarding projects through a capacity market would fail to reflect all the benefits they provide.
- The capacity mechanism is unlikely to be introduced before 2020, and it may not even be introduced at that point if sufficient supply continues to be available. The government has already said that as the British power system has more than 30 per cent excess capacity, it will delay capacity auctions until old plants retire around 2020. After this, if enough generation is still available, the capacity mechanism will not be triggered. This means that demand reduction via a capacity market will only be enabled if demand exceeds supply.
- Capacity payments are unlikely to encourage deep retrofits. Because of the structure of the auction, only the cheapest demand reduction measures would be rewarded. Although economically efficient in the short term, this has led to 'cream skimming' in the US, where the measures with the shortest payback periods are targeted, bypassing the deep retrofits necessary to achieve carbon targets.
- It may put off new entrants. New businesses that aggregate demand side response and demand reduction measures could bid into the capacity market. However, it may deter small enterprises given the complexity and regulatory burden likely to be involved.

Supplier obligation

We have assumed that the design of a new efficiency obligation targeting electricity use would be based on the existing domestic supplier obligations. This is currently the Carbon Emissions Reduction Target (CERT) and the incoming Energy Company Obligation (ECO), which will be introduced in January 2013, just after the domestic Green Deal scheme.[27]

Obligations that are significantly different to the existing supplier obligation (such as the one in New South Wales described on page 4, where the obligation falls on many parties) would require new primary legislation and significantly change the nature of the British market. As a result, they have been excluded from this analysis. But even a simple extension of the existing supplier obligation to include electricity would deliver a number of benefits:

- The existing supplier obligation rewards theoretical carbon savings based on measures, such as installing loft insulation. So an obligation that was partly based on actual electricity savings for larger projects would represent an improvement.
- An obligation is unique in that it would be volume based, and could, therefore, guarantee a specified level of savings. This could be simpler to administer than price-based mechanisms.
- The obligation could be structured to drive deep retrofits by rewarding them more than measures that save less energy per household or building. This would be likely to reduce the overall cost of delivering deep cuts in electricity use. It would also help to avoid the hassle factor of having to make multiple interventions which is a major non-financial barrier to efficiency uptake.

"An electricity efficiency FiT would best suit the British electricity market and deliver the greatest energy savings."

The drawbacks associated with a supplier obligation are:

- Setting an annual reduction level would effectively place a cap on the maximum levels of demand reduction. Experience with other cap and trade schemes shows that suppliers tend not to meet their target. For example under the Renewables Obligation scheme suppliers haven't historically met the renewables target set for them by building their own renewables alone, but have tended to only meet part of the target through their own projects and have then paid into the buyout fund.[28]
- It would be difficult to introduce a market-wide obligation using the existing supplier obligation framework as many large energy users buy energy direct from the wholesale market. Given that 69 per cent of the savings identified by DECC are in commercial and industrial sectors, this is a major drawback.[29]
- It is likely that the obligation would only apply to larger retailers, as is the case for the existing supplier obligation. This would reduce the scope for new entrants on the demand side. Large retailers may outsource but having to engage with a number of different suppliers with different approaches could make the process unattractive to new entrants. Large retailers may, in any case, avoid outsourcing to aggregators working for their retail market competitors. Even if the retailers outsource, less of the revenue will reach the demand side companies. And because large retailers could not profit from saving energy, the obligation also risks being seen as a burden.
- An obligation would create significant disruption and would not fit well with the EMR policy process. The new wider obligation would need to replace the recently finalised new supplier obligation (the ECO) and would be harder to link to the new contracts for low carbon supply being introduced through the EMR process.

Electricity efficiency feed-in tariff

Under an electricity efficiency FiT, projects that reduce electricity demand would be given a revenue stream. This would take the form of a simplified version of the new contracts for low carbon supply under EMR.

A comparison of the three options suggests that an electricity efficiency FiT would best suit the British electricity market and deliver the greatest energy savings. This is because:

- An efficiency mechanism which works within the existing market structure is more likely to be effective than one which requires major structural change to the market. An electricity efficiency FiT could be introduced alongside the new support mechanism for low carbon supply.

- The benefit of Britain's liberalised electricity sector is that competitive pressure can be used to reduce the cost of energy to consumers. An electricity efficiency FiT is the only mechanism which directly aligns companies' profits with maximising electricity demand reduction and minimising costs to consumers.
- A technology neutral FiT could enable the most cost effective measures to be implemented. In addition, a FiT designed to foster longer term savings could provide enhanced support for innovative energy savings measures or deep retrofits.
- By providing a fixed payment for each KWh saved, new efficiency providers would be enabled to enter the market. By offering a reliable finance mechanism and overcoming a major barrier to efficiency, an electricity efficiency FiT helps to unlock new sources of finance, unlike either supplier obligation or a capacity mechanism. Its simplicity would also appeal to local authorities, businesses, and industry, which could access FiT income directly.
- A FiT preserves competition in a liberal market: it makes supply compete with demand by forcing power generators to compete with companies which can demonstrate real energy savings. This incentivises private sector innovation to reduce overall power costs.

The drawbacks associated with a FiT are:

- It would be price-based and, therefore, could not guarantee overall levels of savings across the economy, unlike a supplier obligation. Companies would have to pursue the FiT revenue for it to deliver demand reduction. However, the price could be adjusted upwards to increase uptake or could be adjusted downward, as has been done with solar FiTs, if technology prices fall.
- Choosing a fixed rate for the FiT would make the scheme simpler but, as with the Renewables Obligation or supply side FiTs, this could result in some projects being over rewarded. However, if the level of the electricity efficiency FiT were set below that given to supply side options it would result in savings regardless. This is explored further in the Q&A on page 14.

"A FiT helps to unlock new sources of finance, unlike either supplier obligation or a capacity mechanism."

We conclude that an electricity efficiency FiT is the best option to ensure that electricity market reform delivers the significant potential to reduce electricity demand across the economy. It could be designed to fully reward the benefits of energy efficiency, it would fit well with existing and new policies and it would align company profits with maximising the amount of electricity they can save.

Interaction with other efficiency policies

How would a new mechanism to reduce demand overlap with existing policies? Answering this question allows some conclusions to be drawn about which electricity saving projects could be stimulated by an efficiency incentive.

Complementary interaction: product policy in the domestic sector

DECC is relying on product standards to deliver 51 per cent of electricity savings sought in the domestic sector.[30] Because the standards regulate electricity consuming products, there is a risk that an efficiency measure in the Energy Bill might overlap with these. For example, by funding consumer rebates on new appliances in the domestic sector. However, as we explained in *Cutting Britain's energy bill: making the most of product efficiency standards* (September 2012), an efficiency mechanism would complement and improve product standards, rather than conflict with them.

Product standards need to be improved and expanded to cover all electricity using products. But they have limits (as shown right) and, on their own, are unable to address all barriers to saving electricity in the domestic sector. In other countries, product standards are complemented by fiscal policies. For example, in the US, the Energy Star scheme operates alongside rebate programmes and, in Italy, a tax credit scheme supports product standards.

The limitations of product labelling

Confusing information:
The information consumers get from energy labels does not show annual running costs, and the A+, A++, A+++ system is confusing. Replacing labelling with a bounded A-G scale, where A is always the most energy efficient product, and improving energy efficiency results by progressively downgrading products would help. But evidence of successful efficiency schemes suggests that information provision on its own at the point of purchase is insufficient to drive major change.

Limited compliance:
Compliance, especially in the online sales market, needs to be improved. Around ten per cent of potential savings are not being realised due to non-compliance, where products use more energy than implied by their energy label.

Slow pace of appliance turnover:
The savings from product labelling are reliant on assumptions about appliance turnover. Unfortunately, the limited monitoring available suggests that consumers are not purchasing new products as rapidly as expected. Consumer Focus has conducted a survey which found that 28 per cent of fridge freezers were more than ten years old, often left by an old landlord or previous occupant, or were of an unknown age.[31]

Slow pace of policy reform:
The current testing procedure is lengthy, making it difficult to include rapidly changing technology. Regulation is unlikely to drive the development of innovative new ultra efficient products.

Rather than overlapping, an efficiency incentive would work in tandem with product standards to incentivise energy aggregators to offer the most efficient products and overcome information barriers. It would increase turnover and provide market pull for more energy efficient appliances.

An efficiency incentive could also help to address barriers that product standards cannot tackle on their own. For example, there is a trend away from conventional lighting to low efficiency halogens due to the difference in lighting quality.[32] Product standards cannot mitigate against shifts in consumer preferences of this kind, as energy consumption is only one factor in their decision, whereas financial incentives via an electricity efficiency FiT might influence their choices. Similarly, lack of finance is a major barrier to consumers choosing more efficient products, especially where energy saving products have higher upfront costs. New fiscal incentives, such as those considered here, to fund high efficiency, innovative, long-life products would be well placed to reinforce and improve the impact of existing and future product standards.

Low overlap: the Green Deal and ECO

In the domestic sector, both the forthcoming Green Deal and Energy Company Obligation (ECO) mainly focus on measures that improve buildings' thermal efficiency and reduce the need for heating. Currently, only around seven per cent of domestic heating is electric[33] and whilst the anticipated future uptake of heat pumps will increase the proportion of homes heated by electricity, for the foreseeable future most heating in the domestic sector will be provided by gas and solid fuels. For simplicity, the list of Green Deal and ECO supported measures could be excluded from an efficiency incentive, eliminating any overlap between the policies. However, a Green Deal provider undertaking a comprehensive retrofit for both heat and electrical efficiency should be able to include appliance and lighting replacement in a combined package, with electricity savings funded via electricity efficiency incentives. This would improve the attractiveness of the package as a whole and could support the Green Deal.

Whilst the Green Deal will also be available for non-domestic buildings and will cover additional measures such as lighting,[34] which would overlap with an electricity efficiency incentive, the uptake of the voluntary non-domestic Green Deal packages is expected to be low and will mainly be driven by regulation which is yet to be defined.[35]

Designing an efficiency feed-in tariff

The electricity efficiency FiT could mirror supply side FiTs, and could be introduced into the Energy Bill though a relatively small change. It could be introduced at a set price initially and, over time, move to an auction process, similar to the supply side. The tariff could vary according to a number of factors: by measure (giving more to innovative projects and technology); by user (giving more to hard to reach or fuel poor customers); or by depth of saving (paying more for projects that result in deep retrofit, such as replacing whole heating and cooling systems and lighting, rather than just lighting alone).[36,37]

Enabling a wide range of measures to benefit from an electricity efficiency FiT

An electricity efficiency FiT should apply to any measure, programme or technique which saves energy at a cost lower than the cost of providing energy by building new low carbon power.

> "A well designed electricity efficiency FiT could help to address the distributional effects of climate policy by increasing funding for efficiency projects in fuel poor households."

The government should not aim to select qualifying measures as this would limit innovation and could result in higher costs. Instead, an electricity efficiency FiT should be available to any project that can adequately demonstrate savings. This would allow innovative technologies and business models to compete, thus maximising savings.

However, if the government were to target the mechanism at certain project types, it could base inclusion on the following criteria:

- **Covering gaps in existing policy:** The current policy package will deliver less than a quarter of potential electricity savings in the commercial and industrial sectors. Heating Ventilation and Air Conditioning (HVAC) upgrades,[38] building efficiency and lighting in the commercial sector, as well as pumps, motors and boiler optimisation and insulation in the industrial sector, are not adequately addressed by existing policy. So, an electricity efficiency FiT should target the commercial and industrial sector to pursue their demand reduction potential.
- **Securing the large potential for domestic sector savings:** Although there is a need for policy to focus on the commercial and industrial sectors, the domestic sector has the greatest potential to deliver electricity savings: 66.5 TWh compared to 46.9 TWh from the commercial sector or 31.3 TWh from the industrial sector.[39] An electricity efficiency FiT should include the domestic sector.
- **Managing the impacts of climate policy:** A well designed electricity efficiency FiT could help to address the distributional effects of climate policy by increasing funding for efficiency projects in fuel poor households, as has been done in the US, or in energy intensive industries. In Oregon, for example, there is an energy efficient appliance rebate programme for Energy Star appliances installed in low income households. In New York, grant subsidies were given to low income home owners for up to 50 per cent of costs for energy efficient improvements.[40]

The role of aggregators

For larger energy users, FiT payments could go straight to the organisation that owns the building or factory to enable energy managers to invest directly in electricity saving projects that best meet their needs. Even so, administrative costs will need to be kept low, so the electricity efficiency FiT should only be available for savings greater than a certain threshold per year. For projects which fall below this threshold, such as reduction projects for domestic consumers, FiTs may need to be channelled through efficiency aggregators which source a number of small projects to form a portfolio of energy savings. Aggregators would keep a proportion of the FiT to pay for their services, however competition between different aggregators should ensure this is kept to a minimum.

How could an electricity efficiency FiT be funded?

A simple electricity efficiency FiT, similar to the small scale FiT currently used to support microgeneration, could be introduced. It should be funded from the same pot as the FIT CfD for generation, given that the role of the electricity efficiency FiT is to incentivise demand reduction on a large scale. This would ensure that the system operator takes a holistic view of the electricity market and that supply and demand measures are treated equally.

Therefore, funding would need to come from the contracts for difference (CfD) funding stream, to be derived from all electricity consumers.[41] This will make the money go further, as the level of the support given: the strike price, would be less than that given to supply side options.

So, although the electricity efficiency FiT will benefit non-domestic end users such as businesses, it will still significantly benefit domestic customers as well, by reducing the overall CfD bill.

As outlined above, we do not think an electricity efficiency FIT should be limited to the non-domestic sector. If the government was to only target the commercial and industrial sectors, the distributional effects would be more marked. In this case, a separate funding pot could be used, directly linked to the CfD funding pot. It could potentially be funded through a levy that excluded domestic customers, preventing them from having to foot the bill for business energy efficiency. Funding for the industrial consumers could come from policies targeted at energy intensive industries to help them mitigate against the cost of climate change policies. Businesses could pay for measures in the commercial sector, with the levy possibly replacing the need to buy allowances under the Carbon Reduction Commitment (CRC) if that scheme were ended.

Conclusion

Electricity market reform offers a one-off opportunity to introduce new policies to achieve the vast potential for saving electricity across the British economy. It is an opportunity that may be missed without strong political intervention soon.

Committees from both houses of parliament have condemned the lack of demand reduction measures in the Energy Bill and a wide range of stakeholders, including major energy companies, agree that a mechanism to reward demand reduction is an essential but missing component of the reform.

All three policy mechanisms considered in this report would help to unlock some of the vast potential for electricity saving across the economy, and would represent a significant improvement on the status quo. However, after assessing the possible ways to incentivise electricity demand reduction through the Energy Bill, we have found that an electricity efficiency FiT offers the greatest potential for significantly reducing electricity use in Britain and for stimulating investment in new innovations to reduce demand. Whilst offering a number of benefits, a supplier obligation and the inclusion of energy efficiency in the new capacity market are unlikely to be as effective as an electricity efficiency FiT for the following reasons:

- A supplier obligation based on an extension of the existing supplier obligation, which mainly works to reduce domestic heating through insulation, to cover electricity would only target customers that buy electricity through retailers and not directly from the wholesale market, thereby reducing the impact of the scheme. The mechanism would be vulnerable to lobbying from industry to reduce the level of the obligation, making it difficult to establish a sufficiently high target.
- Only rewarding energy efficiency projects through the new capacity market would undervalue the contribution they make to the wider electricity system and would be unlikely to drive an optimal level of uptake of energy efficiency.

It is vital that the bill is amended to allow for the introduction of energy efficiency support measures, so that an electricity efficiency FiT can be introduced in secondary legislation. As secondary legislation will define the exact design of FiTs, there is an opportunity to design a FiT which is suitable for efficiency projects. A similar approach has been suggested for renewables and CCS FiTs.

Regardless of the specific design, the electricity efficiency FiT needs to be directly linked to the process of rewarding new contracts so that demand reduction can directly compete with new supply.

By introducing this new mechanism to stimulate a new market in electricity reduction, the power of our liberalised electricity market can be harnessed to drive down the cost of achieving a secure, sustainable and low carbon power system.

Questions and answers

Q.

Isn't demand reduction already incentivised by rising bills?

Yes, but the way in which consumers use electricity is not always economically rational. Electricity use is inelastic; for every ten per cent increase in price, electricity demand only falls by one per cent.[42]

Experience from the US shows that efficiency providers need a secure revenue stream to set up, innovate, and grow. This is because efficiency programmes and investments, like renewables, CCS and nuclear, tend to be capital intensive. A FiT would stabilise the future returns on electricity saving projects, which are currently based on uncertain future electricity prices.

In addition, it could also reduce the payback period for deeper measures that are economically rational, but currently unattractive, investments for businesses. Because businesses apply high discount rates to projects that provide long term savings, they don't tend to finance projects that save energy over a long period of time.

Q.

How can we be sure that we're really saving energy?

The current supplier obligation is based solely on theoretical savings deemed to be achieved by different measures, as is the Green Deal, so the government and parliament have already approved significant public funding for deemed savings.

However, we propose that robust monitoring and verification (M&V) processes, and penalties for non-delivery, will need to be applied to an electricity efficiency FiT so that demand reduction from energy efficiency measures can be relied upon by the system operator and genuinely reduce the need to build new power stations.

Robust M&V processes have been developed and successfully used abroad. The US has been monitoring and verifying electricity saving programmes for over a decade which has enabled lessons to be learnt which can be applied here in Britain. Protocols which describe in detail how to conduct M&V have also been developed, for example the International Performance Management and Verification Protocol (IPMVP).[43] These M&V processes would be possible prior to the planned roll-out of smart meters for monitoring energy use, but would be made simpler and cheaper as smart meters are made available to all end users.

Q.

Will the energy bill be more complex if an electricity efficiency feed-in tariff is included?

No, the FiT wording in the bill could be simply expanded to include low carbon generation and demand reduction; the detailed design would be set out in secondary legislation. Introducing an electricity efficiency FiT enables a holistic approach to be taken: the same body that awards contracts to low carbon generators would also contract for energy efficiency projects, allowing demand to compete equally with supply.

Q.

Could an incentive that pays people to save electricity result in unhealthy homes?

There could be concern that paying people to use less energy could have a negative impact on those who are already unable to afford the energy they need. This would mainly be a problem if projects included those that reduced energy used for heating. However, an electricity reduction incentive would largely exclude heating in the domestic sector.

It might be that programmes to incentivise behavioural change would need to be limited to homes without electric heating. Another option would be only to include technical measures, such as better heating controls, that would optimise the use of heat but would not allow for under heating.

Q.
Isn't there a big risk of getting the level of an electricity efficiency FiT wrong?

As discussed above, an electricity efficiency FiT could be administered initially via a set price so that the lowest cost projects were supported first. However, an electricity efficiency FiT also needs to be set at a level which will incentivise the more capital intensive efficiency works, such as deep retrofits, which can deliver substantial electricity demand reduction in the long term and play a key role in avoiding the need for building additional, and more expensive, generation, transmission and distribution infrastructure. Over time it may be possible to move to an auction approach, reducing the risk of over paying for efficiency. In all circumstances it would be cheaper than supply FiTs and, therefore, cheaper for the customer.

Q.
How can we avoid creating an industry dependent on long term public subsidy?

Although an electricity efficiency FiT is very likely to reduce the cost of decarbonisation, it raises the risk of creating an efficiency industry that requires continuing subsidy. To mitigate this risk, the government could incorporate a digression pathway into support for efficiency, whereby support is lowered over time on the basis of evidence of cost reduction, in the way it has done for the Renewables Obligation. If done correctly, and with sufficient warning to the market, this could help to stimulate investment in efficiency in the near term, whilst supporting its development as a viable industry.

However, support for efficiency is not the same as support for renewables, CCS or nuclear. Efficiency is usually cheaper than building new low carbon generation, and its accompanying transmission and distribution infrastructure. An electricity efficiency FiT may not need to incorporate subsidy at all.

Instead, in the long run, it may simply be necessary to de-risk efficiency investment, and enable a guaranteed return for actual energy savings to allow efficiency providers to raise capital. In this case, a FiT which acts to stabilise and guarantee returns at or below the average electricity price, rather than to provide subsidy, may be sufficient. As outlined below, the main barriers to efficiency relate to risk rather than affordability: put simply, efficiency makes economic sense but fails to raise finance.

Including demand reduction projects in the FiT allocation process would enable them to compete equally with supply side options; and, over time, as the process moves to an auction based model, they would only be bought if their cost came below supply side alternatives.

Notes and references

1 155TWh of electricity demand per year in 2030, McKinsey for DECC, 2012, *Capturing the full electricity efficiency potential of the UK*. http://www.decc.gov.uk/assets/decc/11/cutting-emissions/5776-capturing-the-full-electricity-efficiency-potentia.pdf

2 Energy and Climate Change Committee, 2012, *Draft Energy Bill: pre-legislative scrutiny – First report,* www.publications.parliament.uk/pa/cm201213/cmselect/cmenergy/275/27502.htm

3 McKinsey for DECC (draft report), 2012, *Capturing the full electricity efficiency potential of the UK,* http://www.decc.gov.uk/assets/decc/11/cutting-emissions/5776-capturing-the-full-electricity-efficiency-potentia.pdf

4 In Italy, France and the UK, energy saving programmes cost between two and six times less than residential electricity prices: P Bertoldi, S Rezessy, E Lees, P Baudry, A Jeandel, and N Labanca, 2010, 'Energy supplier obligations and white certificate schemes: comparative analysis of experiences in the European Union', in: *Energy policy*, vol 38, 1455–1469.

5 Mott Macdonald, 2011, *Costs of low carbon generation technologies*, http://hmccc.s3.amazonaws.com/Renewables%20Review/RES%20Review%20Technical%20Annex%20FINAL.pdf

6 Evan Mills, Steve Kromer, Gary Weiss, and Paul A Mathew, 'From volatility to value: analysing and managing financial and performance risk in energy savings projects', *Energy policy*, vol. 34, no 2, January 2006, p 191, evanmills.lbl.gov/pubs/pdf/volatility_to_value.pdf

7 See, for example, the residential standard offer programme run by SWEPCO: www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX138F&re=0&ee=1. A similar example in north Texas can be found at www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX116F&re=0&ee=1

8 As early as 2005, programmes in California, the Pacific Northwest, and Texas started to address cream skimming by graduating support (eg by reducing incentives for lighting-only retrofits), see page 5 of www.cee1.org/eval/db_pdf/917.pdf

9 Average cost of three US energy savings programmes, expressed in £/kWh. Sources: Esource, *Refrigerator replacement in the weatherization program*, September 2001; Swiss Federal Institutes of Technology, *Utility rebates for ENERGY STAR appliances*, September 2011; and Natural Resources Defense Council, *Reanalysis of the 2006-2008 upstream lighting program*, July 2011

10 Supply cost figures in this sentence and in the graphic illustration below it are levelised £/MWh from Mott Macdonald, 2011, *Costs of low carbon generation technologies*, hmccc.s3.amazonaws.com/Renewables%20Review/MML%20final%20report%20for%20CCC%209%20may%202011.pdf

11 Short run costs in this calculation are based on Reuters, May 2012, 'UK nuclear build requires taxpayer rescue', uk.reuters.com/article/2012/05/08/uk-nuclear-britain-edf-idUKBRE8470XC20120508; and *The Times*, May 2012, 'French demand high price for 'rescuing' nuclear industry with two new reactors', www.thetimes.co.uk/tto/business/industries/utilities/article3476326.ece

12 Cities Aggregation Power Project, Inc, 2009, *The history of electric deregulation in Texas: the unfulfilled promise of utility restructuring,* http://tcaptx.com/downloads/HISTORY-OF-DEREGULATION.pdf

13 www1.eere.energy.gov/femp/financing/eip_tx.html

14 Texas utilities spent $105m on efficiency measures in 2010, saving $407m. Cost data from www.texasefficiency.com/index.php/publications/reports; savings data based on Texas guidance on retail prices of $0.064/kWh and avoided supply costs of $80/kW per year from info.sos.state.tx.us/pls/pub/readtac$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_tloc=&p_ploc=&pg=1&p_tac=&ti=16&pt=2&ch=25&rl=181; actual retail prices and avoided supply costs are higher, making these estimates very conservative.

15 Including utilities, generators selling directly to the retail market, and large consumers of energy buying from the wholesale market.

16 New South Wales Government, Trade and Investment, www.trade.nsw.gov.au/energy/sustainable/efficiency/scheme

17 Currently based on a grid carbon intensity of 1.06 tonnes /MWh

18 New South Wales Government, Trade and Investment, www.trade.nsw.gov.au/energy/sustainable/efficiency/scheme

19 The penalty to wholesale market participants is $23.99 (AUS) per certificate not redeemed, giving an effective penalty of $34.27 once the impact of the penalty not being tax deductible is taken into account. There is a secondary market in these certificates, and the spot price currently stands at about $31 www.ess.nsw.gov.au/How_the_scheme_works/The_certificate_market (assuming $1=£0.68).

20 Based on the levelised cost of power from a CCGT in New South Wales, table 4.16, http://www.bree.gov.au/documents/publications/aeta/Australian_Energy_Technology_Assessment.pdf

21 The system operator forecasts peak demand in a region for a future delivery year and runs an auction for both supply and demand side resources that can commit to being available during the peak periods.

22 NEPOOL Participants Committee 3/4/11 Meeting, Agenda Item #6, 'Strategic Planning' materials, slide 57. Source: Paul Peterson, Synapse

23 RAP, 2012, *US experience with efficiency as a transmission and distribution system resource*, www.raponline.org/document/download/id/4765

24 The obligation would set an artificial cap on the amount of electricity savings that could be achieved and would not allow demand to directly compete with supply when contracts were being awarded.

25 The term 'deep retrofit' used here refers to undertaking several measures at once in a building to maximise the energy saved per intervention. For example, in an office this could mean upgrading heating, cooling and ventilation systems, fitting efficient lighting, and installing energy management systems rather than only going for easier measures such as lighting upgrades alone.

26 McKinsey for DECC (draft report), 2012, *Capturing the full electricity efficiency potential of the UK,* http://www.decc.gov.uk/assets/decc/11/cutting-emissions/5776-capturing-the-full-electricity-efficiency-potentia.pdf

27 The Green Deal is a new financial mechanism that will remove the need to pay upfront for energy efficiency measures by enabling householders and businesses to pay for energy efficiency improvements through savings on their energy bills. The Green Deal will be available to both the domestic sector from October 2012 and non-domestic sector at a later date. There are 45 measures or areas of home improvement approved to receive funding under the Green Deal such as heating and hot water (condensing boilers, heating control), insulation (cavity, loft), glazing, lighting and microgeneration (heat pump, solar PV). All the improvements identified will have to meet the Golden Rule, ie the payments made for the improvements cannot be higher than the estimated energy bill savings.

28 Compliance in 2010-11 ranged from 62-89% of the obligation. Source: Ofgem RO *Annual report 2010-11.*

29 These savings are being driven by ecodesign regulation. McKinsey for DECC (draft report), 2012, *Capturing the full electricity efficiency potential of the UK,* http://www.decc.gov.uk/assets/decc/11/cutting-emissions/5776-capturing-the-full-electricity-efficiency-potentia.pdf

30 Dustin Benton and Thomas Turnbull, September 2012, *Cutting Britain's energy bill: making the most of product efficiency standards,* Green Alliance

31 Forthcoming Consumer Focus research on consumers and energy using appliances.

32 Energy Saving Trust, 2012, *Powering the nation – household electricity-using habits revealed*, www.energysavingtrust.org.uk/Publications2/Corporate/Research-and-insights/Powering-the-nation-household-electricity-using-habits-revealed

33 DECC, 2012, *The future of heating: A strategic framework for low carbon heat*, www.decc.gov.uk/en/content/cms/meeting_energy/heat_strategy/heat_strategy.aspx

34 The non-domestic Green Deal will cover additional measures such as lighting systems, heat pumps and mechanical ventilation with heat recovery.

35 ie Minimum standards for private rented non-residential buildings which will only come into force in 2018; the government has yet to set out either the minimum standards that will need to be reached or the potential penalties for non-compliance.

36 The Regulatory Assistance Project, 2012, *Energy efficiency feed-in tariff: key policy & design considerations*, www.raponline.org/document/download/id/4774

37 There is also the issue of whether the FiT is only available for electricity or for all fuels. Here we only consider the possibly of an electricity only FiT. However in theory, a FiT for all types of fuels could be introduced. An all electricity efficiency FiT that covered fuels used for heating, such as natural gas, would overlap more with existing policies but could enable greater overall energy savings by targeting more end uses and fully rewarding energy efficiency projects (eg those that reduce heating by gas in the winter and cooling by electricity in the summer). It would help to optimise overall system design by ensuring the correct technology is chosen in each application rather than one that merely shifted demand from one energy type to another. Given the current policy framework in the UK, with market reform only considering electricity and a number of policies that target domestic heat use, it may be easier initially to introduce an electricity only FiT.

38 A combination of product standards, building regulations and non-domestic Green Deal is expected to result in some HVAC upgrades in the commercial sector. However the current policy package is expected only to deliver less than half of the potential electricity savings from HVAC upgrades.

39 McKinsey for DECC (draft report), 2012, *Capturing the full electricity efficiency potential of the UK*, Slides 15-17

40 National Governors Association, 2011, *Clean state energy actions, 2011 Update, Energy efficiency – financial and other incentives*, www.nga.org/cms/home/nga-center-for-best-practices/center-publications/page-eet-publications/col2-content/main-content-list/clean-and-secure-energy-2011.html

41 The costs of funding suppliers' obligations under the contracts for differences (CfDs) will be passed onto consumers, in the same way as the Renewable Obligation costs currently are. Payments will be taken from suppliers and aggregated by a settlement body for distribution to generators.

42 Figures from the US are available from T Nakajima and S Hamori, May 2010, 'Change in consumer sensitivity to electricity prices in response to retail deregulation: a panel empirical analysis of the residential demand for electricity in the United States', *Energy policy*, vol 38, issue 5, available from www.sciencedirect.com/science/article/B6V2W-4Y4XCVK-6/2/28de2d40133e2c077c862e6553fe33f0. Similar figures for the UK can be found in T Barker, S Baylis, and C Bryden, 1994, 'Achieving the Rio target: CO_2 abatement through fiscal policy in the UK', *Fiscal studies*, vol 15, no 3, pp 1-18, available from www.ifs.org.uk/fs/articles/fsbarkeretal.pdf; and in R. Bernstein and R Madlener, 'Responsiveness of residential electricity demand in OECD countries: a panel cointegation and causality analysis', FCN working paper no 8/2011, available from www.eonerc.rwth-aachen.de/global/show_document.asp?id=aaaaaaaaaacfxmd

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