The Industrial Logic of Energy Market Competition
Submission to the Competition and Markets Authority Energy Market Investigation
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I am pleased to be able to make this submission to the Competition and Markets Authority (CMA) Energy Market Investigation. I would be happy to see my submission published with the others.

My submission draws on my experience of regulation in the newly-competitive telecommunications industry. In 1992 I was involved in a regulatory change which is relevant to today's energy market: the imposition on British Telecom (BT) of a new obligation to modernise its transmission and distribution networks to facilitate interconnection of competitors. This industry-specific regulation helped to create a more open telecommunications infrastructure; I describe the change in the annex as I believe that a similar transformation may be appropriate for the energy infrastructure today. The example also shows that competition, in a formerly monopolistic industry where there are still entrenched suppliers cannot rely on an 'invisible hand of the market'; a very obtrusive hand was needed to make UK telecommunications a competitive success story which the world copied. The 1992 change in telecom regulation, although controversial, was based on industrial logic rather than on assumptions about how market entrants or customers should or would react. This is the right approach because the advantage of competitive markets lies in their creative unpredictability.

Introduction: problems in the household energy market
Despite the best efforts of regulator Ofgem, the price of mains gas and electricity supplied to households has not come down as steadily as was hoped when the government first made supply and generation fully competitive in 1998. After a number of years during which customers made use of their new freedom to switch suppliers and prices fell, prices have recovered over the last eight years to above their old levels and fewer customers are changing their supplier. Competition in this 'utility' sector does not seem to have brought permanent benefits to the economy comparable to those seen in the telecommunications industry two decades earlier. The shortfall has led the Competition and Markets Authority to launch the Energy Market Investigation to see whether competition is working.

Summary of main recommendations
Both Ofgem and DECC are regulating the energy companies, which supply some customer premises services in addition to supplying, transmitting, and distributing centrally-acquired or generated gas or electricity. The CMA investigation will need to examine both of the regulators and all of the goods and services involved. Both DECC and Ofgem have acknowledged the problems that beset the industry; DECC by its changes in policy and Ofgem by its referral to the CMA. This indicates that radical suggestions may be appropriate. Although some of the following main recommendations may be far-reaching they are based on industrial logic rather than on assumptions about how incumbents, competitors, or customers should or would react. My principal recommendations are:

- Ofgem should ensure that access to transmission and distribution networks is open on equal terms to non-traditional suppliers including aggregators of micro-generated energy;
- DECC should involve Local Authorities in the subsidised refurbishment of energy-inefficient dwellings on social grounds.

- Ofgem should impose line-of-business restrictions on energy suppliers barring them from involvement in customer premises equipment or services markets. This will prevent them from ineffectually dominating and stifling the important embryonic market for energy efficiency measures. This recommendation conflicts directly with the current policy of imposing obligations on some of energy suppliers under the Energy Company Obligation.
- DECC, to further avoid obstructing the embryonic market for customer premises equipment for generating, storing, monitoring, and saving energy, should discontinue subsidies for such equipment (including the Renewable Heat Incentive) except for vulnerable or energy-poor households on social grounds. It should not mandate feed-in tariffs but should let the market determine them.

I will explain these recommendations below after describing some relevant industry context and the potential impact of technology change on the industry and on Britain's economic growth.

Industry structure and technology change

When rapid technology development affects a regulated industry we should look beyond the service characteristics of a new technology to see its potential for restructuring the sector. A preoccupation with environmental concerns has caused regulators to focus too exclusively on the 'renewable' or 'low carbon' characteristics of new technology. They should also identify any characteristics that can cause beneficial structural change; otherwise their rulings may inadvertently force new technology to conform an obsolete industry structure. In the case of renewables, the non-environmental benefit is their ability to replace some nationally-planned and centralised energy generation by distributed production including micro-generation at the point of use. This decentralisation will be accelerated by:

- the declining cost of mass-produced consumer electronic and electrical equipment which is following a downward, predictable, semiconductor or appliance cost curve;
- the escalating cost of centralised energy generation (both high- and low-carbon), which is following an upward and chronically over-budget civil engineering cost curve;
- the fact that even renewable and low-carbon energy sources create important externalities when deployed on an industrial centralised scale; this applies to wind, hydro, biomass, photovoltaic solar, nuclear, and deep geothermal. The externalities of centralisation, while they may not be factored into energy prices, nevertheless cause social opposition and are responsible for prejudice against 'renewable energy'. Put bluntly, the energy may be renewable but the land is not.
- The DECC estimate that centrally-generated electricity prices will rise by 33 per cent by 2020, and the high reported 'strike price' for energy from the Hinkley 'C' nuclear reactor.[1]
- The availability of surplus energy in Europe as backup, particularly baseload nuclear electricity from France.
- The unusual ability of Britain to benefit from decentralising technology, due to:
    - our temperate island climate, bathed as we are in a warm current, which ensures that our atmosphere remains a reservoir of energy usable by household heat pumps night and day, year-round;
    - the scope for improved energy efficiency of the housing stock, overcoming the legacy of our former wealth of cheap fossil fuels;
    - the unusually low land density of the housing stock. The density of new development has almost doubled in this century to nearly 50 dwellings per

[1] CMA Issues Statement para 16; *Financial Times* 2 October 2014

hectare. Allowing half of that for access roads etc. still leaves 100 square metres per dwelling of airspace and land or rooftop which receives an average 10 kw of energy from the sun throughout the year. For illustration only, the average dwelling in England (poorly insulated as it is) consumes gas and electric energy at an average rate less than 2 kw throughout the year.[2,3]

- our contrasting more efficient use of indoor home living space, requiring less energy per dwelling.[4]

The above factors favour the UK as uniquely suited to take advantage of the new distributed energy production technologies, but do not seem to be widely appreciated. The primacy of cost curves in industry (the first two main points above) may not be widely recognised because the energy industry until now has been sheltered from Moore's Law. It is commonly said that photovoltaic (pv) solar has reached 'grid parity with nuclear' as if that signified reaching a goal. This 'parity' is fleeting and insignificant when pv solar cost is falling at 25 per cent annually and nuclear escalating at 15 per cent with no end in sight for either.[5] Cutting out the high cost of land by domesticating solar makes it highly competitive against centralised generation of whatever kind, and also plentiful. This fact has not been taken into account in the CMA Issues Statement.

Implications of technology change for the CMA investigation

Ofgem's principal objective is to protect the interests of existing and future energy consumers, including businesses as well as households, and the 2010 Energy Act requires it to use means other than competition where necessary. This raises the possibility that Ofgem could seek to make household energy consumers buy centrally-generated energy to subsidise business users and universal service. In view of the developments described above it seems unlikely that such an industry structure could be sustained, although the CMA Issues Statement seems to assume that households can and should remain dependant on centrally-planned supply:

- Paragraph 13 proposes to limit the investigation to 'the markets within which gas and electricity companies compete to supply customers' thus apparently not considering the role of household micro-generation in 'protecting the interests of … consumers';
- Paragraphs 16 and 51 lists as 'key characteristics' of the energy market numerous items that will not apply to households with micro-generation:
    - CMA refers to a 'natural monopoly' of distribution;
    - CMA asserts that electricity is non-storable, which is only a key and problematic characteristic of industrialised centrally-generated electricity. Industrial solutions commonly proposed (pumped hydro, flywheels, liquid air) would introduce new externalities and physical dangers. In households, on the other hand, electrical energy can be safely stored directly in electrical vehicle batteries and as heat in the fabric of the building, in the ground for heat pumps, in pools, and in hot water tanks. Household demand response is easily tailored to availability of household supply. It would be remarkable if, as pv solar costs continue to fall, household batteries do not soon become a consumer item equivalent to the old coal bunker. These batteries would be much less complex than those of electric vehicles, which must minimise weight while delivering in two hours enough to power a home for twenty-four (about 44kwh).[6]

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[2] DCLG Land Use Changes in England, 19 December 2013; Mackay, D, *Sustainable Energy Without the Hot Air,* p.38. Obviously only a fraction of energy from the sun can be converted to electricity or (by heat pumps) to indoor heat

[3] ONS 2011 data for household energy consumption.

[4] Rosenow, J. *Home energy efficiency policy in Germany and the UK,* 2013

[5] Citi GPS: *Energy Darwinism* October 2013; MIT: Update of the *MIT 2003 Future of Nuclear Power Report*, 2009

[6] http://www.ons.gov.uk/ons/dcp171766_321960.pdf

    - CMA identifies wind as the only renewable source of energy, omitting pv solar and heat pumps which are relevant to distributed household micro-generation;
    - CMA assumes that 'blackouts' will possibly 'cut whole areas of customers off from the network' which assumes their total dependence on the grid;
    - CMA accepts that the 33% rise in electricity prices by 2020 are caused by 'climate and energy policies'. In reality they are caused by planned centralisation of new electricity generation technology to fit the obsolescent industry structure;
    - CMA accepts that 'customer inertia' is inevitable, not recognising that it can be overcome by innovative technology in home energy equipment, as happened for example with wood-burning stoves.
- CMA's 'forward thinking' of Paragraph 18 does not extend to household micro-generation even though the entire focus of the study is on the household energy market.

Impact of technology change on national economic growth

The substitution of some centrally-distributed energy by household micro-generation will cause substantial and permanent growth in GDP and employment. This is because GDP is a measure of the value-added by UK-based enterprises, and systematically importing energy creates few jobs and little value-added for UK firms. Since the decline of North Sea oil the UK has become heavily dependent on imported energy; in 2012 we imported 42% of our primary energy consumption.[7] On the other hand, the availability of temporary backup sources (e.g. national fossil fuel reserves and surplus nuclear electricity from France) will reduce the 'risk that the lights will go out' without depressing UK GDP. Avoiding the inevitable cost penalties of centralised generating capacity will reduce the costs of intermediate consumption in industry and further boost UK industry value-added.

The fact that micro-generators will pay less for their energy does not affect the increase in GDP. Consumer savings on energy will be spent on goods and services which augment UK GDP, employment, and tax revenue.

Recommendations in detail

1. Ofgen and DECC should open the transmission and distribution networks

The current profile of centralised electricity generation encourages producers of baseload electricity to package their energy in 'Economy 7'-type offerings during off-peak night hours. With the entry of new technology these offerings may be disrupted by cheaper energy available during the day. Some traditional suppliers may benefit from contracts granting priority scheduling of the grid to match their offerings. Ofgem and DECC should ensure that such contracts are restricted and take other steps to ensure that market forces will determine use of the grid.

2. DECC should involve Local Authorities in subsidising energy-saving refurbishment

Local Authorities can make use of the taxation possibilities provided to them by the Localism Act to encourage the private sector to redevelop brown-field residential sites at higher density to overcome the historic inefficient use of land and services (transport, schools, sanitation) and incidentally to make homes more energy-efficient. The mix of buildings and the pace of redevelopment will vary from locality to locality; one-size-fits-all policies developed by national government are inappropriate. The existing national policy of prioritising subsidisation of 'hard-to-treat' homes, for example, would be counter-productive in a locality where these homes are first in line to be redeveloped.

[7] http://fractionalflow.com/2013/10/07/united-kingdom-energy-and-trade-balance/

3. Ofgem should bar energy companies from involvement in equipment and services

Some might argue that the recent inability of electricity suppliers to meet their agreed targets for installing energy-saving equipment under their Energy Company Obligation (ECO) has been due to a conflict of interest: more efficient insulation and heating systems would depress their core business of selling energy. This is unlikely to explain the shortfall. The example of British Telecom in the annex shows that regulators can oblige dominant suppliers to undertake activities which conflict with their perceived interests. The difference is that the activities concerned (network digitisation) were well within BT's core competences, whereas the competences for installing home insulation and heating systems are far removed from those of electricity supply. Utilities perform best when they 'stick to their knitting' of providing a single commodity at the cheapest price, which is why regulators usually impose line-of-business restrictions on them. Subcontracting ECO functions does not solve the problem; to be a prime contractor still requires skills relating to the area concerned. Small subcontractors are especially troublesome, and energy companies will be unwilling to form joint ventures with suitably reliable contractors such as DIY multiples for fear of losing control of their client base. Exclusion of the energy companies from this key market will ensure that it develops as it should, both for subsidised and non-subsidised households.

4. DECC should not subsidise home energy equipment

If home energy equipment does not become a lucrative competitive market for consumer goods, no affordable subsidy of it out of the public purse will make any useful impact on the country's energy situation. The focus should therefore be on avoiding interference with natural development of a potentially competitive market. Consumer goods innovators normally begin by targeting 'early adopters' who are ready to pay high prices for what is newly-fashionable, prices that will subsidise development for the mass market which tends to follow the lead of the prestigious early adopters. An example already quoted is how the consumer goods industry has turned the humble stove into a prestige product.

Subsidies interfere with this process; consumers do not improve their social status by engaging with subsidies, and manufacturers will tend to tailor the product to the subsidy instead of to the tastes of early adopters. Opportunities for miss-selling on the basis of unpredictable subsidies or feed-in tariffs will be plentiful. Left to their own devices, though, suppliers can easily find their early adopters by targeting homes which have broadband, making it unnecessary to wait for the utility company's smart meter. Nowadays home computers and even peripherals such as printers are in continuous communication with their manufacturers, reporting on usage and environmental factors. A similar development would force energy suppliers to usefully compete against equipment suppliers for control of the client base, in the same way that 'cloud' computing competes against the client/server business model.

5. Other steps

There are many steps that other local and central government departments could take to encourage competition in the home energy market:

- promoting electric vehicles;
- mandating underfloor heating (to be more compatible with pv solar) in building codes;
- abolishing planning controls on heat pumps.
- allowing public buildings to lease space to pv solar leasing companies;

Conclusion: dealing with the unpredictability of competition

The optimist can visualise an energy future in which households are not only self-sufficient in energy production thanks to new technologies including electricity micro-storage, but even form

a cumulative secure reserve capable of supplying the national grid for several days with electricity comparable to the output from a nuclear reactor. This only appears to be science fiction if viewed from the hidebound perspective of the current industry structure. We have seen a transformation of the telecommunications infrastructure – which was confidently described as a 'natural monopoly' only two decades ago – no less far-reaching. Nevertheless, competition's strength is its unpredictability and we cannot be sure that the energy market will evolve in this or any other useful way under the impact of new technology.

The message of this submission, though, is that this is the worst moment to abandon competition, a back-pedalling scenario which is contemplated in the Energy Act of 2010 and which statements from DECC, the CMA, and Ofgem seem to seriously countenance.[8] The willingness to give up on competition seems to be based on the failure of 'switching' to produce lasting benefits to consumers. This failure was predictable; the example of the telecom sector both here and in the USA shows that incumbents are prepared to lose a token amount of market share very quickly, using price competition, to appease the regulator but this is a transitory phase and customer benefits are short-lived. The use of smart meters to facilitate switching between the current types of supplier will make little difference. True competition involves disruption of traditional industry structures.

The example of British Telecom in the annex shows that traditional players may oppose re-regulation and restructuring and delay competition even though in the end the disruption benefits their shareholders who are well aware that their stock is no longer that of a statutory monopoly utility. This resistance is understandable given that industry executives are usually products of the traditional structure and feel more at home with it than with a competitive consumer market. They will naturally put the best case for avoiding a venture into the competitive unknown, and may convince government of the possibility that 'the lights will go out' if the current structure is abandoned. As the *Financial Times* explained:

> *The Hinkley deal is pivotal to Britain's plans to keep the lights on. ... Ministers argue the country must start building new generating capacity if it is to avoid blackouts.*[9]

Nuclear generation, however, does not guarantee that the lights will stay on in the event of a natural or human event which shuts down a reactor for safety reasons. The price of this limited security of supply is a commitment to higher energy costs until 2058 and beyond, which will burden taxpayers whose parents are not yet born. An advantage of distributed, ubiquitous generation is that it would eliminate the need for such a high-stakes gamble by public officials. With many other emergency backups available, including fossil fuels, surplus nuclear energy available from across the Channel, and the technical ability to cut off selected users and usages it is clear that a 'dash for competition' using distributed generation at the point of use could more than match the traditional structure for security of supply. It will be a mistake if the regulators and the CMA do not take into account this avenue by which energy consumers can protect their own interests.

[8] Se Annex 2 of Ofgem's submission to CMA 21 July 2014

[9] http://www.ft.com/cms/s/0/00eff456-3979-11e3-a3a4-00144feab7de.html#ixzz3FUCzSXyS

Annex: Competitive restructuring of the telecommunications infrastructure in the 1990s

Summary
In June 1992 the telecommunications regulator Oftel imposed a controversial new requirement on British Telecom (BT), obliging it to digitise its local exchanges and trunk lines by 31 July 1997. The new requirement was based on industrial logic: the BT was the only privatised telephone company in the world that was at liberty to curtail profitable network investments in order to delay connection of competitors. The lesson for regulators of other newly-competitive industries is that hands-on regulation is necessary but can be based on industrial logic rather than on guesses about the outcome of competition.

Background
In 1992, when Oftel was conducting its 5-yearly review of the innovative RPI-X price cap formula, BT was facing new competition in its wireline transmission and distribution business after the end of a 7-year 'duopoly' period when it had shared the market with Mercury Communications. Following the government's decision to allow new wireline competitors, BT in 1991 had announced that it was reducing its investment in new network technology. It reduced its target for digitisation of local exchanges by 25 per cent, explaining that it was now focusing on customer service improvement instead. This explanation seemed odd considering that replacement of its antiquated and labour-intensive mechanical exchanges by computers was one of the most profitable investments conceivable. Independent observers estimated that for every 1000 subscriber lines converted, BT would save 17 maintenance staff.

In July 1990 I submitted a report to the Department of Trade and Industry Assistant Secretary responsible for introducing competition in telecommunications, pointing out that BT was the only privatised telephone company in the world whose investment decisions were not subject to scrutiny by the regulator (other privatised companies existed in the US and Japan).[10] Logically, therefore, BT would be free to impede the development of competition by avoiding investments which facilitated use of its network by competitors. Logically also, it might be accused of failing in its duty to shareholders if it did not make use of this freedom. The report therefore recommended that the regulator should oversee BT's investment plans. The report received a favourable reception despite the then Thatcher government's belief that a few years of price cap regulation alone would suffice to make the industry competitive.[11] The report did not even mention mobile communication. Only 2 per cent of the population had a mobile phone at the time; it was a high-priced and unreliable service in its infancy which still used analogue technology.

When it subsequent imposed a new RPI-X price cap, Oftel followed the report's recommendation and also imposed a binding obligation on BT to digitise exchanges covering 99 per cent of the population and install 3.5m km of fibre-optic cable by 31 July 1997. BT vociferously objected to the new regulation, claiming that it violated the spirit of the 'price cap' regime, and began an unsuccessful public campaign to reduce Oftel's powers. When it reluctantly complied with the new regulation, however, its share price soared partly because of the unexpected new traffic generated on its network by market entrants. Much of this traffic originated from mobile phones, the service having reached the mass market in the intervening years so that by the date specified by Oftel for network modernisation, penetration had reached 15 per cent and was increasing dramatically.

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[10] *The Slowing Modernisation of the UK Telephone Network,* 10 July 1990. See http://www.hugh-small.co.uk/BT.pdf
[11] *The UK Model of Utility Regulation*. CRI Proceedings 31, Ed. I. Bartle. University of Bath, 2003

It is significant that regulation based on industrial logic facilitated a competitive mobile market even though that benefit was not foreseeable and did not motivate the regulator's decision. The unanticipated popularity of mobile communications revealed a dynamic that had not been obvious: mobile was not a *wireless* market any more but a *wireline* one, which boosted BT's revenues even though the regulator had not allowed BT itself to take control of a mobile operator. In 1992 cells had often been 25 km across or greater; now that usage had increased it was necessary to reduce their size to increase the efficiency of frequency use. Smaller cells meant that calls travelled a shorter distance wirelessly and operators relied more on wireline companies, particularly BT, to connect more and smaller base stations to the landline network using leased lines. BT's reluctant network modernisation now paid off handsomely because its new network technology, and the low marginal cost of capacity on fibre optic trunks, reduced the cost of carrying mobile calls and helped the service to penetrate the mass market.

In 1999 the government lifted its ban on BT owning a mobile operator and BT used its cash pile to buy out its partner's stake in Cellnet. With hindsight BT's shareholders might have been better served if the government had not relaxed this line-of-business restriction and if BT had given them a special dividend instead to allow them to invest in a cellular operator themselves if they wanted to. Industrial logic dictates that it is not a good idea to go into competition with your customers, and mobile operators were by now among BT's best customers. However, business executives often imagine that past successes have convinced their shareholders to let them choose investments on their behalf. When the government auctioned more mobile frequencies the following year BT's high bids helped to cause a bidding frenzy that by general agreement enriched the government by £22bn (against a forecast of £5bn) at the expense of shareholders including those of BT, who saw their stock price fall dramatically as the winners struggled to raise the funds to build the new networks. Line-of-business restrictions, it seems, can benefit everyone.

At its inception in 1983 'mobile' telecommunications had been seen as a mobility service; the first UK licence holder's business plan foresaw a customer base of only 120,000 goods vehicles. The development of that market shows how one must look beyond the superficial service characteristics of the new technology to discern its potential to disrupt established industry structures. 'Mobile' technology has not created a 'mobile' communications infrastructure but rather a more distributed and even *ubiquitous* one. Dangerous as it is to predict the consequences of competition, the parallels between telecommunications in the 1990s and energy in the 2010s suggest that something similar may be in store for the energy market. Renewable generation technology may create, not just a 'sustainable' industry, but also an industry of ubiquitous generation and communication of energy.

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