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Project Discovery: Energy Market Scenarios

Response from Chemical Industries Association
The Chemical Industries Association[1] welcomes the chance to respond to this consultation. ***Secure and competitively priced energy is essential to our membership who compete in globally traded markets.***

In summary, the CIA calls for urgent investment in g*as storage and the rapid* development of clean coal and new nuclear to ensure a diverse secure energy mix. We are concerned that the cumulative impact of financing renewables will result in uncompetitive prices and ultimately carbon leakage. Although some of our members already provide demand side management services to National Grid it is not feasible to a number of chemical processes. Demand Side Management should be sourced from all sectors of the economy and not unduly weighted on large industrials.

The CIA welcomes the work conducted by Ofgem in starting to evaluate the security and affordability of energy supplies over the next 10-15 years. It is clear that a major amount of investment is required if we are to meet our future energy requirements and that this will come at a cost. There are potential security of supply risks in the increased dependence on gas power generation as increasing amounts of gas are imported. Further still, there are worrying indications that a more flexible demand side will be needed to cope with energy supply shocks in the future. All these issues need to be addressed urgently if we are to provide the environment for continued industrial activity in the UK. Future investment in the industrial sector should be encouraged particularly in the chemicals area, which has been heavily impacted by the recession.

We are concerned that the Government's proposals for decarbonising electricity generation will increase energy costs (disproportionately / unilaterally), threaten energy security and risk carbon leakage from energy intensive solution providers

[1] The CIA has in membership around 150 of the larger companies in the UK chemical and pharmaceutical industry, which has aggregate turnover in excess of £60bn and directly employs almost 200,000 highly skilled people. It is the only major sector to maintain a significant positive trade balance, typically registering a surplus of £5bn annually.

like chemicals that are contributing to the greening of the economy[2]. While we applaud the Government's support of clean coal and new nuclear, these are longer-term solutions and will not be available until at least the end of the next decade. In the interim it is currently predicted that imported gas supplies will increase dramatically with the continued reduction in supplies from the UK Continental Shelf and closure of other thermal generating plant. Almost all near term plans for new baseload generating capacity to replace closed coal fired plants rely on gas as the primary energy source, thus aggravating our already stretched gas position.

The Government has targeted up to 30% of electricity generation coming from renewables if we are to meet our climate change goals. We have concerns that the flexibility and availability of plants will not be able to cope with the largest of swings in intermittent generation, as identified in DECC's recent call for evidence – Delivering secure low carbon electricity[3]. Within this call of evidence a case study by Redpoint highlighted that in extreme cases of change in wind generation as much as 80% of flexible generation will be required to cover such a shortfall. This was based on all the flexible generation being CCGTs as other flexible coal and oil plant will be shutdown due to the LCPD and future IED. We are concerned not only about the management costs required to balance the market in real time with a high nominal wind capacity, but also that we are placing increased reliance on gas as the main back-up generating capacity when gas imports have been predicted to reach 80% of UK demand by 2020. ***The UK already needs urgent investment in gas storage; the increased need to provide generation flexibility will only exacerbate an already dire situation. Gas storage should be a priority energy infrastructure investment.***

It is clear in Project Discovery as well as the Government's recent call for evidence on electricity security that industrials are assumed to play a major role in providing demand side response. As large energy consumers some of our sites are already involved in providing balancing services to National Grid such as Short Term Operating Reserve (STOR). We also communicated to membership earlier in the year that National Grid were looking to engage further with large industrials as traditional flexible providers are replaced with increased nuclear and renewables. Although there are some opportunities at chemical sites, many of our processes could not be shut down, and while there would undoubtedly be some response - given appropriate incentives - there are also limits. Secure and competitive energy supplies are essential if the UK is to be a credible manufacturing location. Companies' first responsibility is to their customers and therefore production schedules should not be put at risk by uncertainty over energy supplies and the need to interrupt. ***Demand Side Management should be sourced from all sectors of the economy and not unduly weighted on large industrials. We ask Ofgem – possibly via National Grid - to assess the amount of demand side response that is COMMERCIALLY AVAILABLE from industry.*** We would also like to highlight the House of Commons, Business and Enterprise Committee report in Energy prices published in July 2008[4], which stated

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[2] We support the move to a low carbon economy, in fact, while CIA's members have improved their energy efficiency by 35% since 1990 and recognise the need to continue to work to reduce emissions, their products also enable climate change solutions. As demonstrated in this ICCA Carbon Life Cycle Analysis Study produced by McKinsey & Company http://www.icca-chem.org/ICCADocs/ICCA_A4_LR.pdf

[3] http://www.decc.gov.uk/en/content/cms/consultations/electricsecure/electricsecure.aspx

[4] http://www.publications.parliament.uk/pa/cm200708/cmselect/cmberr/293/293i.pdf - page 13

(Page 13) *"We cannot form public policy in a world of energy shortages and sharply rising prices on the complacent assumption of a demand side response. The gas price spikes of winter 2005/06 were cited as a key factor by the industrial energy user groups in the loss of around 100,000 manufacturing jobs in the months that followed"*. One key comment from members has been the change in the interruptible gas regime due to the approval of UNC modification 90. The changes recently implemented on interruptible gas contracts will lead to reduced industrial ability to switch to alternate fuels and actually lead to less demand side response being available. We ask Ofgem to assess the effect of this modification when calculating the amount of industrial demand side response capability.

We note that while industrials are assumed to play a major role in providing demand side response, the economic impact on industrial consumers is barely touched upon. Negative factors include the effect of a "tighter" UK market in pushing up UK spot and especially forward prices, the disruptive effect on production and plant operating efficiency, inability to maintain customer delivery schedules and long term loss of reputation with customers. There would be cumulative severe damage to the UK's standing as a credible manufacturing location and place to do business. ***It is essential that measures aimed at reducing carbon emissions do not put undue and unilateral upward pressure on energy costs.*** Apart from increased volatility and forward price premiums, we already know base prices are set to rise. With the current environmental measures such as EU ETS, the Renewables Obligation and the Climate Change Levy (CCL) the initial UK Renewable Energy Strategy estimated that there is a 21% increase to medium sized industrial electricity bills alone.[5] The possible addition of a CCS levy and the Renewable Heat Incentive as well as other measures to pay for low carbon supplies will also increase energy prices significantly. ***We call on Ofgem to factor in the effect of future scenarios on the competitiveness of industry in the UK, quoting changes in wholesale energy prices rather than aggregate consumer energy bills.***

We note that the ultimate aim of Project Discovery is to examine whether the current market arrangements will deliver secure and sustainable energy supplies. We therefore believe that the second phase of Project Discovery, which examines the current market arrangements, is vital in determining whether any of the scenarios are indeed plausible. Some key assumptions have been made in the initial phase in relation to the ability of the market to deliver new investment (e.g.coal with CCS, nuclear power plants). We simply do not see the current environment (financial, planning, legislative, carbon pricing) encouraging the market to deliver what are significant investments where returns are based upon a very uncertain future outlook. We believe that certain market participants who could invest in such plants operate on a global scale and have choices as to where they make their investment based on the incentives and security of the return on their investments. A number of the market participants are no longer UK companies. We also note that certain market participants have not been immune from the recession and therefore maybe somewhat constrained in their future investment capacity.

[5]UK Renewable Energy Strategy: Consultation document – section 10.5.3
http://www.berr.gov.uk/files/file46799.pdf

We would encourage Ofgem to examine what opportunities there are to extend the life of plants that have currently been scheduled to close. For the nuclear sector we note that the Project Discovery analysis already assumes that Heysham and Hartlepool stations are extended to 2019. We would ask Ofgem to examine what incentives could be put in place to encourage existing stations (nuclear and opted out coal) to examine lifetime extensions. This would allow the baseload generation capacity to be maintained in some of the scenarios to allow the transition to more carbon neutral forms of generation.

The analysis on future gas requirements show that under all the scenarios considered the gas demand remains relatively stable to 2015. By this time the UK will be importing over 60% of our gas requirements from overseas in the form of LNG and pipeline gas. The ability of the gas market, infrastructure and storage to react to significant changes in the intermittent nature of large forms of renewable power generation will be a massive challenge for the gas supply chain. A growing share of the import dependency will be based upon LNG and whilst there is a current glut of LNG in the global market we note that there is a significant reduction in new LNG projects beyond 2014/15. We also note that the current shale gas developments in the North American markets may further impact the development of new LNG capacity. ***We would therefore urge Ofgem in the second phase of Project Discovery to look at the market arrangements for the security of future gas supplies, infrastructure requirements and strategic gas storage.***

Following our general comments above please find below responses to the questions asked.

Chapter 2

Question 1: Please provide comments on our approach of using scenarios and stress tests to explore future uncertainty, and as a basis for evaluating policy responses.

Scenarios consider a limited number of "stories", each of which assumes certain background circumstances – in this case essentially a 2x2 combination of slow or fast economic recovery, combined with an enthusiastic or otherwise promotion of "green" policies by governments. Scenarios have the advantage of considering only a manageable number of possible circumstances, which, if chosen carefully and with internal consistency, can illustrate ranges of outcomes for other variables of interest.

In the present case no probabilities are given, although some key assumptions in the Green Stimulus/Transition scenarios on the penetration of "green" technologies look highly improbable. To quote from Prof Dieter Helm's analysis of EU climate policy (see www.dieterhelm.co.uk/publications/SS_EU_CC_Critique.pdf) "*The probability that the correct answer to the question of what to do about climate change is even approximately 20 per cent overall reductions, with 20 per cent from renewables—and then 20 per cent from energy efficiency—is close to zero. Its political resonance is matched by its economic inefficiency. … The renewables target is not only an expensive way of reducing emissions in the short term, but it lacks credibility, too.*"

We also find it hard to believe that energy demand could be reduced so much in the two "Green" scenarios in such a short time frame from available technologies. It is also counterintuitive that scenarios requiring double the investment level (an extra

£100bn) have no major impact on bills for customers. Who is to pay for the investment? In an assumed continuing market driven framework, which investors will be persuaded to make these investments? Or will the incentives be in subsidies which are charged to general taxation? Looking at the table in the Appendix ("Gas consumer bills", printed page 83) the sharply higher 2015 bills in the "Dash for energy" scenario suggests that UK bills are influenced more by what the rest of the world does than our own domestic investment plans. This should be made clearer in the text.

The unwelcome events which are the subject of the stress tests are chosen sensibly, and for each taken in isolation the analysis may be a fair guide to how the system might cope. But there is no presentation of what might happen if those disruptions for which the analysis looks at a single day were in fact to persist for several days, or weeks or months. Moreover, there could be several simultaneous disruptions.

Question 2: Are there other techniques for analysing uncertainty that we should consider?

Computer simulation methods, repeated many times (hundreds or thousands), can begin to reveal the likelihood of outcomes dependent on a range of factors with independent or linked probability of occurrence. A simulation model which moved forward a day at a time could "roll the dice" according to appropriate statistically based parameters to determine firstly the temperature-related demand for both electricity and gas, whether or not each supply infrastructure component failed or not, and how demand might then be met. Rules can be built in to say how long such interruptions might last – anything from days to weeks or months to repair a fault at Rough, or a damaged pipeline or part of LNG import infrastructure, possibly much longer periods if an earthquake were again to knock out Japanese nuclear generating capacity and cause diversion of LNG flows. A period of still weather and low wind generation can last several days – not least when high pressure brings colder weather, so these are linked probabilities.

Question 3: Do you agree with how we measure the impacts of our scenarios and stress tests?

See general comments above. As static calculations, assuming the market behaves rationally, they are no doubt a reasonable estimate of what could happen, but the dynamic impact of extended infrastructure problems and interactions when other parts of the system do not behave as expected is less well displayed. Such further complications could include "irrational" market behaviour – there have, for example, been extended periods in past winters when Continental gas did not flow to the UK despite UK prices being markedly higher.

The proper economic impact on the UK is not captured either, in that the "consumer" impact considered – as implied by the tables in the Appendix – is almost always for ***retail*** consumers. While they are assumed to play a major role in providing demand side response, the economic impact on industrial consumers is barely touched upon. Negative factors include the effect of a "tighter" UK market in pushing up UK spot and especially forward prices, the disruptive effect on production and plant operating efficiency, inability to maintain customer delivery schedules and long term loss of reputation with customers. There would be cumulative severe damage to the UK's standing as a credible manufacturing location and place to do business. We should like to see this more explicitly dealt with, and quoting wholesale energy prices rather than aggregate consumer energy bills.

Question 4: Do you agree with our key scenario drivers and choice of scenarios?

Given the need to keep the number of scenarios to a manageable number, the 2x2 combination is sensible, with the two dimensions certainly reflecting the key preoccupations of the time.

Question 5: Do you believe our scenarios sufficiently cover the range of uncertainty facing the market, and hence cover the areas where future policy responses may be required?

No. We have already alluded to the plight of industrial consumers not being adequately considered. Given scenarios where unreliable and unpredictable renewables have a large nominal share of capacity, and industrial consumers are assumed to provide much of the balancing of the system through demand side response, the impact on the "insurance premium" in forward market prices needs to be more thoroughly researched.

Uncertainty also arises from assumptions about the fate of the coal fired power stations which have not been fitted with flue gas scrubbers to make them compliant with the LCPD (let alone the IED!) Most actors – suppliers, customers and politicians in private, even occasionally in public – assume that the stations will be kept in service if the only alternative is widespread power shortages. At the same time DECC officials maintain that this could not possibly happen because we would be breaking Brussels' rules and would be hauled before the authorities and risk large fines. Those who have invested in FGD equipment might seek redress in the courts, too. As long as uncertainty persists about the fate of the old stations, potential investors in new capacity are understandably reluctant to commit funds because they think the older plants may indeed be allowed to continue. With too little new capacity built, this risks becoming a self-fulfilling expectation. We could have an inadequate generating capacity margin, and be forced to rely on older, less reliable plants which we can only assume have not had much money spent on them in recent years, and may not be capable of reliable operation anyway. The uncertainty needs resolving.

Question 6: Do you have any specific comments on scenario assumptions, and their internal consistency?

Some general observations are made in the answer to Question 1. The assumptions appear more determined by arbitrary political targets than rational probabilities. Specifically, the assumption (para 2.66) that "In the Green scenarios, little additional investment is required beyond renewables, CCS and nuclear" is hardly realistic. Neither CCS nor nuclear is likely to make a significant impact before well into the 2020s, while the renewables need back-up of almost 1:1 in conventional nominal capacity in order to provide adequate security. This must imply a large addition to gas fired capacity. Why is it not there?

Question 7: Do you agree with our methodology for modelling gas and electricity supply/demand balances?

In broad terms, yes, although the bland statements in paragraphs 2.68 and 2.69 underestimate the practical difficulties of finding alternatives at times of stress. Often the same stress factors will affect markets beyond the UK and complicate our position.

The casual reference to “curtailment of demand (voluntary and involuntary)” betrays a lack of understanding of the UK’s fundamental competitive position. We are failing to pay our way in the world, the deficit being further aggravated by our need to import an increasing proportion of our primary energy requirements. If we are to improve our trade performance, we must be able to provide a business environment conducive to producing goods economically and reliably. Uncertain power supplies complicate scheduling, increase stock holding costs, increase prices for assured energy supplies and divert managerial resource to “gaming” in energy markets.

Question 8: Do you agree that LNG is the likely medium-long term source of "swing gas" for the European market?

Yes, although new pipelines are also being constructed. However, global flows are realistically only possible as LNG.

Chapter 3

Question 1: Do you have any observations or comments on the scenario results?

The results for gas emphasise the reliance placed on having adequate gas storage – which is not the case at present. You highlight the greater danger being the ability to sustain gas supplies through a long winter rather than on any one day. This implies total storage capacity is inadequate, while the maximum rate of withdrawal is less of a problem. “Dash for Energy” suggests that by 2020 we have managed to double the rate of access to stored gas, despite the present market based regime having so far conspicuously failed to deliver adequate storage.

On electricity, the most worrying feature is the heavy reliance on wind in the Green scenarios. Footnote 35 explains that only 15% of nominal wind capacity, shown as 30+ GW, can be relied upon when calculating capacity margins. Of the aggregate 100 GW including 30 GW of wind, only 75GW is reliably available –assuming everything else has 100% availability! Alternatively, to give 100GW effective capacity, an additional 25 GW of conventional capacity – almost certainly CCGT - needs to be available as back-up. The only way that figure 3.9 is able to show any positive capacity margin is by the optimistic assumption that aggregate demand will have fallen markedly.

It is also a worrying feature that such a high proportion of generation in the non-green scenarios is gas fired, and that nuclear’s share dwindles and is not replaced. The proportion of “reliable” generation from gas reaches 75% or more – and a large part of CHP is likely to depend on gas, too.

Overall one would have to conclude that reliance on simple market forces (outside the renewables area, that is!), coupled with a drive for unrealistic renewables targets and the negative impact of directives such as the IED, is not going to deliver a stable and secure future. Generation needs to be diversified much more.

Question 2: Do you agree with our assessment of what the key messages of the scenario analysis are?

The conclusions in the panel in paragraph 3.66/Table 3.1 are at variance with other statements. For example Green Transition says “the EU renewables target and the

Government's carbon budgets are met, but at a cost to consumers in the near term who would be required to fund the investment." This higher cost to consumers would be our expectation too, yet the chart in Figure 3.21 shows consumer costs virtually identical to Slow Growth. Nor can we agree with the GT conclusion that "This scenario is generally favourable to security of supply" – see comments under Chapter 3, Question 1 above. It is also at variance with a recent German study by the Rheinisch-Westfälisches Institut für Wirtschaft sforschung (www.rwi-essen.de), published in October 2009 entitled "*Economic impacts from the promotion of renewable energies: The German experience*". It has relevance to the UK position. For example, one paragraph in the executive summary says:

"*Due to their backup energy requirements, it turns out that any increased energy security possibly afforded by installing large PV and wind capacity is undermined by reliance on fuel sources – principally gas – that must be imported to meet domestic demand. That much of this gas is imported from unreliable suppliers calls energy security claims further into question.*"

The Project Discovery conclusions taken together indicate the influence of what the rest of the world does – as we noted in our response to Question 1 of Chapter 2. They also depend too much on the attainment of some unrealistic UK targets on both energy efficiency, and therefore reduced demand, as well as renewables penetration, and skate over very thin capacity margins. There is a very real possibility that renewables output could not only fall to 15% of the nominal output, but on occasions to virtually zero.

Question 3: Are there other issues relating to secure and sustainable energy supplies that our scenarios are not showing?

Our main concern is that the impact on industrial consumers, and the likely damage to the manufacturing economy overall, is inadequately considered.

Question 4: To what extent do you believe that innovations on the demand side could increase the scope for voluntary demand side response in the future?

We see a very low likelihood of innovations around continuous process plant. Shutdowns, even with weeks to prepare, can be extremely expensive as well as potentially hazardous if done in haste. Other "batch" processes can more easily offer some response, but here too adequate notice is required since individual production stages can take several hours for completion. Provision for alternative sources of heat can be built in to plants at design/construction stage, but at a cost. Moreover, the alternatives, most likely oil or electricity for gas, offer either limited duration back-up in the case of oil, or simply put a strain on another part of an interlinked national energy supply grid.

Chapter 4

Question 1: Do you agree that our stress tests are representative of the types of risks facing the GB energy sector over the next decade?

Yes, insofar as they cover most of the individual types of risks we may encounter. Damage to the Langeled connection would be similar to, but of greater magnitude than, a long-term 40% LNG diversion, or a Bacton outage.

Question 2: Are there further stress tests that you think should be considered?

Combinations of two or more simultaneous adverse events, including a Langeled / Bacton outage and /or zero wind extending over longer periods.

Question 3: Do you agree with the assumptions behind our stress tests?

The assumption “storage provides the 'swing' supply to attempt to meet winter demand” in paragraph 4.6 illustrates just how vulnerable the UK could be. For much of last year’s cold but unexceptional winter gas was being drawn from storage at close to maximum rate just to satisfy “normal” demand. It is unlikely that there would be very much ‘swing’ capacity left – unless storage capacity can be expanded by very much more than is assumed for the basic scenarios. The amount of “demand side response”, as the euphemism has it, projected from I&C customers in Figs 4.2 and 4.4 implies massive industrial disruption and long term damage to the economy.

In the electricity oriented stress tests (no wind) it would have been useful to see the related impact on gas markets as CCGTs were switched in – although as we observed above in our answer to Question 6 of Chapter 2, the scenarios appear to have underprovided back-up reliable power generation capacity, presumably because wind’s unpredictability makes CCGT use irregular, and investment in such capacity therefore unattractive. Instead “load cutrtailments” – another euphemism, this time for blackouts – are foreseen. This is really an admission of failure to provide secure energy, and will again have very negative consequences for the UK’s reputation as a place to do business.

We would not place much faith in the expectation (paragraph 4.18) of a meaningful contribution from smart grids and meters. This would require large numbers of consumer appliances to be capable of responding to signals from the grid. Little, if any, of the present stock is capable of such response. Moreover, smart grids and appliances can only defer electricity demand for a limited period, not reduce it. Householders can hardly wait days to run a dishwasher or washing machine - and the cycle will run at some time. A freezer may cope for 12-24 hours without power, but will later require to use more to regain its optimum working temperature.

Question 4: Do you have any views on the probabilities of these stress tests occurring?

Recent past experience (Rough, Langeled, Interconnector, Grain LNG) suggests that at least one major supply option is likely to fail or behave perversely at least once every other year. The Met Office must have the data on how often extended windless periods occur!

Question 5: Do you agree with how we have modelled demand curtailment in response to constrained supply?

There do not seem to be many options. Those chosen appear disastrous for industrial customers, who are being asked to bear the costs of the past failure of the liberalised market based system to provide adequate energy supply infrastructure or long term supply contracts, and a future architecture inspired by a political imperative to incorporate excessive amounts of inherently unreliable wind capacity. Sensible long-term diversification of primary energy sources is also thwarted by the projected IED and political unwillingness, reflected in the models, to countenance new coal capacity.

Question 6: Do you have any other comments on our stress tests?

No.

One purely practical matter relating to the report itself: numbering questions through the whole report in one sequence from 1 to n rather than restarting at 1 within each chapter would have been much easier for responders, and avoided possible confusion.