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Dear Ian,

### **Project Discovery - Energy Market Scenarios**

Thank you for the opportunity to respond to Ofgem's Project Discovery Energy Market Scenarios consultation. This response is made on behalf of all ScottishPower companies, under both Scottish Power Limited and ScottishPower Renewable Energy Limited.

We believe it is timely and important to consider whether current market arrangements remain fit for purpose and capable of delivering secure and sustainable energy supplies given the current challenges within the GB and European Energy markets. As such, we welcome Ofgem's Project Discovery Energy Market Scenarios and see them as a valuable basis from which to assess possible energy futures and thereby help inform forthcoming consideration of market arrangements and energy policy.

In our view, the approach and analysis undertaken is both rigorous and extremely beneficial in considering the diverse yet plausible future outcomes that we may face and we commend Ofgem on the time and effort taken to produce such a substantial and important piece of work. We think that the approach of mapping possible future outcomes against parameters of economic growth and success with environmental programmes is sound; like Ofgem, we do not believe the future will look exactly like any particular one of the four scenarios outlined. We think that 'Green Transition' and especially 'Green Stimulus' may face funding difficulties, while the level of environmental underperformance in 'Dash for Energy' and 'Slow Growth' may not be politically acceptable. However, we do believe that the future outlook will contain elements of all four of these scenarios to a greater or lesser extent.

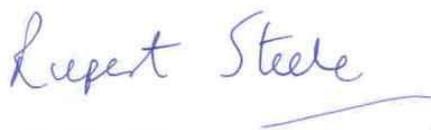
We have summarised below the key points contained within our response:

- We believe the timeframe covered by the analysis should be extended, as some 2050 targets will be impacted by decisions made today and over the next decade;
- We believe an additional piece of qualitative analysis should be undertaken before, or in parallel with, the second stage of Project Discovery. This analysis should explore current energy policy and any areas where existing instruments or intentions may conflict with each other;

- We believe that security of supply will ultimately be achieved provided that policy does not obstruct the proper functioning of the market; however there is less certainty over the impact on price and speed of progress towards decarbonisation and other related environmental goals;
- All scenarios show that end user prices will have to rise in the future and we agree with this conclusion. It is important that Industry, the Regulator and Government clearly communicate the reasons behind these likely increases;
- We believe Ofgem should look to incorporate the following in its scenarios and analysis:
  - A more aggressive outlook for nuclear in the generation mix by 2025, in some scenarios;
  - An “imperfect market” outlook where lack of appropriate frameworks means that timely investment is not forthcoming;
  - The probability of gas price divergence from oil and the range of outlooks of the related cost to the consumer;
  - Given the high levels of wind generation in some of the scenarios, details of how the system may work and adjust on an hourly basis;
  - Differing assumptions in relation to network/grid issues, in particular considering what might happen if current initiatives to improve transmission are not successful quickly enough.

We look forward to engaging further in the debate on the necessary market framework and optimum energy policy response required to achieve a secure, low carbon energy future. In the meantime, we attach our response to your consultation questions at Annex 1, with an additional list of comments and questions on the assumptions used by Ofgem at Annex 2. If you have any questions, please do not hesitate to contact me using the details printed on the previous page.

Yours sincerely,



**Rupert Steele**  
Director of Regulation

**Project Discovery Energy Market Scenarios –  
ScottishPower Response to Consultation Questions**

1. This response is made on behalf of Scottish Power Limited (a major UK energy supply, networks and generation business), and ScottishPower Renewable Energy Limited (the UK's leading wind farm developer). Both companies are subsidiaries of Iberdrola SA and references to “ScottishPower” and “we” are to either or both companies, and their subsidiaries, as the context requires.
2. Scottish Power Limited is an energy business that provides electricity transmission and distribution services to more than 3 million customers, supplies over 5 million electricity and gas services to homes and businesses across Great Britain (GB), and operates electricity generation, gas storage facilities and associated energy management activities in the UK.
3. ScottishPower Renewable Energy Limited is part of Iberdrola Renovables, which is 80% owned by Iberdrola SA. Iberdrola Renovables is the largest developer of renewables globally. Among our projects is the Whitelee wind farm which, at 322MW, is the largest onshore wind farm in Europe.

**Introduction**

4. We welcome Ofgem's Project Discovery Energy Market Scenarios Consultation at this important time in the transition to a low carbon energy system. Ofgem are to be congratulated on a thorough piece of work which illuminates some of the difficulties ahead. Our response sets out our views against each of the Ofgem Scenarios, and provides our views on the assumptions made as well as our thoughts on whether current market arrangements are sufficient.
5. We believe the scale of the challenge which lies ahead is significant, in terms of transformation of the UK's generation mix, and in financing the level of investment in generation and networks required over the next ten to fifteen years. We think that the position could in fact be tougher than indicated in the scenarios because of imperfections in the market – principally arising from political risk, a tougher capital environment and less than perfect information held by market participants.
6. We remain convinced that competitive wholesale and retail markets are the most effective way of delivering on environmental targets at the lowest possible cost to consumers. However, there remains a question as to whether the current “commodity only” framework is most effective in handling political and regulatory risk around peak pricing. Moreover, we do see a place for Government intervention where necessary, particularly to assist the industry in bringing forward low carbon technologies at scale that are strategically important for the country. This includes technologies such as CCS where worldwide deployment potential exists – with both opportunities for UK exports and to make a real difference to worldwide carbon levels – but where costs currently remain prohibitive.

**Chapter 2 – Approach and Assumptions**

**Question 1 & 2: Please provide comments on our approach of using scenarios and stress tests to explore future uncertainty, and as a basis for evaluating**

**policy responses. Are there other techniques for analysing uncertainty that we should consider?**

7. The scenario analysis approach used in this project helpfully provides different views of the future based on certain related assumptions. However, it is unclear how these scenarios will feed into the second stage of Project Discovery in terms of reviewing the current market arrangements to see if they are appropriate for the challenge of delivering secure and sustainable energy supplies. This is particularly significant given the resulting costs to the consumer are in a relatively tight range for three of the scenarios, with the fourth scenario 'Dash for Energy' being driven by many external factors that could be considered out of the control of policy. Within the 'Dash for Energy' scenario, we believe the likely make up of the market over the duration of the high price period has already, to some extent, been determined. On this basis, we believe the timeframe covered by the analysis should be extended, as some 2050 targets will be impacted by decisions made today and over the next decade.

8. It is interesting to note that all scenarios have energy costs to consumers coming down in 2010. Unless this is based on large energy efficiency savings (and the percentage falls look too high for this to be right) we do not agree. As Nick Horler wrote in his letter of 1 September 2009, in our opinion there are no immediate signals that would indicate a fall in retail prices for this winter, and risks of an increase next year. All Project Discovery scenarios also show that consumer prices will rise at later dates; it is important that Industry, the Regulator and Government clearly communicate the reasons behind these likely increases.

9. We also believe an additional piece of qualitative analysis should be undertaken before or alongside entering into the second stage of Project Discovery. This analysis should explore current energy policy and any areas where existing instruments or intentions may conflict with each other. It should look at when and how inherent risks in current market arrangements are likely to form a barrier to the desired end result for both generators and consumers. The analysis should be mindful of the lead times within the industry, political risk, capital constraints and the effects of imperfect information. Given the ability for all players in the market to invest elsewhere, we feel it is imperative that this analysis also examines other markets to see if elements of alternative successful structures can be facilitated within the UK competitive markets.

10. We appreciate that analysis such as Project Discovery has to be based on an outlook of future wholesale prices. We welcome Ofgem's recognition that:  
*'energy markets are inherently uncertain. At both a global and regional level, there are a profusion of interacting factors affecting wholesale and retail energy markets that are constantly in flux. We do not believe it is possible to predict with any certainty the likely future development of the market particularly over the longer term'.*

Against the backdrop of this uncertainty we believe Ofgem should focus on how appropriate, timely and cost effective investment that will put us on the best path towards all energy policy goals, can be encouraged and adequately rewarded. With this in mind, we hope that during the second stage of the project, the assumption of all scenarios that market participants will make timely economic decisions, is explored in detail and account taken of the possibility of imperfect market operation as detailed in paragraph 9 above.

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

11. Our response to this question is somewhat covered in other answers. Ofgem's stress test analysis calls upon demand side management to balance the system. We believe further analysis is required to look at the loss of load probability inherent in the scenarios, as well as the impact that demand side management will have on industry. Careful consideration should be given to what should be considered voluntary and involuntary action. Are price spikes acceptable to industry or will they seek to find more stable markets?

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

12. Given our experience of scenario analysis and modelling uncertainty, we believe that the key scenario drivers form a good basis for analysis. The construction and choice of scenarios are easy to communicate, which we believe is important in capturing a basis for analysis which is built up of many complex issues.

**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?**

13. In terms of the level of capital investment required (£90-£200bn), gas generation (70 – 215TWh) and gas demand (76-113bcm on an 11 year outlook), these numbers clearly demonstrate the uncertainty associated with cost effective long-term investment within the industry. However, we believe the scenarios and analysis should have incorporated the following points:

- The possibility of a more aggressive outlook for nuclear in the generation mix by 2025. The lead times associated with this technology mean that policy support is required now. The lack of volume in the scenario analysis seems to be contrary to current DECC ambitions.
- An outlook where lack of appropriate frameworks means that timely investment is not forthcoming. The risks of this happening in the context of this work need to be explored so that social and economic issues are understood.
- The analysis should include the probability of gas price divergence from oil and the range of outlooks of the cost to the consumer associated with this.
- Given the scale of wind generation in some of the scenarios, it is important to assess within the analysis how the system may work and cope on an hourly basis. The current analysis applies some seasonal shape to prices based on historic relationships between summer and winter prices. However, given the outlook for the change in supply and the flexibility required in the gas generation fleet, using an historic shape is unlikely to identify future policy dilemmas and investment conundrums. Whilst we appreciate the scale of modelling involved in this type of analysis, these points may prove to be more important than absolute future commodity price levels, both in terms of the framework, the need for gas storage and low load generation investments.
- It appears to us that further intervention to achieve energy policy objectives is likely. Against this backdrop it is important to consider a scenario where such

intervention comes sooner rather than later and whether this intervention might reserve parts of the market for certain technologies. In terms of intervention, it is important that regulatory risks are minimised particularly in a Scottish context, where certain policy decisions may encourage particular technologies i.e. offshore generation against onshore.

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

14. It is the project goal to explore whether current market arrangements are capable of delivering secure and sustainable energy supplies and what the costs to customers will be. However, in the green scenarios Ofgem assumes implicitly that planning, connection access and supply chain issues are not barriers to achieving the target. Present experience suggests that this is a questionable assumption. Although internally consistent, it appears that the analysis has assumed that current market arrangements will deliver certain technologies as a starting point to a number of elements in the scenarios. Hopefully, this is a concern that will be addressed in the second stage of the project.

15. Under the Green transition scenario, although recognising it is an assumption, it would appear dangerous to assume that a shift in the UK to cleaner forms of thermal will lead to lower coal prices, as these will be driven predominately by global supply and demand considerations.

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

16. As a starting point yes, although how pricing of electricity is treated on the back of balancing may not give the desired results, or highlight how policy action may be needed to underpin investments and the operation of the system. In the analysis, prices are based on the short run cost of the marginal plant in each demand block, and an uplift component, which reflects margin tightness (based on historic analysis). Given the high level of wind generation in some scenarios, historic tightness may tell us little about the future. As well as this, the analysis does not assume new build until returns are high enough; against the back drop of SRMC markets, this assumption needs to be explored further to see what policies may need to be put in place to ensure adequate returns. A commodity-only market may mean that there will at times be a tight system that will require demand side response during times of stress. Before or during the second stage of analysis, the loss of load probability inherent in the systems in the scenarios should be explored. We suspect that many industrial and commercial consumers will be reluctant to accept the disruption to production inherent in demand side actions.

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

17. Yes. We believe this is a good central assumption, although there is a risk that LNG chains may not be as flexible as some forecast. During periods of strong worldwide markets, this swing may also come, if at all, at a very high cost as the UK seeks to attract marginal spot cargoes. As commented above, this should be considered in the shaping of future prices in the base cases as well as the stress tests that have been run.

### **Chapter 3 – Scenario Analysis**

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

18. We welcome that this work is now in the public eye and is being well communicated, as it highlights to the public the risks faced by the energy industry and investors. While the risks highlighted by the scenarios are known within the industry, we accept that this is the first stage of the process and believe the next stage of the project will be vital.

19. In our view, the approach and analysis undertaken is both rigorous and extremely beneficial in considering the diverse yet plausible future outcomes that we may face and we agree that this approach is the most appropriate way to look at the future as opposed to being too prescriptive in constructing one particular view.

20. We see a clear dichotomy in the scenario results. The results of two scenarios would imply a level of environmental underperformance that may not be politically acceptable, whilst the remaining scenarios may face funding difficulties. In reviewing the scenarios, the scale of uncertainty is likely to lead to a prudent investment approach, which leads us to anticipate a partial success outcome in delivery with the likely outcome being a blend of all four scenarios. We believe that security of supply will ultimately be achieved provided that policy does not obstruct the proper functioning of the market; although there is less certainty over the impact on price and speed of progress towards decarbonisation and other related environmental goals (where associated costs may limit what can be afforded).

21. We believe that centralised generation will remain the main part of the security of supply solution for the foreseeable future. However, current market arrangements require augmenting to meet the operational and network challenge caused by future forecasts of supply intermittency. We believe such a response is likely to see new supply and demand side measures emerge.

22. Up to 2020 with all things being equal, we believe it is possible to achieve a continued favourable supply margin (at least until 2015) and strides towards the Government's objectives in renewables and CO<sub>2</sub>, albeit with only partial success. However, progress against these objectives will require a focus on delivery and the removal of investment uncertainties. Moreover, there is a risk that a quicker than expected return to growth, after deferral of generation plant due to the recession, could lead to a period of unexpectedly tight margins.

23. We are concerned that final arrangements for the IED and CCS/CCR regulation could lead to premature closure of some coal plant and move towards increased reliance on gas. Decisions around Phase III of the EU Emissions Trading Scheme will also be important in determining the extent to which the ETS provides the necessary price signal to incentivise investment in low carbon generation.

24. At present, we see at least 3GW of new nuclear in place by 2020 (likely to be assisted by measures to incentivise low carbon generation), probably no new coal by that date (subject to clean coal and CCS policy decisions), and a likely challenge in delivering at least 30% of renewable electricity. Demand for energy is difficult to judge; significant reductions in gas use (other than for power generation) are expected as energy efficiency takes hold, but electricity demand will depend also on economic growth and development of new applications.

25. All future scenarios also include increased penetration of wind power. This is to be welcomed. As the amount of wind energy increases, so will the intermittency of electricity supply, which will drive the need for greater plant flexibility and an increased need for ancillary service provision.
26. It is not yet clear whether the new technologies brought to the market (Supercritical Coal, Nuclear, CCS) will be able to provide much assistance with flexibility and ancillary services. Economically, there will be strong pressures to run new low carbon plants at high load factors to recover the investment. All things being equal, this could lead to other technologies (CCGTs) running at low load factors for sustained periods.
27. There are many operational challenges for managing the electricity system with a higher penetration of intermittent generation. A high wind scenario will result in unprecedented volatility in generation output with major implications for other plant.
28. Output variability will lead to price volatility and price spikes may increase, with possible periods of zero and negative prices and possibly a reduction in overall average prices. Nuclear, clean coal, CCS and biomass generation will not be well placed to flex as wind output varies, not least because of the need to achieve a high load factor to remunerate the considerable investment.
29. This will put more strain on the flexible generation that can more economically flex with wind output and will increase the required level of fast response reserve on the system. Indeed, it is the subject of some debate whether the operating regime required by thermal plant may be technically and/or economically unachievable under the current market arrangements. As a minimum, such a system is likely to require a series of ancillary services from the market that rely upon flexible thermal generation to provide. The ramp rate for the change in wind generation is likely to increase the requirement for warming contracts for flexible thermal plant.
30. As there are numerous future energy scenarios, future electricity demand predictions remain uncertain. Particular uncertainties exist in relation to the level of electrification to expect within the transport system (and when), and the level of future electric heating requirements, both of which will significantly impact seasonal and daily peak loads. The amount of new capacity that will be commissioned, and suppliers and customers' responses to the potential need for demand side management measures, also remain uncertain. Accordingly, care must be taken to ensure all possible outcomes are considered when estimating the potential for smart demand and prudence should be deployed in doing so, particularly until measures have been properly tested and their impact sufficiently evaluated.
31. We suspect that the main gains in terms of demand side measures in the domestic and small business sectors will be in areas where automation can be used to flex demand without direct intervention or inconvenience for the consumer.
32. While demand reduction arising from the current recession has improved plant margin in the short term, this cannot be taken for granted as the recession ends. It remains of critical importance that policy continues to deliver results in relation to delivery of new infrastructure. This requires no let up whatsoever in reforms to planning (implementing the 2008 Planning Act and the functioning of the Infrastructure Planning Commission (IPC)), market instruments (including to the RO and FIT), regulatory funding for grid development and the proposed CCS funding that is to be taken forward in this year's Energy Bill.

33. One comment we would make with regard to all scenarios is the obvious absence of predictions in relation to network/grid issues. While we note the assumption that grid connections exist in all scenarios, we would urge caution in this approach. Based on historical experience there is at least a risk that there will be problems going forward caused by insufficient grid connectivity and delays in new infrastructure being built. In particular, problems could arise around transmission access and potentially prohibitive charging regimes in Scotland.

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

34. On the whole we agree with the key messages from the scenarios but they do not address the lead times faced by the industry. For example, they do not address the forecast spend over the next few years in nuclear to address future carbon targets. Under the 'Dash for Energy' and 'Slow Growth' scenarios is the assumption that this investment is stranded or not supported. The low outlook for nuclear new build would seem to go against recent work prepared by DECC. In reality, we believe the high gas prices in the 'Dash for Energy' scenario would send a market signal to build nuclear. It may be that the differing views on nuclear deployment reflect differing assumptions as to whether the Government is likely to take initiatives to encourage new low carbon generation.

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

35. As already stated under certain scenarios, further work is required to demonstrate how the system will operate on a daily and hourly basis, when dealing with large volumes of intermittent wind generation.

**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?**

36. The need for demand side management is inherent in a system that is by design, tight during peak periods. In the future, it will be unknown until close to delivery where this tightness may occur, due to the variability of the intermittent supply. This makes it inherently difficult to change demand side behaviour, unless systems are very dynamic and prices are extreme in tight periods. As previously stated, we suspect that the main gains for most customers will be in areas where automation can be used to flex demand without direct intervention or inconvenience for the consumer. We think that much of industry may be unwilling to accept the disruption of production inherent in a high level of demand side management and could see such requirements as a significant factor in choice of location.

37. It remains the case that there are solutions to the intermittency and inflexibility of low carbon generation through engineering the supply side to overcome the problem. This is of course the default solution, which will need to be applied if there is insufficient demand side management. It is not evident that this approach would have a higher cost to the consumer, and this merits full analysis. However a strong supply side solution to intermittency may require incentives to ensure it is put in place in a timely manner.

## **Chapter 4 – Stress Tests**

### **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?**

38. Yes. We believe that the stress tests that have been analysed are representative of the major risks faced by industry and we agree that 1 in 20 demand is a good working assumption.

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

39. Yes. Given the uncertainties inherent in the current market arrangements the scenarios should be stress-tested for underinvestment or investment that is not timely. This should consider the factors mentioned above concerning market imperfections around political and regulatory risk, capital shortfalls and insufficient knowledge by market participations. This test should consider both infrastructure and clean generation so that social and economic issues are in some way quantified.

40. We believe other geopolitical factors should be considered, that might cause prices to go even higher than those analysed. We believe the success or failure of certain technologies, particularly nuclear, CCS and renewables, and timings of delivery should be stress tested under appropriate scenarios.

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

41. Yes.

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

42. It is very difficult to put precise probabilities against each of the stress tests, but it is likely that there will be some form of dispute over gas in Europe in the future; whether or not this will actually impact the UK will depend on many other factors at that time. Given the nature of the weather patterns that create some of the very cold days in winter, it is possible there will be very little wind during these periods.

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

43. This is an ongoing debate, but we believe the way the analysis has been set out is logical. The overarching question we feel still needs to be addressed, is what impact this type of response may have on industry in the UK and the willingness of industry to provide it.

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

44. No.

## Annex 2

### Additional topics for Ofgem to consider

*The following points are based on outstanding questions that we have and points raised during the reading of the Project Discovery Energy Market Scenarios Consultation, which do not naturally fall into the context of the consultation questions.*

- There is no real timeline as to when Ofgem expect the project to be complete. It would be beneficial to have a clear understanding of when the next phases of the Discovery work will be undertaken and finished.
- Page 11 discusses unforced electricity outage during peak times. We find it difficult to believe companies would deliberately take outages during periods of likely high returns. We would welcome clarification on this point.
- The consultation discusses fitting 19 GWs of Coal and 4 GWs of gas with SCR at a cost of £1.2bn. We would ask if Ofgem could provide further details behind this assumption, as we believe these costs are significantly underestimated. In our view, the current market costs of fitting NOx abatement technology are considerably above the levels suggested by Ofgem. In addition, there will be considerable associated life extension costs as these thermal plants near the end of their design life, independent of the choice they make under the IED.
- The consultation estimates £16bn to meet energy efficiency targets. On a household level this would appear quite low at first reading. We would welcome further details of the assumptions made in this area.
- During a recent seminar it was suggested by Ofgem representatives that there is an element of micro CHP assumption in some of the scenarios. We have been unable to find these assumptions in the report, and would appreciate any detail on the cost or policy assumptions made.
- The report suggests that some of the technologies deployed may require subsidies. Other than for renewables, we would be interested in understanding if any specific subsidy assumptions have been made for other generation technologies. For example, has any generalised support for low carbon generation or support for the carbon price been considered?
- We would welcome clarity on the level of costs and incentives which have been assumed within the Electric Vehicle and heat pump assumptions to incentivise the high take-up in the green scenarios, particularly in the period to 2020.
- Given the conclusion in the report that:  
“energy markets are inherently uncertain. At both a global and regional level, there are a profusion of interacting factors affecting wholesale and retail energy markets that are constantly in flux. We do not believe it is possible to predict with any certainty the likely future development of the market particularly over the longer term”  
we would welcome views from Ofgem on what they believe to be the risk premium that energy company boards would expect when investing in this type of market.

- A 10% cost of capital (post tax nominal) has been assumed throughout. However, in the slower growth scenarios it has been assumed that capital is hard to come by but not more expensive - we believe that this is not realistic. In such circumstances, there could well be impacts on both the price and availability of capital and we think that they would be more accurately modelled accordingly.
- We believe the assumption in some scenarios that renewable and energy efficiency targets are fully met remains challenging.
- Under some of the scenarios the retail gross margin assumptions, when considering fixed costs to serve and the need for appropriate “shape” in the energy purchased, appear very low. We believe that under some of the scenarios there would be severe pressures on retail business profitability.
- The capital cost assumptions used in the outlook for certain technologies appear to be on the lower side of ranges discussed within the industry. We believe it would be challenging to construct either a nuclear power station or CCS supercritical coal at the costs which have been provided. We would expect to see significantly more nuclear in the mix within the Ofgem scenarios if it were assumed that it can be built it for £2000/kW.

ScottishPower  
28 November 2009