UTILITY 2050

Decision Theatre: Present Utilities

Empirical Report

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Utility 2050 Decision Theatres: Present Utilities

1.0 Introduction to the Utility 2050 project decision theatres.

The utility 2050 project assess the impacts of low-carbon energy futures on electricity utilities, and explores how they can access new markets.

The Utility 2050 project recognises that the energy sector faces uncertainty. There are many possible futures with different generation mixes, flexibility technologies, final demands, consumer preferences, and political priorities. The Utility 2050 project uses innovative interdisciplinary approaches to quantify and explore big questions about future market sizes, regulatory priorities and customer preferences.

This empirical report summarises the output of the decision theatre held on 16th May 2017 in central London. Decision theatres present participants new data on a specific multi-stakeholder problem. In this case the Utility 2050 project, findings were presented (see section 3.1). The information given to participants was used to reach a decision on the following question:

What are the most important CHANGES needed to enable utilities to access new markets in the energy transition?

The rest of this report is structured in four sections. Section 2 summarises the decision theatre method, and the justification for its selection for this study. Section 3 summarises the data given to participants prior to the decision theatre and once again at the start of the workshop. Section 4 describes the decision theatre process and the results of each stage, including the final decision. Section 5 concludes and explains next steps.

2.0 The decision theatre method

Decision Theatres (DTs) are workshops that culminate in participants or stakeholders making a decision. DTs are one off events often within a longitudinal research process that may involve several DTs, groups of participants, and decision-making dilemmas.

Arizona State University pioneered the use of decision theatres to consider decision-making in a context of climate uncertainty. Their study explored the complex relationships that exist between rapidly growing populations and finite water supplies[1]. Decision theatre techniques have been used to explore complex issues of resource and infrastructure governance such as local energy infrastructures[2], urban flooding[3], and forestry management[4]. Decision theatres are being used internationally to tackle complex, multi stakeholder issues with cutting edge analytics.

The Utility 2050 decision theatre work package aims to run three separate decision theatres with three groups of energy system decision makers. These are present utilities (both established and new entrants), investment and finance, and policy and regulation. The central question and preparatory material will be common to all the decision theatres. This process will generate three sets of prioritised changes to the energy system that are designed to make a breakthrough in UK energy system planning. Results of prior decision theatres will be disclosed to participants at the conclusion of their own DT.

The Utility 2050 Present Utilities decision theatre comprised ten participants from the UK energy sector. These were: 3 x large utilities executives (i.e. three of the UK's big six), 2 x challenger utilities officers or affiliates (i.e. new market entrants), 2 x executives of energy service providers, 1 x generation heavy utility (i.e. making majority revenues from merchant plant), 1 x Distribution Network Officer Executive, and 1 x executive of a large energy and petrochemical firm. The stakeholders were purposively sampled to provide insight from across the commercial, operational side of the UK's energy market.

3.0 Preparatory Utility 2050 data

At the beginning of the decision theatre facilitators shared the findings of the Utility 2050 project to date. This information was sent to participants prior to arrival and comprised three datasets from the Utility 2050 project. The data presented to participants was:

[1] White, D.D., Wutich, A.Y., Larson, K.L. and Lant, T., 2015. Water management decision makers' evaluations of uncertainty in a decision support system: the case of WaterSim in the Decision Theater. *Journal of Environmental Planning and Management*, *58*(4), pp.616-630.

[2] Bush, R.E., Bale, C.S., Powell, M., Gouldson, A., Taylor, P.G. and Gale, W.F., 2017. The role of intermediaries in low carbon transitions–Empowering innovations to unlock district heating in the UK. *Journal of Cleaner Production*, *148*, pp.137-147.

[3] Walsh, C.L., Glendinning, S., Dawson, R.J., England, K., Martin, M., Watkins, C.L., Wilson, R., McLoughlin, A., Glenis, V., Parker, D., 2013. Collaborative platform to facilitate engineering decision-making. Proc. ICE Eng. Sustain. 166, 98e107.

[4] Boukherroub, T., D'Amours, S. and Rönnqvist, M., 2016. Decision theaters: a creative approach for participatory planning in the forest sector. In *Proceedings of the 6th International Conference on Information Systems, Logistics and Supply Chain (ILS'2016), Bordeaux*.

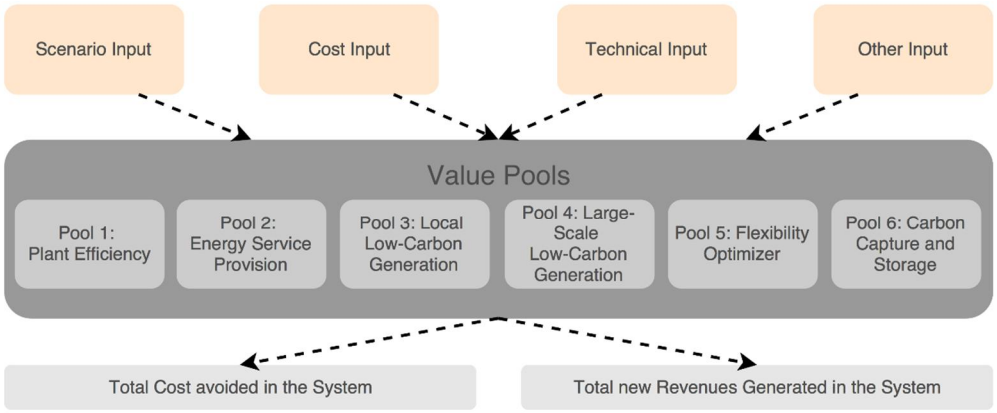
Dataset #1: New financial opportunities 'Value Pools'.

The Utility 2050 project asked what new financial opportunities are presented by future energy systems. These new opportunities were called 'value pools'. The value pools quantified by the research team are either new revenues to the system or avoided costs i.e. through technology switching or efficiencies.

The six value pools we quantified were:

- VP#1: Plant efficiency, the easiest avoided cost to understand, simply what can be saved by investing in the existing generation portfolio to make it more efficient over time.
- VP#2: Energy services, this value pool includes all new revenues available by installing energy efficient appliances and management systems in homes as well as electric vehicle charge kit *and* new revenues from the extra electricity needed to charge electric vehicles.
- VP#3: Local low carbon (distributed) generation. Essentially the market for microgeneration, this is where utilities companies offer solar lease and servicing along with offering trading or brokerage platforms for local generators
- VP#4: Large scale low carbon generation. This value pool is an 'avoided cost' value pool because, depending on carbon prices and fuel prices, low-carbon generation should become cost competitive with gas CCGT in the future. Therefore, with the right carbon price, companies would choose to build low carbon as opposed to traditional generation to cover the same net capacity. This value pool is calculated without feed in tariff subsidies.
- VP#5: Flexibility, the value of battery storage and demand response can be both new revenues or avoided costs, this value pool captures price arbitrage and the provision of energy services to the transmission system operator.
- VP#6: Carbon Capture and Storage, estimates the costs avoided by building CCS plant under a range of carbon prices.

Figure 1: Value pools identified and conceptual model map.



To test the values pools, we selected eight UK future energy scenarios. These were:

Author	Name of the Scenario
DECC – 2050 Calculator (2010/2011)	High Renewables, higher Energy Efficiency
	Higher Nuclear, less Energy Efficiency
	Higher CCS, more Bioenergy

National Grid (2016)	Gone Green No Progression
Realising Energy Transition Pathways (2008)	Market Rules Central Coordination Thousand Flowers

The results show that in 2050, depending on the scenario assessed some value pools are very robust, some are volatile, and some are destroyed completely. Across the scenarios tested these new revenues and avoided costs were compared against the size of the entire market. Figure 4 shows that new revenues and avoided costs combined are a maximum of 30% and a minimum of 13% of the future market sizei across the scenarios. Across the surveyed scenarios, the potential new revenues in the UK energy system are up to £12.8bn per year in 2050. The cost savings potential is up to £6bn per year in 2050.

Figure 2: Cumulative new revenues across system futures in 2050 by value pool

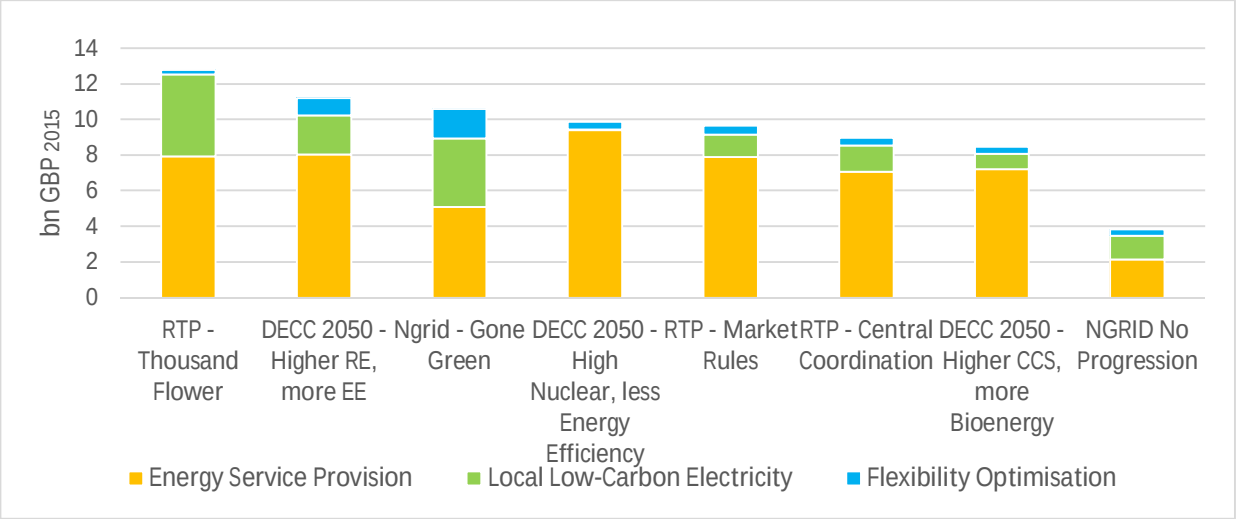


Figure 3: Cumulative avoided costs across system futures in 2050 by value pool

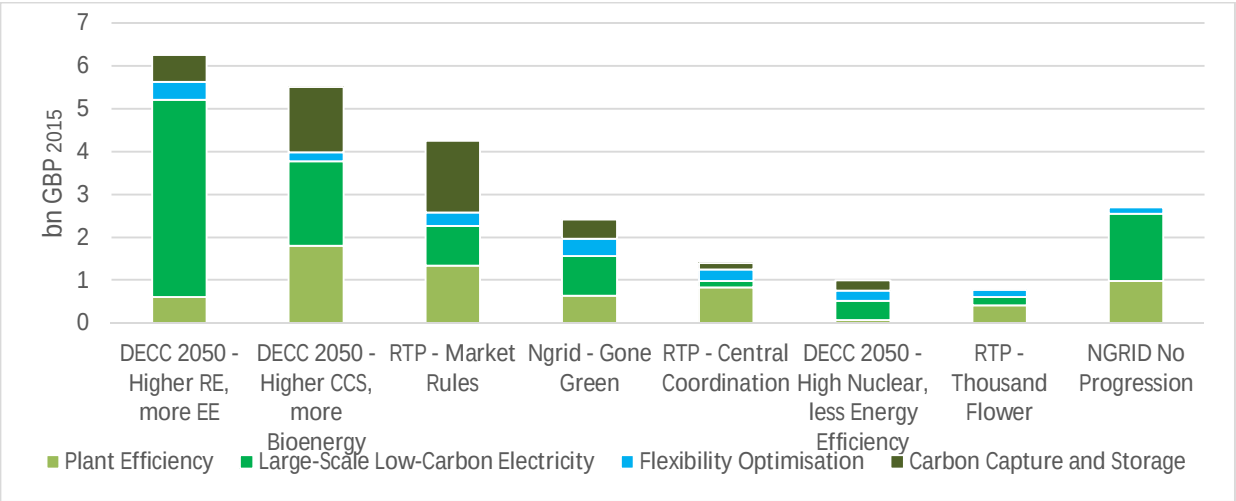
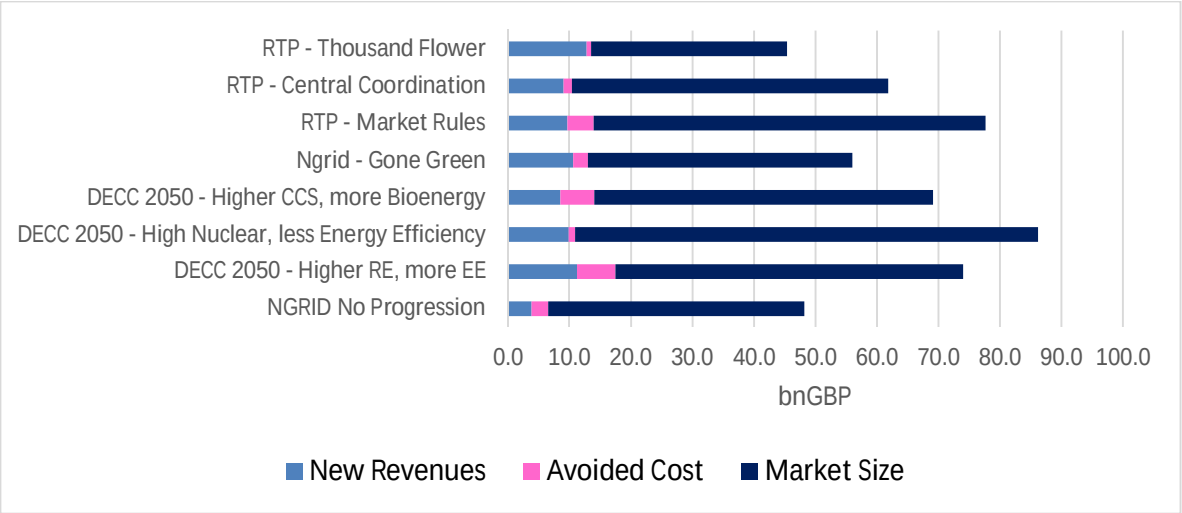


Figure 4: Comparison of indicative market size against new revenues and avoided costs in 2050.



The main insights from this work are summarised below, specific questions were encouraged from participants during the decision theatre. Each insight is accompanied by a 'provocation' which led into activity #1 of the decision theatre.

1. The cost of carbon in the UK's carbon price floor is critical to both CCS and large scale low carbon generation value pools. We used the Committee on Climate Change's expected carbon prices. Without direct subsidy the main driver for firms to construct large scale low carbon generation (VP#4) are the cost differentials between these and conventional technologies. Across the scenarios analysed the carbon price only reaches a sufficiently high value to make these value pools positive in 2050. These points support previous analysis in suggesting that linked long term subsidy contracts of low carbon generation alongside carbon pricing will continue to be necessary to deliver required levels of large scale low carbon generation. However, this analysis demonstrates carbon capture and storage is extremely sensitive to what future energy scenario is followed. This raises Provocation #1: Will anyone really invest in CCS when it is such a volatile value pool?

2. The energy service provision value pool is robust across all scenarios, and the dominant driver of new revenue is the electric vehicle service element. Across all climate compatible scenarios there is a substantial commercial opportunity available in electric vehicle service provision. Indeed electric vehicle services are the single biggest element of new revenues available across all assessed future energy scenarios including 'no-progression'. This prompts Provocation #2: Utilities can capture lots of value from electric vehicles so they will lead the way on promoting them.

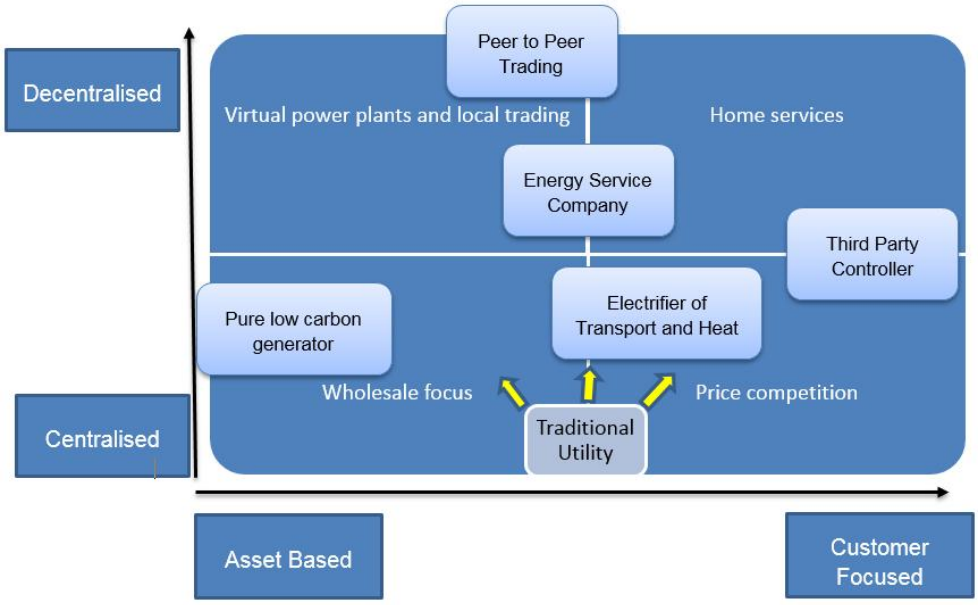
3. Revenues and avoided costs from flexibility markets (i.e. batteries and demand response) are extremely volatile across scenarios. Depending on the scenario, flexibility services are worth between £46m to £1bn by 2050. Demand response could be worth up to £600m in new revenues and £400m in avoided costs by 2050. Conversely these markets may be worth as little as £210m and £140m respectively by 2050. At the same time, storage, demand response, and flexibility are key enablers in other parts of the energy market. The resultant Provocation #3: Flexibility value is so volatile only small start-ups will bother with it and it will never reach the scale needed.

4. In the National Grid Gone Green and RTP Thousand Flowers scenarios the combined value pool #3 for distributed generation is £3.8 and 4.5bn in 2050, where in those scenarios with more centralised generation the value pool is often below £1bn by 2050 or in some does not exist at all. This value pool envisages utilities leasing consumers' microgeneration equipment (largely solar) and providing local power exchanges for trading. Provocation 4 is: Distributed energy and electricity utilities will always be in competition because large utilities won't pursue this value pool.

Dataset #2: Business model innovation

In summer 2016 the Utility 2050 team ran a workshop on the utility business models of the future. The 5 business models proposed were: low carbon generation only businesses focussed on building low carbon capacity and/or CCS, a 'New Electrifier' which installed electric heating and electric vehicle charge provision, Energy Service Companies offering appliances, efficiency retrofit and electric vehicle services, peer to peer trading platforms for local generation, and 'Third Party Control' which essentially bundles utilities around consumer needs and takes switching decisions on the consumers behalf. These business models were placed on the following matrix:

Figure 5: business model market positions.



Adapted from: White, N., Ingham, K., von Bechtolsheim, D. M., Haischer, M. & Francis, D. R. (2013) *The future of energy utilities - How utilities can survive the "perfect Storm".* Arthur D. Little.

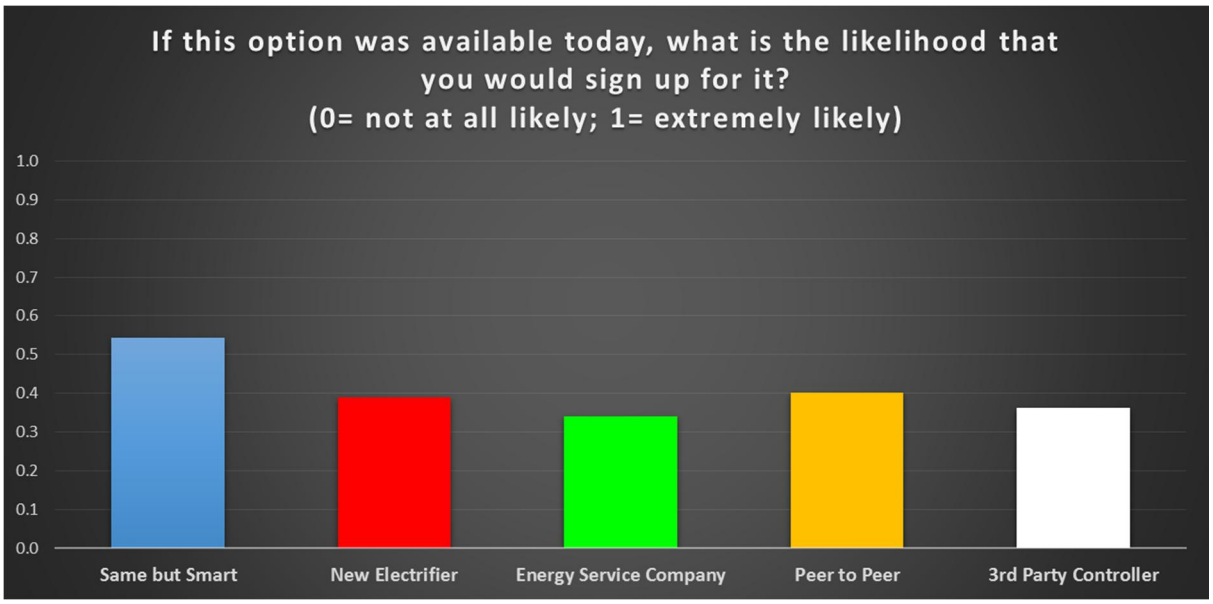
Each of the business models can capture one or more of the value pools proposed above. The intricacies of each business model were not presented at length but DT participants were asked to use them as ways of understanding how utilities might capture new value pools. The provocations which came from this analysis are:

- Provocation #5: Regulation gets in the way of business model innovation
- Provocation #6: Some business models just too risky for the levels of return in the sector
- Provocation #7: Some business models are technically possible but just too complex to understand

Dataset #3: Consumer Insight

Business model innovation will only turn 'value pools' into revenue if consumers want what is being sold. The Utility 2050 team undertook a consumer facing survey. We presented key attributes of the business models we generated to a representative sample n=2000+ of UK energy bill payers and asked which of the business models they found attractive. The attributes and results are shown in figure 6 below:

Figure 6: Spread of preferences in comparative choice exercise



We expected consumers would want business models closer to what they are familiar with. However the Peer to Peer Trading (which means more control and engagement) and the Third Party Controller (which means giving up both control and data access) models scored very well. This suggests consumers are happy to give up data and have more or less control in return for some benefit (financial or lifestyle). There was no 'total loss' business model i.e. all BMs were attractive to one market segment. This means consumers may be more segmented than we think. The provocations we can draw from this are:

> Provocation #8: Consumers are more engaged than we think when given meaningful choices.
> Provocation #9: Consumers are not as engaged as they say and any business model based on deep engagement is bound to fail.

The nine provocations provided by the facilitators were:

- *Provocation #1: Will anyone really invest in CCS when it is such a volatile value pool?*
- *Provocation #2: Utilities can capture lots of value from electric vehicles so they will lead the way on promoting them.*
- *Provocation #3: Flexibility value is so volatile only small start-ups will bother with it and it will never reach the scale needed.*

- *Provocation #4 is: Distributed energy and electricity utilities will always be in competition because large utilities won't pursue this value pool.*
- *Provocation #5: Regulation gets in the way of business model innovation.*
- *Provocation #6: Some business models just too risky for the levels of return in the sector.*
- *Provocation #7: Some business models are technically possible but just too complex to understand.*
- *Provocation #8: Consumers are more engaged than we think when given meaningful choices.*
- *Provocation #9: Consumers are not as engaged as they say and any business model based on deep engagement is bound to fail.*

4.0 Decision theatre results.

Stage 1 was designed to facilitate discussion whereby further provocations identified by the attendees in stage 1 of the decision theatre "discussion" were:

- *Provocation #10: Energy has no value in the future, we need to price what is valuable, which is capacity power.*
- *Provocation #11: Vertical integration of any form will not exist in the future.*
- *Provocation #12: Customers need to be exposed to [time of use price] risk for more innovative business models to work.*
- *Provocation #13: The system is not transparent enough to know who is contracted for what.*
- *Provocation #14: Consumers will always value price stability above all else.*
- *Provocation #15: It might be true that a private market is just not the right tool to deliver complex system goals.*

This discussion phase of the decision theatre is designed to allow participants to adopt a 'system' mind-set and pay attention to long term trends rather than the current moment of energy policy.

The following four stages, 2-5 comprised the active stage of the decision theatre.

Stage 2 asked participants to take account of the data presented and the provocations made, and adopt the role of a powerful 'system architect' to 'play god' and decide what changes they would make to the system so that new financial opportunities could be exploited and low carbon energy futures be delivered. Participants were asked to 'think big' to 'not be constrained by the current system' and to individually prepare 3 specific changes needed in one to three sentence explanations recorded on A5 report cards.

The changes proposed by individuals are presented below in no particular order with a short explanatory summary. It must be remembered that the individuals are not giving balanced recommendations, only answering what would be necessary to allow the value pools presented above to be captured. The change proposals were:

- Reverse unbundling: Allow network companies to extend operations into other areas of the market, particularly for storage services. This would require changes to market boundary rules.
- Mandated energy efficiency: The specific recommendation was to prevent the building or renting of any property below EPC B unless historically significant. Participants also discussed the option to make energy efficiency retrofit mandatory.
- Mandated storage in buildings with no user control: This is the combination of two proposals 1) for all properties to have electricity storage installed and controlled by suppliers with no user control, and 2) to regulate for the addition of batteries to the system.
- Market Transparency: The need for removal of information barriers across the system to make clear who is using what, where, and when and who is contracted for what where and when. This aimed to ensure participants were not gaming they system and risking contracting similar services with two or more parties and banking on only one being called. Also for better information for investment planning and system operation.
- Take ideology out of energy planning: A call for system efficiency to be prioritised above matching institutions to political ideologies.
- Ensure regulatory innovation for new products and services (long term): A call for system regulation to be flexible in the retail market in order to provide innovative business models to customers that provide them with value, not on £/kWh basis but on a £/service basis. Also to allow bundling of multi utility payments in single contract i.e. heat, telecoms, electricity. It was unclear as to whether the proposer also intended a de-regulation stance.
- Proper energy system strategy for EV integration: This was the combination of two proposed changes. 1) To develop a framework for EV Charging which defined, rights to charge, the capacity needed per charger, how transferrable billing works, and a mechanism to define infrastructure needs. 2) Regulate the charge cycle of each vehicle.
- Accept the decentralisation and build a compatible market: This proposal comprises a move away from the existing market model of vertical integration which promotes monopoly and a move towards integration at a local level with decentralised markets.
- Decide upon free market or central planning: The current model is a mix of central planning *of* free markets the change recommendation was to have one of either: removal of all central intervention or full central planning.
- Ring fence green energy finance: The long term specification of what budgets green energy will be allocated.
- Put subsidy on general taxation not bills: The current subsidy funding mechanism was thought to be regressive and placing it on general taxation more progressive.
- Eliminate the capacity market: Specifically stop subsidising coal and diesel generation through the capacity market and/or take eliminate entirely.
- A national strategy for the electrification of heat: A proposal to clearly plan how much heat should be electrified, where, and by when.
- Ban fossil fuels in heat and transport: A national regulation to ban new gas boilers to move to heat pumps in new builds, ban fossil fuel combustion in road transport, and mandate <50g/kWh grid intensity of electricity.
- Price out carbon: The combination of three individual proposals for a societal carbon tax, priced at the 'real cost' of carbon, implemented post Brexit, compatible with 2050 targets.

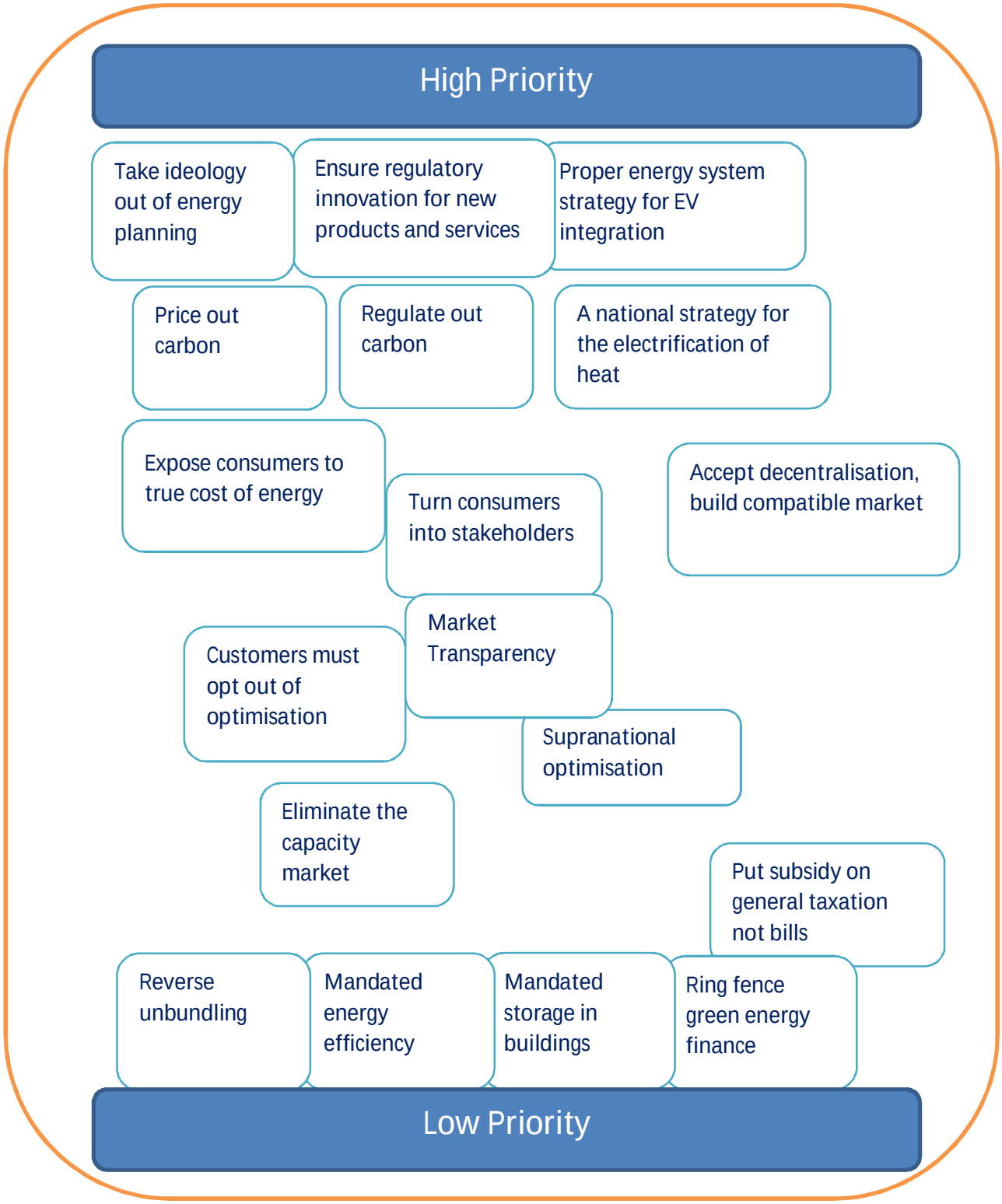
- Regulate out carbon: The combination of two individual proposals: 1) a total ban on carbon emissions from electricity generation by 2040. 2) A policy that makes CCS commercially viable via support at the first stage.
- Expose consumers to true cost of energy: Customers must be exposed to the true cost of energy for business model innovations around flexibility to be meaningful. This includes cost reflective pricing across peaks and troughs in wholesale prices.
- Taking customers out of the flexibility equation by regulating opt out as opposed to opt in participation: This means auto optimisation for new appliances, vehicles and 'taking the customer out of the process.
- Turn consumers into stakeholders: A combination of two change proposals 1) Consumers need to be turned into stakeholders to drive behaviour change, 2) UK Needs its own 'Enegiwende' [Germany's citizen driven energy turnaround] to drive through innovation and change.
- Supranational optimisation: Integration of Energy Supergrid, union of markets/interconnectors.

Stage 3 asked participants to work together with the change proposals listed above. Participants were asked to order the change proposal by priority, still remaining within the mind-set of what would be ideal from their perspective if they were 'in charge' of the system and wanted to access the value pools identified. This was a timed exercise and the group was given guidance by facilitators where necessary, but otherwise given freedom in how to order change proposals by priority. Importantly the group was asked to seek 'consent not consensus' i.e. not all participants needed to agree, but had to reach a prioritisation of proposals within the timed session, with which they could agree to move forward with. The prioritisation consented to is shown in figure 7.

Stage 3 observations:

- The high priority proposal for removing ideology from energy planning was combined with the proposal to decide upon free markets or central planning. This reflected a strong view that the two were almost identical. The 'accept decentralisation and build compatible market' proposal was also combined with the ideological removal proposal.
- The lowest priority changes were those that were left unaddressed by the participants or those that were deemed to be under consideration and therefore not a priority for change. For example mandated efficiency and storage, along with reversal of unbundling were not discussed while the ring fencing of green energy finance was thought to be analogous to the existing levy control framework.
- Those change proposals in the middle of the priority ranking were thought to be important but either enabled by those higher in the ranking or those that needed to be preceded by those higher up the ranking. I.e. ensuring regulatory innovation was thought necessary as a pre-cursor to exposing consumers to peak pricing through time of use tariffs. Similarly, national strategies for the electrification of heat and transport were thought to be necessary precursors to further 'market transparency' in ancillary and balancing services which would inevitable include heat and EV charge flexibility aggregation.

Figure 7: Prioritisation of stage 3 change proposals.

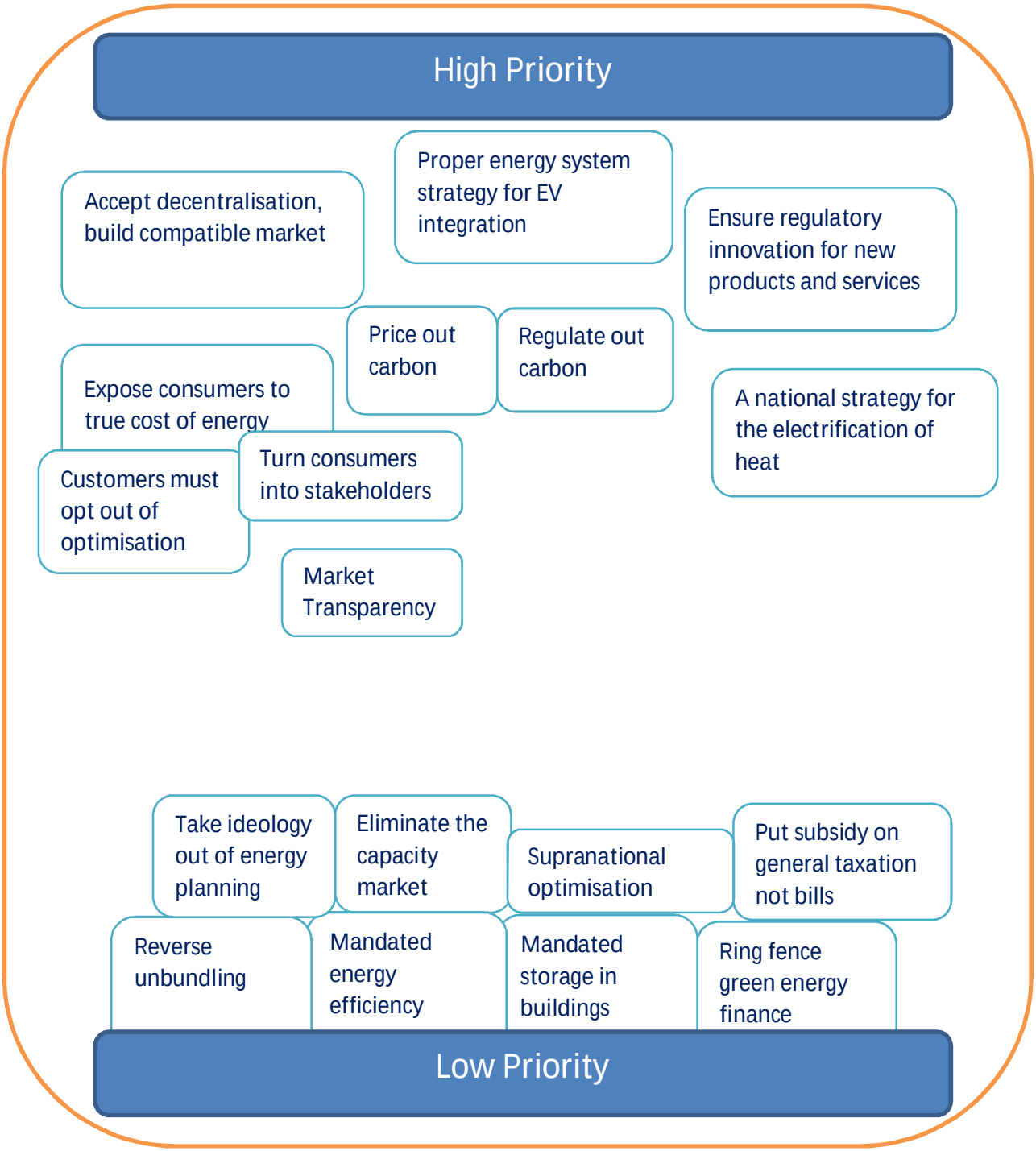


Stage 4 took the prioritised list of 'system architect' changes and asked the present utility stakeholders to consider the other communities involved in delivering the UK energy transition, namely policymakers and regulators, investors, and consumers. This exercise aimed to take a list of actions entirely aimed at allowing utilities to access new financial value pools and reflect them against the known constraints of markets, consumers, energy politics, and the goals of system regulation. This was also a timed 'consent not consensus' exercise. The agreed re-prioritisation led to a rationalisation of change proposals, a clearer division between consumer, regulatory, and strategic concerns and a removal of the 'middle ground' which participants felt would present a clearer set of priorities.

The decision theatre participants changed the order and wording of the change priorities in the following ways:

- The 'accept decentralisation and build compatible market' proposal was taken out of the 'take ideology out of energy planning' proposal because on reflection participants felt this was more of a market institutional issue than a purely ideological bias. This was achieved after some discussion but enjoyed broad consent. The remaining ideological bias proposals subsequently dropped in priority, due to them being 'unrealistic' and following a discussion about politics being inextricably linked to energy systems.
- Throughout the exercise participants were mindful of the persistently high value pool offered by electric vehicle charging and services. There was substantial agreement on the statement that "EV's change the whole game" given the size and robustness of the value pool across all climate compatible scenarios. This led to the proposal for a proper strategy for EV charge integration to be the top priority change from the present utilities decision theatre.
- The participants decided to cluster three proposals they felt were related to consumer protection and engagement. These were the 'expose consumers to the true cost of energy', 'turn consumers into stakeholders' and 'consumers must opt out of optimisation' proposals. Each of these was deemed necessary to enrol consumers in the realisation of 'system critical' services such as enabling flexibility and increased awareness of system constraints.
- The 'ensure regulatory innovation for new products and services' and 'accept decentralisation and build compatible market' proposals were both retained as high priorities and were thought to be "challenging but possible" to achieve with the buy in of other system stakeholders.
- Supra-national optimisation and capacity market elimination were reduced to low priorities for the following reasons. Supra-national optimisation, i.e. increasing southern European solar integration with northern European wind generation was thought to be a) something the market would achieve given compatible transboundary trading agreements (subsequently prompting a Brexit deal discussion) and b) it was unlikely that in response the construction of solar in the north or wind in the south would stop in deference to transboundary suitability. For the 'eliminate capacity market' proposal the higher priority of 'accept decentralisation and build compatible market' was thought to hardwire the need for some form of future capacity payment for transmission connected flexible plant and therefore the participants decided to reduce the elimination of the capacity market to a low priority.

Figure 8: Re-prioritisation of change proposals taking account of all system stakeholders.



Stage 5 took the re-prioritised list and finalised the decision process by taking the six highest priority change proposals and re-writing these as concrete actions that could be undertaken by different system stakeholders. This final stage was introduced by facilitators by explaining that these were the changes that the research team would take to future decision theatres with other system stakeholders in the Utility 2050 project, namely the policy and regulatory community and national and international investors. The following change decisions were finalised as:

"WE NEED AN ELECTRIC VEHICLE STRATEGY THAT RECOGNISES WHOLE SYSTEM COST AND OPPORTUNITY"

Utility 2050 Present Utility Decision Theatre UK, 2016

This change proposal specifically responds to the high priority present utilities, network operators, and new market entrants are placing on understanding how charge cycles, flexibility remuneration, and curtailment compensation can be agreed upon at a national level. This was thought to enable commercial innovation on tariffs and services by reducing much of the uncertainty about how vehicle charging can be integrated into the current market and wider physical system.

"WE NEED A SIMPLER INSTITUTIONAL FRAMEWORK TO SUPPORT THE ENERGY TRANSITION"

Utility 2050 Present Utility Decision Theatre UK, 2016

This change proposal encompasses each of the high priority areas and builds on deep discussion during stage five that whilst the 'market transparency' change proposal remained outside the highest priority areas, the institutional transparency was equally problematic. Many of the changes proposed would incorporate several government departments, regulatory bodies and commercial entities and there was thought to be no clear lines of responsibility or process that could deal with such systemic issues.

"THE REGULATORY FRAMEWORK NEEDS TO ADAPT SO THAT NEW PRODUCTS AND SERVICES CAN EMERGE"

Utility 2050 Present Utility Decision Theatre UK, 2016

Many of the value pools quantified in the Utility 2050 results require retail side model innovation to capture. There was broad consensus that the current regulatory framework and licensing conditions do not allow market experimentation on consumer aggregation, bundled services, longer term contracting, or non-energy payments and cost reflective pricing. In order to allow market actors i.e. present and future utilities to access new value pools from flexibility, decentralised generation, platform services and efficiency services.

"NEW MARKETS NEED TO DEVELOP TO ALLOW CUSTOMERS TO BENEFIT FROM FLEXIBILITY, WHILE MAINTAINING AN ACCEPTABLE SOCIAL CONTRACT "

Utility 2050 Present Utility Decision Theatre UK, 2016

The Utility 2050 data shows substantial opportunity available from flexibility and platform service value pools. The myriad issues around exposing consumers to price peaks using new functionality of smart metering may expose consumers to unacceptable and unexpected bills. Some exposure was thought necessary to allow business models to develop which manage that exposure and enable broader system functionality in a more intermittent future with uncertain levels of storage and demand response. However, price exposure must be enrolled into acceptable and legitimate social contracts between consumers and suppliers.

"THERE MUST BE LONG TERM CERTAINTY ABOUT UK CARBON PRICING THAT IS COMPATIBLE WITH THE PARIS AGREEMENT"

Utility 2050 Present Utility Decision Theatre UK, 2016

The ability of the UK energy market to reduce direct subsidy and allow low-carbon generation to become a positive investment is dependent on carbon pricing. Even with the substantial values in other parts of the system fully exploited there is no substitute for carbon pricing to render renewable energy and carbon capture and storage being an attractive investment. Without certainty over the long term carbon price in the UK these technologies will continue to depend on variable direct subsidy. This clear and climate compatible carbon pricing is necessary under all scenarios tested.

"WE NEED A NATIONAL STRATEGY FOR THE ELECTRIFICATION OF HEAT"

Utility 2050 Present Utility Decision Theatre UK, 2016

The value pool modelling for the Utility 2050 project did not include the electrification of heat. However participants prioritised a heat strategy around a similar narrative as an electric vehicle strategy. It is a new revenue pool (albeit moving revenues from gas sales) that is derived from the electrification of a service that is currently fossil fuel dependent. Where heat electrification is best targeted, how much electrification is preferred, and how flexibility can be built in to heat electrification at the outset, were all thought to be high priorities that could be dealt with by a national strategic exercise.

5.0 Summary and next steps

This is an empirical report and as such does not conduct analysis or draw conclusions.

Section 1 of this report introduced the decision theatre framing and the Utility 2050 project. Section 2 presented the data produced for decision theatre participants. Section 3 summarised the decision theatre method. Section 4 detailed the results of the five stage decision theatre process and the distillation of the six most important changes needed to enable utilities to access new markets in the energy transition.

The next step for the utility 2050 project is to undertake two further decision theatres for policy and regulatory actors and for Investors and produce similar empirical reports for each before undertaking analytical synthesis. The aim of the subsequent synthesis will be to produce a set of priorities around which UK electricity system stakeholders can find common ground advancing the low carbon agenda. It will do this by placing the values at stake in the context of other policy problems faced by different stakeholders to demonstrate the conflicting priorities and trade-offs that need to be reconciled for the low carbon energy transitions to develop new markets whilst seeking to manage the energy trilemma.

Appendix A: Consent to take part in Utility 2050 research [example for reporting purposes only]

UNIVERSITY OF LEEDS

	Add your initials next to the statements you agree with
I confirm that I have read and understand the information sheet/ letter dated 16th May 2017 explaining the above research project and I have had the opportunity to ask questions about the project.	
I agree for the data collected from me to be stored and used in relevant future research in an anonymised form.	
I understand that relevant sections of the data collected during the study, may be looked at by auditors from the University of Leeds or from regulatory authorities where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records.	
I agree to take part in the above research project and will inform the lead researcher should my contact details change during the project and, if necessary, afterwards.	

Name of participant	
Participant's signature	
Date	
Name of lead researcher	
Signature	
Date*	

*To be signed and dated in the presence of the participant.