



UKERC Technology and Policy Assessment

2017 future topics consultation – final report

Robert Gross
Philip Heptonstall
Richard Hanna

June 2017

Preface

The UK Energy Research Centre

The UK Energy Research Centre (UKERC) carries out world-class, interdisciplinary research into sustainable future energy systems. It is a focal point of UK energy research and a gateway between the UK and the international energy research communities. Our whole systems research informs UK policy development and research strategy.

UKERC is funded by The Research Councils Energy Programme.

For more information, visit <http://www.ukerc.ac.uk/>

The Technology and Policy Assessment (TPA) Theme of UKERC

The Technology and Policy Assessment (TPA) was set up to inform decision-making processes and address key controversies in the energy field. It aims to provide authoritative and accessible reports that set very high standards for rigour and transparency. Subjects are chosen after extensive consultation with energy sector stakeholders and with the UKERC Research Committee.

The TPA has been part of UKERC since the centre was established in 2004 and is now in its third phase, which started in 2014. The primary objective of the TPA is to provide a thorough review of the current state of knowledge through systematic reviews of literature, supplemented by primary research and wider stakeholder engagement where required.

CONTENTS

1	SUMMARY	4
1.1	Overview	4
1.2	Main findings from the consultation	4
1.3	Conclusions and decision on which topics to take forward	6
2	TPA TOPICS CONSULTATION: IN DETAIL	8
2.1	Background	8
2.2	Workshop structure and agenda	8
2.3	Academic research and evidence-based policy making	9
2.4	Topics identified as priorities in the workshop	12
2.5	Summary of bilateral consultation outcomes	15
2.6	Conclusions from the workshop and bilateral discussions	17
	ANNEX 1. CONSULTATION PROCESS STAGES	24
	ANNEX 2. PROSPECTIVE TOPICS	25
	ANNEX 3. TPA TOPIC SELECTION CRITERIA	30
	ANNEX 4. CONSULTEES	31

1 Summary

1.1 Overview

This document records consultation activities undertaken by the UKERC TPA Research Theme during 2017. The primary aim of the consultation is to identify the priority topics for the TPA theme to research in the remainder of UKERC Phase 3 (i.e. until Spring 2019). The following steps have been undertaken:

1. The TPA team produced a ‘long list’ of prospective topics for comment from the UKERC Co-Directors, Research Committee and Advisory Board.
2. A revised long list of topics (see Annex 2) was agreed by the TPA Co-Director and the UKERC Director, following input from the other UKERC Co-Directors, the Research Committee and the Advisory Board.
3. A wide range of stakeholders were invited to a consultation workshop to discuss the list of prospective topics, any other topics suggested by consultation attendees, and the wider role of TPA style reviews.
4. The TPA team followed up bilaterally with any key stakeholders who are not able to attend the consultation event but indicated that they were willing to be consulted.
5. The topic priorities which emerged from the consultation event and bilateral follow-ups were documented and circulated to consultees and the UKERC Co-Directors, the Research Committee and the Advisory Board.
6. The TPA Co-Director and the UKERC Director sought advice from the UKERC Co-Directors, the Research Committee and the Advisory Board, and then decided which projects would be taken forward.

The first three stages of this process were completed by early April 2017, with the bilateral follow-ups completed in late April, May and early June. The TPA Co-Director and the UKERC Director met in late June to review the findings from the consultation and decide on which projects to take forward. This document is the final output from the consultation process. More detail is provided in Section 2 and the Annexes.

1.2 Main findings from the consultation

Consultees were asked to select/suggest their top three topics paying regard to the TPA selection criteria (see Annex 3). Workshop participants identified two topic areas over which there was unanimity across all breakout groups:

- Participants chose to select a ‘family’ of topics relating to energy efficiency and demand management – **Household energy efficiency – what next after the Green Deal?** (Topic 2.1), **A review of policy interventions to promote energy efficiency (EE) in non-energy intensive commercial sectors** (Topic 2.2), and **How strong is the**

evidence base on which the potential role of active demand side participation by domestic consumers is based? (Topic 2.4).

- **How realistic, and how uncertain, are the assumptions made about technology roll out in decarbonisation scenarios? (Topic 3.2) and the linked new topic of Will the electric vehicle roll-out progress as rapidly as some predict, and what drives the wide variations in scenario outcomes for this technology? (No topic number).**

A third topic was top-3 in two breakout groups and noted as a close runner up by the third:

- **How do methods used to assess the impact of government policy on consumer bills differ and to what extent can this explain what makes the role of government/utilities/market in energy prices so controversial? (Topic 4.4).**

Several other topics were identified as top-3 by at least one of the breakout groups:

- **What is the evidence on the effectiveness of UK low carbon/energy innovation policy? (Topic 3.1).**
- **How long do energy policies last after take-up before cancellation and/or major change, and how does this compare to how long new policy development takes? (No topic number).**
- **How significantly do recent decarbonisation scenarios rely upon net carbon negative technologies such as Bio-energy to CCS (BECCS)? And how well understood are the technical, social, land use, water, ecosystem and other constraints on BECCS? (Topic 4.5).**
- **Energy storage costs and economics – is the paradigm changing? (Topic 1.2).**
- **Market design – can wholesale electricity markets deliver investment in low-carbon generation? (Topic 1.3).**

There was less consensus across those participants interviewed bilaterally. However, four topics were rated top-3 or each received strong support from three to five consultees:

- **Energy storage costs and economics – is the paradigm changing? (Topic 1.2).**
- **Market design – can wholesale electricity markets deliver investment in low-carbon generation? (Topic 1.3).** Particular areas of interest included asking what is meant by subsidy-free renewables and the extent to which the drive for economies of unit scale in power generation has reached a plateau (and what that means for markets).
- **A review of policy interventions to promote energy efficiency (EE) in non-energy intensive commercial sectors (Topic 2.2),**
- **How strong is the evidence base on which the potential role of active demand side participation by domestic consumers is based? (Topic 2.4).**

Four further topics also received strong support from several consultees but with either more equivocation from others or less ‘top-3’ support:

- **How do methods used to assess the impact of government policy on consumer bills differ and to what extent can this explain what makes the role of government/utilities/market in energy prices so controversial?** (Topic 4.4).
- **What is the evidence on the effectiveness of UK low carbon/energy innovation policy?** (Topic 3.1).
- **How realistic, and how uncertain, are the assumptions made about technology roll out in decarbonisation scenarios?** (Topic 3.2). As in the workshop, there were suggestions that this could include/focus on electric vehicle roll-out.
- **How significantly do recent decarbonisation scenarios rely upon net carbon negative technologies such as Bio-energy to CCS (BECCS)? And how well understood are the technical, social, land use, water, ecosystem and other constraints on BECCS?** (Topic number 4.5).

1.3 Conclusions and decision on which topics to take forward

A group of topics received strong support in both the workshop and bilateral interviews. The top six topics that emerged were:

1. A family of energy efficiency and demand response related topics (see Section 2.4 for details).
2. A topic on technology roll-out rates in scenarios, possibly focused upon electric vehicle roll-out.
3. The impact of policies on consumer bills.
4. The use of and constraints on BECCS in scenarios.
5. The economics of electricity storage.
6. Wholesale market design issues.

More limited support was expressed for topics related to UK innovation policy and how long policies last. Very little or no support was expressed for the TPA to investigate the Rebound Effect, Split Incentives, oil and gas prices, embodied energy or Brexit.

The TPA team therefore assessed the top six topics against the TPA criteria in Annex 3 to inform the discussion between the TPA Co-Director and the UKERC Director as to which topics should be taken forward. The results of that assessment are shown in Section 2.6. Following discussion, the TPA Co-Director and the UKERC Director decided that the TPA team should address the following three topics (in this order):

- The impact of policies on consumer bills. It is envisaged that this will be a Rapid Evidence Assessment using a case study approach.

- A topic on technology roll-out rates in scenarios, with a focus on electric vehicle roll-out. It is envisaged that this will be a full Systematic Review.
- A topic drawn from the family of energy efficiency and demand response related topics. It is envisaged that this will be a full Systematic Review, likely to be taken forward in collaboration with other UKERC theme(s). The topic that scored most highly against TPA criteria is the one that addresses energy efficiency policy in the non-domestic and non-energy intensive sectors. However there may also be scope for the TPA to produce a short review of the evidence on demand response, drawing on outputs that the TPA team and colleagues have recently produced for BEIS and the HubNet consortium.

Of the three remaining topics from the top 6, the view of the TPA Co-Director and the UKERC Director was that the BECCS and electricity storage topics have significant overlap with other projects either within, and/or external to, UKERC, and that the evidence base for the wholesale market design topic does not lend itself to the TPA approach.

2 TPA topics consultation: In detail

2.1 Background

The TPA team has consulted extensively over prospective review topics since it was first established in 2004, and the TPA Director and team have experimented with a variety of approaches to such consultation. In UKERC Phase 3, an initial round of consultations were held in 2015.

In 2017 the TPA team went through a new consultation over future projects. The process used for the 2017 consultation, which was clarified and revised following comments from the UKERC Funders Group and Research, Advisory and Directors Committees, is described in detail in Annex 1. A single consultation workshop was held at Imperial College on 20th April 2017 to discuss a list of prospective topics (and any other topics suggested by consultation attendees). In addition, the TPA team also followed up bilaterally with key stakeholders who were not able to attend. The primary aim of the consultation process was to identify the priority topics for the TPA team in the remainder of phase 3 of UKERC (i.e. until Spring 2019). Consultees were identified in consultation with UKERC Co-Directors, Research Committee and Advisory Group. Over 100 individuals from a wide range of organisations were invited to participate. Around 30 individuals took part in the consultations.

The following sections summarises the output from the discussions that took place during the workshop and in the bilateral discussions, and the TPA team's assessment of the priorities which emerged from the consultation. Section 2.2 shows the workshop agenda and describes how the activities were structured. Section 2.3 provides a summary of the discussions on the role of academic research in evidence-based policy making. Section 2.4 shows the topics identified as priorities by the workshop attendees. Section 2.5 reflects on the outcome from the bilateral discussions that followed the workshop. Section 2.6 concludes with an assessment against the TPA selection criteria of the priority topics which emerged from the consultation.

2.2 Workshop structure and agenda

The workshop agenda is summarised below:

1. Introduction to UKERC
2. Introduction to TPA approach and projects, and the role of academic research in evidence-based policy making
3. Breakout discussions on the role of academic research in evidence-based policy making
4. Report back from breakout discussions

5. Introduction to potential TPA topics
6. Breakout discussions on potential TPA topics
7. Report back from breakout groups and plenary discussion
8. Wrap-up and Conclusions

As the agenda shows, the workshop was split into two main sessions, with the first session focussed on introducing UKERC and the Technology and Policy assessment function, and discussing the role of academic research in evidence-based policy making and how the work of the TPA can most effectively contribute to policy analysis and debate. For this session, attendees were split into two breakout groups and each group was asked to consider a range of questions relating to how decision makers construct, commission and use information and evidence, and what this means for the role of TPA reviews in the context of a wider programme of research at UKERC. Feedback from each breakout group was then reported back and summarised in plenary session. The questions and associated feedback are described in Section 2.3 below.

The second session of the workshop was focussed on discussing prospective topics for future TPA reviews. For this session, attendees were split into three breakout groups and each group was asked to identify their top three topics. Feedback from each breakout group was then reported back and summarised in plenary session, and is described in Section 2.4 below.

2.3 Academic research and evidence-based policy making

The purpose of the session was to help TPA staff think about the role and value of TPA reviews and mix of rapid and full reviews. Workshop attendees were asked to consider the questions posed below and discuss which appear most important or relevant. Feedback from each breakout group is then presented separately in Boxes 1 and 2, followed by a summary of key reflections from the plenary discussion.

- How do decision makers construct, commission and use information and evidence?
- What are the principal sources of evidence used in policy formation or advice?
- What is the most common delivery timescale for commissioned consultancy/research in support of your work?
- Do policymakers actively pursue evidence based policy and practice?
- How do you engage with academia and with academic research outputs?
- What is wrong with academic research/engagement/output from a policymaker or other user perspective?
- What does this mean for the role of TPA reviews in the context of a wider programme of research at UKERC?
- What should UKERC/TPA try to achieve with respect to timelines for report production/breadth/depth?

Box 1: Group 1 feedback summary

- There are gaps in government engagement with evidence e.g. green deal.
- There is a degree of ‘incumbency’ in the types of actors that tend to provide evidence to policy makers. Dominant thinking and approaches may prevent evidence-based studies from challenging ingoing assumptions effectively.
- Policy makers often want a particular answer, and an evidence review may not provide it.
- To maximise the reach of evidence conclusions, outputs are required in a range of formats and length
- Evidence reviews may not provide the policy prescription. This can be partially addressed through ‘what works’ questions but scope for this is limited.
- There is an ongoing problem of interesting questions that do not have sufficient evidence bases e.g. what to do with domestic heat options? Quick scoping reviews might help with this if they can identify whether/what evidence is available rather than engaging in a Rapid Evidence Assessment over 6 months that might provide inadequate policy answers.
- What is the best approach to accessing the demonstration experience that does exist but may not be easy for academia to find or include? Maybe partnership or accessing through UKERC network.
- Political timescales are in some respects very slow. There may be long periods of time available to meet particular policy needs so there are longer term evidence needs in policy-relevant research. Some things can be anticipated relatively far ahead e.g. IPCC 1.5 degree report next year. Therefore, there are opportunities to answer questions with longer studies that may address big, longer-term issues and those that tackle the evidence base for the type of paradigm shifts required in the energy field. The TPA should undertake such projects.
- There are still opportunities to do smaller, more rapid projects but it is difficult to meet short-term policy decision timeframes.

Box 2: Group 2 feedback summary

- TPA research by its nature is difficult to be novel and this raises questions as to the point in the policy development process when evidence reviews can be most useful e.g. are they helping to set, shape or influence a policy debate?
- There is a continuing question (and tension) as to whether evidence reviews should respond to immediate policy demands or have a more forward-looking/horizon scanning role.
- Whilst there is a challenge for full-scale TPA systematic reviews to feed directly into the short-term policy process. There is also an opportunity for TPA to

embrace a more horizon scanning role and select longer projects that can help shape policy thinking, as well as do rapid projects to fill short term gaps.

- There was some consensus about the importance of driving debate rather than being reactive.
- It is difficult for evidence reviews to have policy impact if the topic is already politicised, and there have been some instances where policy has been developed with no/weak evidence.
- Some form of scoping review may provide useful insight and identify evidence gaps in those areas where there is very thin and/or non-peer reviewed analysis or experience.
- Access to results from industrial research may be very useful but difficult to find and unlikely to be peer-reviewed in the same way as academic evidence. How can non-peer reviewed research be best included and treated e.g. with the IPCC approach to assigning risk levels to different qualities of evidence?
- Evidence can feed into policy through e.g. expert panels, consultation responses, and commissioned analyses, as well as anticipatory evidence review publications.
- Overall, there is no single 'right' approach. What is needed is a portfolio of approaches to evidence gathering to meet different policy needs.

Reflections from the plenary discussion

A key challenge for the TPA team is to anticipate if possible future policy needs. Whilst the very short timescales for some policy decisions may rule out a rigorous evidence review approach, there is clearly a view that some aspects of policy formulation take place over much longer periods and that these areas do lend themselves to the TPA approach. They may also allow a role which is more focused on shaping forward agendas rather than following short-term policy needs. Since the TPA work is funded by the research councils, this gives the TPA a degree of independence in choosing both topics and the approach to evidence reviews.

It was also suggested that there may be value in conducting quick scoping reviews where evidence is known to be (or suspected to be) lacking. This would give the TPA another potentially very useful approach. Whilst there clearly are trade-offs between full systematic reviews and more rapid approaches, methodological rigour can still be maximised provided questions are sufficiently constrained and that the approach to limiting evidence volumes is clearly understood. An approach to assigning relevancy and robustness indicators to evidence, such as that adopted in parts of Defra may assist with this but it is still the case that tailoring research questions sufficiently narrowly for Rapid Evidence Assessments is a challenge in any policy sphere.

2.4 Topics identified as priorities in the workshop

The list of prospective topics created by the TPA team and the TPA topic selection criteria (see Annexes 2 and 3) were first described to workshop attendees. Attendees were asked to discuss these topics in their breakout groups, together with any additional topics that each group might generate. Each breakout group was asked to identify their top three topics in priority order. Each group was provided with a pro-forma to record their deliberations over the top three, which included space to make notes against the TPA selection criteria.

Breakout groups were also invited to feedback any ‘runners up’ – where they identified topics that of significant interest but not in their top three. The feedback from each breakout group is presented separately in Boxes 3, 4 and 5 below, followed by a reflection on the priorities identified across the three breakout groups.

Box 3: Group 1 priority topics

Top 3:

1. **How strong is the evidence base on which the potential role of active demand side participation by domestic consumers is based?** (Topic 2.4). This was felt to meet most of the TPA criteria in that it reflects the concerns of users, is relevant to current debates, there are some areas of conflicting/confusing evidence, the question could be made sufficiently concise, and that there is an evidence base available (especially if the qualitative evidence is also reviewed, and perhaps with a focus on automation).
2. **What is the evidence on the effectiveness of UK low carbon/energy innovation policy?** (Topic 3.1). It was felt that this may require rephrasing to reflect the difficulty in measuring the impact of innovation but that it could then help to address the concerns of users and be relevant to current debates, and that there are some areas of controversy over the most appropriate types of innovation funding. The question would need careful framing to allow it to be addressed by a TPA review and synthesis.
3. **Will the electric vehicle roll-out progress as rapidly as some predict, and what drives the wide variations in scenario outcomes for this technology?** (No topic number as this was a new question generated in the breakout group). This may reflect the concerns of users if correctly framed (which would also be needed to ensure the question is sufficiently concise), and that it would be relevant to current policy debates. There are clear areas of differences in both assumptions and results although to properly understand them may require access to the models used for analyses. This could be also be linked to topic 3.2 (How realistic, and how uncertain, are the assumptions made about technology roll out in decarbonisation scenarios?).

Outside top 3 but still of significant interest:

How do methods used to assess the impact of government policy on consumer bills differ and to what extent can this explain what makes the role of government/utilities/market in energy prices so controversial? (Topic 4.4).

Market design – can wholesale electricity markets deliver investment in low-carbon generation? (Topic 1.3) Possibly involving a review of market structures?

How realistic, and how uncertain, are the assumptions made about technology roll out in decarbonisation scenarios? (Topic 3.2) Perhaps appropriate for a scoping review?

Box 4: Group 2 priority topics

Top 3:

- 1. How do methods used to assess the impact of government policy on consumer bills differ and to what extent can this explain what makes the role of government/utilities/market in energy prices so controversial? (Topic 4.4).** This was felt to be a key policy issue that reflects the concerns of users, is very relevant to current policy debates, and where there are substantial areas of controversy.
- 2. How realistic, and how uncertain, are the assumptions made about technology roll out in decarbonisation scenarios? (Topic 3.2).** This was considered to meet the topic selection criteria of reflecting the concerns of users, being particularly relevant to the use of scenarios to inform policy, and representing a relatively concise question. This would have to be balanced against a desire to cover the widest possible range of technology areas including supply, demand and transport and reflect the substantial evidence base, and review existing constraints in models.
- 3. Demand side response and energy efficiency in domestic and non-energy intensive commercial sectors.** (No topic number as this was an umbrella topic generated in the breakout group with overlaps to topics on the initial list). These are: **Household energy efficiency – what next after the Green Deal?** (Topic number 2.1), **A review of policy interventions to promote energy efficiency (EE) in non-energy intensive commercial sectors** (Topic number 2.2), and **How strong is the evidence base on which the potential role of active demand side participation by domestic consumers is based?** (Topic 2.4). This generalised topic would require a question to be framed so that it was sufficiently concise.

Outside top 3 but still of significant interest:

How significantly do recent decarbonisation scenarios rely upon net carbon negative technologies such as Bio-energy to CCS (BECCS)? And how well understood are the

technical, social, land use, water, ecosystem and other constraints on BECCS? (Topic number 4.5).

Energy storage costs and economics – is the paradigm changing? (Topic number 1.2).

Box 5: Group 3 priority topics

Top 3:

1. **How realistic, and how uncertain, are the assumptions made about technology roll out in decarbonisation scenarios?** (Topic 3.2).
2. **Household energy efficiency – what next after the Green Deal?** (Topic number 2.1) and **How strong is the evidence base on which the potential role of active demand side participation by domestic consumers is based?** (Topic 2.4). This reflects what was felt to be a significant overlap between these topics and the potential to frame a question which addresses both.
3. **How long do energy policies last after take-up before cancellation and/or major change, and how does this compare to how long new policy development takes?** (No topic number as this was a new question generated in the breakout group).

Outside top 3 but still of significant interest:

How do methods used to assess the impact of government policy on consumer bills differ and to what extent can this explain what makes the role of government/utilities/market in energy prices so controversial? (Topic 4.4)

How significantly do recent decarbonisation scenarios rely upon net carbon negative technologies such as Bio-energy to CCS (BECCS)? And how well understood are the technical, social, land use, water, ecosystem and other constraints on BECCS? (Topic number 4.5).

Reflections on the priorities identified

Two topic areas were placed in the top 3 by all breakout groups. These topics were:

- The ‘family’ of topics relating to energy efficiency and demand management – **Household energy efficiency – what next after the Green Deal?** (Topic number 2.1), **A review of policy interventions to promote energy efficiency (EE) in non-energy intensive commercial sectors** (Topic number 2.2), and **How strong is the evidence base on which the potential role of active demand side participation by domestic consumers is based?** (Topic 2.4).

- **How realistic, and how uncertain, are the assumptions made about technology roll out in decarbonisation scenarios?** (Topic 3.2) and the linked new topic of **Will the electric vehicle roll-out progress as rapidly as some predict, and what drives the wide variations in scenario outcomes for this technology?** (No topic number).

A third topic was top 3 in two breakout groups and noted as a close runner up by the third:

- **How do methods used to assess the impact of government policy on consumer bills differ and to what extent can this explain what makes the role of government/utilities/market in energy prices so controversial?** (Topic 4.4). Note that the question was raised in plenary as to how much consumers are concerned about this. It was also suggested that there may be some connection between this topic and the Green Deal question (Topic 2.1).

Several other topics were identified as top 3 by at least one of the breakout groups:

- **What is the evidence on the effectiveness of UK low carbon/energy innovation policy?** (Topic 3.1).
- **How long do energy policies last after take-up before cancellation and/or major change, and how does this compare to how long new policy development takes?** (No topic number).
- **How significantly do recent decarbonisation scenarios rely upon net carbon negative technologies such as Bio-energy to CCS (BECCS)? And how well understood are the technical, social, land use, water, ecosystem and other constraints on BECCS?** (Topic number 4.5).
- **Energy storage costs and economics – is the paradigm changing?** (Topic number 1.2).
- **Market design – can wholesale electricity markets deliver investment in low-carbon generation?** (Topic 1.3).

2.5 Summary of bilateral consultation outcomes

A series of bilateral interviews were held after the workshop to canvass the views of stakeholders willing to provide input but unable to attend the workshop. These discussions were held in the period from late April to early June. The majority of the discussions were face-to-face with the remainder either by phone or email. This section summarises the topic priorities that emerged from the bilateral meetings, based on file notes taken by the TPA team during the meetings. Interviewees are listed in Annex 4, but opinions are anonymised and unattributed.

Of those individual consultees that expressed an opinion on the role of academic research in evidence-based policy making and how the work of the TPA can most effectively contribute to policy analysis and debate, there was support for the view that responding to short-term policy needs was especially challenging and that it would be useful to have a clear view on what is reasonable to expect from a resource-constrained rapid evidence assessment. The view was expressed that there is definitely still a role for full systematic reviews where the TPA approach can add value. The need for clarity on what the TPA team assess in terms of policy was raised, in particular whether the focus is on reviewing existing policies or advocating new policies, and the need to have very clearly defined questions (which some of the topics as currently framed may not be).

The interviews did not reveal substantial consensus. The dynamic of an individual interview is obviously different from a workshop, where participants are asked to discuss and seek agreement with one another. A wide range of prospective topics had a least some degree of support from at least one of the consultees.

Four topics were rated top-3 or received strong support from several (three to five) consultees:

- **Energy storage costs and economics – is the paradigm changing?** (Topic number 1.2).
- **Market design – can wholesale electricity markets deliver investment in low-carbon generation?** (Topic 1.3). Particular areas of interest included asking what is meant by subsidy-free renewables and the extent to which the drive for economies of unit scale in power generation has reached a plateau (and what that means for markets).
- **A review of policy interventions to promote energy efficiency (EE) in non-energy intensive commercial sectors** (Topic number 2.2),
- **How strong is the evidence base on which the potential role of active demand side participation by domestic consumers is based?** (Topic 2.4).

Four further topics also received strong support from several consultees but with either more equivocation from others or less ‘top 3’ support:

- **How do methods used to assess the impact of government policy on consumer bills differ and to what extent can this explain what makes the role of government/utilities/market in energy prices so controversial?** (Topic 4.4).
- **What is the evidence on the effectiveness of UK low carbon/energy innovation policy?** (Topic 3.1).
- **How realistic, and how uncertain, are the assumptions made about technology roll out in decarbonisation scenarios?** (Topic 3.2). As in the workshop, there were suggestions that this could include/focus on electric vehicle roll-out.

- **How significantly do recent decarbonisation scenarios rely upon net carbon negative technologies such as Bio–energy to CCS (BECCS)? And how well understood are the technical, social, land use, water, ecosystem and other constraints on BECCS?** (Topic number 4.5).

The remaining topics either received no support at all or only modest support from one or two interviewees.

2.6 Conclusions from the workshop and bilateral discussions

A group of topics related to energy efficiency received strong support in both the workshop and bilateral meetings. However the broad family of topics identified at the workshop would need to be narrowed down to a single, manageable question that is amenable to the TPA approach. The bilateral consultations provided support for research on both commercial sector energy efficiency policy and demand side response. A topic on technology roll-out rates in scenarios, possibly focused upon electric vehicle roll-out, also received strong support.

Other topics with considerable support amongst stakeholders include the impact of policies on consumer bills, wholesale market design issues, the economics of electricity storage and BECCS.

Very little or no support was expressed for the TPA to investigate the Rebound Effect, Split Incentives, oil and gas prices, embodied energy or Brexit.

The top six topics that received strong support in both the workshop and bilateral interviews were therefore:

1. A family of energy efficiency and demand response related topics (see Table 1 below for details)
2. A topic on technology roll-out rates in scenarios, possibly focused upon electric vehicle roll-out
3. The impact of policies on consumer bills
4. The use of and constraints on BECCS in scenarios
5. The economics of electricity storage
6. Wholesale market design issues

The TPA team assessed these top six topics against the TPA criteria in Annex 3 to inform the discussion between the TPA Co-Director and the UKERC Director as to which topics should be taken forward. The results of that assessment are shown in Table 1 below.

Table 1: Assessment of priority topics against the TPA criteria

Topic and notes from workshop and bilateral meetings	Notes and assessment against TPA criteria
<p>1. Participants chose a ‘family’ of topics relating to energy efficiency and demand management – Household energy efficiency – what next after the Green Deal? (Topic 2.1), A review of policy interventions to promote energy efficiency (EE) in non-energy intensive commercial sectors (Topic 2.2), and How strong is the evidence base on which the potential role of active demand side participation by domestic consumers is based? (Topic 2.4).</p>	<p>A single topic would need to be chosen. Workshop participants did not give a clear steer as to which EE topic to take forward, but the bilateral discussions revealed particular support for a project related to commercial energy efficiency policy or demand side response.</p> <p><u>Does the question reflect the concerns of users?</u></p> <p>The workshop findings indicate that stakeholders think so. Policymakers noted that commercial energy efficiency has been neglected and is important.</p> <p><u>Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?</u></p> <p>Yes. There is a clear need for EE policy development in each area.</p> <p><u>Are there important areas of conflict or confusion that a TPA assessment could help overcome?</u></p> <p>Yes – for the DSR question in particular since the role of the demand side in managing variable generation varies between analyses.</p> <p><u>Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of the TPA?</u></p> <p>Yes – for the commercial EE question and the DSR question. Unclear for the Green Deal question.</p> <p><u>Is the question amenable to a synthesis assessment based on existing evidence? (For example, is the question sufficiently tightly</u></p>

	<p><u>defined? Is an adequate evidence base both available and accessible?)</u></p> <p>Yes – for the commercial EE question and the DSR question. Probably not for the Green Deal question.</p>
<p>2. How realistic, and how uncertain, are the assumptions made about technology roll out in decarbonisation scenarios? (Topic 3.2) and the linked new topic of Will the electric vehicle roll-out progress as rapidly as some predict, and what drives the wide variations in scenario outcomes for this technology?</p>	<p><u>Does the question reflect the concerns of users?</u></p> <p>Clearly of interest to several stakeholders. The topic received more support in the workshop than in the bilateral interviews.</p> <p><u>Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?</u></p> <p>The topic is not at the top of the policy agenda. The electric vehicle focus would make the topic more policy relevant. However the workshop also stressed the importance of TPA undertaking more ‘horizon scanning’ research that anticipates future policy issues.</p> <p><u>Are there important areas of conflict or confusion that a TPA assessment could help overcome?</u></p> <p>Yes, since speed of change in scenarios is often challenged by commentators.</p> <p><u>Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of the TPA?</u></p> <p>Yes though this would be a full review and not a REA.</p> <p><u>Is the question amenable to a synthesis assessment based on existing evidence? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)</u></p>

	<p>The topic is very 'doable' from a TPA perspective as there is a large literature on scenarios.</p>
<p>3. A third topic was top-3 in two breakout groups and noted as a close runner up by the third:</p> <p>How do methods used to assess the impact of government policy on consumer bills differ and to what extent can this explain what makes the role of government/utilities/market in energy prices so controversial?</p>	<p><u>Does the question reflect the concerns of users?</u></p> <p>Clearly of considerable interest to many stakeholders at the workshop and to several of the interviewees.</p> <p><u>Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?</u></p> <p>Likely to be highly relevant to the proposed energy price review.</p> <p><u>Are there important areas of conflict or confusion that a TPA assessment could help overcome?</u></p> <p>Yes. Energy prices and the impact of policy on bills continues to focus in policy and media debates.</p> <p><u>Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of the TPA?</u></p> <p>Yes if the focus is on an international review of policy practice.</p> <p><u>Is the question amenable to a synthesis assessment based on existing evidence? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)</u></p> <p>Yes if the focus is on an international review of policy practice. The review would draw on grey literature on how policies are paid for as well as any academic critique of different approaches. This could be a rapid review.</p>

<p>4. How significantly do recent decarbonisation scenarios rely upon net carbon negative technologies such as Bio-energy to CCS (BECCS)? And how well understood are the technical, social, land use, water, ecosystem and other constraints on BECCS? (Topic 4.5).</p>	<p><u>Does the question reflect the concerns of users?</u></p> <p>Considerable support from a wide range of stakeholders</p> <p><u>Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?</u></p> <p>No overwhelming short-term policy relevance. Very important to longer term dimensions of climate change policy and to international developments post-Paris.</p> <p><u>Are there important areas of conflict or confusion that a TPA assessment could help overcome?</u></p> <p>Clearly an important area of international discussion. Somewhat less clear if TPA can add value to ongoing work in this area by IPCC.</p> <p><u>Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of the TPA?</u></p> <p>Careful scoping would be needed. Likely to require a full systematic review.</p> <p><u>Is the question amenable to a synthesis assessment based on existing evidence? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)</u></p> <p>Unclear but there is a large scenarios literature and the uses BECCS and both CCS and bioenergy are well studied.</p>
<p>5. Energy storage costs and economics – is the paradigm changing? (Topic 1.2).</p>	<p><u>Does the question reflect the concerns of users?</u></p> <p>Considerable support from a wide range of stakeholders</p>

	<p><u>Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?</u></p> <p>Several stakeholders noted the increasing interest in the value chain for storage and a need to understand better the prospects for increased use of storage as costs fall.</p> <p><u>Are there important areas of conflict or confusion that a TPA assessment could help overcome?</u></p> <p>One recent area of controversy is whether storage can deliver enough energy to sustain during the time period required for capacity market payments.</p> <p><u>Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of the TPA?</u></p> <p>Yes. There are clear questions associated with the role of storage under different market arrangements.</p> <p><u>Is the question amenable to a synthesis assessment based on existing evidence? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)</u></p> <p>The evidence base on storage technology and cost projections is likely to be reasonably substantive. Less clear whether there is evidence on how storage secures value under different market arrangements.</p>
<p>6. Market design – can wholesale electricity markets deliver investment in low-carbon generation? (Topic 1.3).</p>	<p><u>Does the question reflect the concerns of users?</u></p> <p>Yes. Several stakeholders close to policy development noted the importance of</p>

	<p>understanding what a ‘subsidy free’ environment for renewables could look like.</p> <p><u>Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?</u></p> <p>Yes. The topic speaks to the aspirations set out in the Industrial Strategy Green Paper to reduce the cost of decarbonisation. Stakeholders also noted an ongoing interest in reducing government intervention in electricity markets.</p> <p><u>Are there important areas of conflict or confusion that a TPA assessment could help overcome?</u></p> <p>Yes - there has been recent controversy associated with the role of the CfDs and capacity mechanism, for example the House of Lords Economic Affairs committee recently recommended that they be merged.</p> <p><u>Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of the TPA?</u></p> <p>Yes. The question is clear.</p> <p><u>Is the question amenable to a synthesis assessment based on existing evidence? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)</u></p> <p>Less clear. It is not obvious what the evidence base would be. The topic could be more of a ‘think piece’.</p>
--	---

Annex 1. Consultation process stages

The process to be used for the 2017 consultation was clarified and revised following comments from the UKERC Funders Group and Research, Advisory and Directors Committees, and it was agreed that it would follow the stages described below:

1. The TPA team will draw up a 'long list' of prospective topics and circulate this for comment to the UKERC Co-Directors, Research Committee and Advisory Board.
2. The topics list will be agreed by the TPA Co-Director and the UKERC Director, following discussions with the other UKERC Co-Directors, the Research Committee and the Advisory Board.
3. TPA also to generate a 'long list' of potential stakeholders, also to be discussed with UKERC advisors and co-Directors.
4. In advance of the consultation event, the TPA team will assess each prospective topic against the TPA selection criteria. The results of this assessment are intended to help inform discussions during the consultation event and any subsequent follow-up meetings rather than determine in advance which topics should be taken forward.
5. A single consultation event will be held to discuss the list of prospective topics (*and any other topics suggested by consultation attendees*). The primary aim of the consultation event is to identify the priority topics for the TPA team in the remainder of phase 3 of UKERC (i.e. until Spring 2019).
6. The TPA team will follow up bilaterally with any key stakeholders who are not able to attend the consultation event.
7. The topic priorities which emerge from the consultation event and bilateral follow-ups will be documented and circulated to consultees and the UKERC Co-Directors, the Research Committee and the Advisory Board.
8. The TPA Co-Director and the UKERC Director will seek advice from the UKERC Co-Directors, the Research Committee and the Advisory Board, and then decide which projects will be taken forward in 2017.

The first three stages of this process were completed during February, March and early April 2017. The 4th, 5th, and 6th stages were completed in late April, May and early June. The final two stages were completed by late June.

Annex 2. Prospective topics

A list of prospective topics was circulated to consultees in advance of the workshop and bilateral discussions, and this list is reproduced below. The list was drawn from a combination of topics identified by TPA team and UKERC Directors, topics identified in previous rounds of consultation, topics suggested in informal discussions with stakeholders, and comments from the UKERC Advisory Board and Research Committee.

The final topic list sent to consultees was agreed by the TPA Director and UKERC Director. Prior to the consultation event, the TPA team assessed each prospective topic against the TPA selection criteria (see Annex 3). The results of this assessment were intended to help inform discussions during the consultation workshop and bilateral discussions rather than determine in advance which topics should be taken forward.

Topics are presented within topic groups. Individual topics within each group are listed in reverse chronological order based on the date when they were first suggested.

Table 2: Topic Group 1: Primary energy, supply and infrastructure

No.	Topic	Comments relating to TPA criteria
1.1	<p>Is repurposing the UK gas grid for hydrogen feasible?</p> <p>Notes: Strong interest from many policy stakeholders in possibility to use gas grid to deliver hydrogen for heating and transport</p>	Is the evidence base sufficient for a systematic review to yield useful answers?
1.2	<p>Energy storage costs and economics – is the paradigm changing?</p> <p>Notes: Costs for leading battery and other storage options are falling. Storage is also able to access opportunities for a wider range of system services. Could this change the economics of storage?</p>	Good match to most of the TPA criteria although the question would need refining.
1.3	<p>Market design – can wholesale electricity markets deliver investment in low-carbon generation?</p>	Quite high policy relevance given govt. wants to reduce intervention in the energy market. Not clear if there is an evidence base that would allow a TPA review to address this.

No.	Topic	Comments relating to TPA criteria
1.4	What is the evidence for the relative effectiveness of local energy solutions?	Not clear that this fulfils the criteria of relevance to current debate and/or conflicting evidence. What problem is this question addressing?
1.5	What impact could low/volatile oil and gas prices have on renewables, including their economic competitiveness and on policies to support them?	Does the question as currently framed address a clear policy need? It may also need to be revised to fulfil the criteria of relevance to current debate and/or conflicting evidence.

Table 3: Topic Group 2: Demand side, energy efficiency and behaviour

No.	Topic	Comments relating to TPA criteria
2.1	Household energy efficiency – what next after the Green Deal? Notes: What policies could be put in place in the UK for ‘able to pay’ households? Could review international best practice in this area.	High policy relevance but is there an evidence base that a TPA review could draw upon?
2.2	A review of policy interventions to promote energy efficiency (EE) in non–energy intensive commercial sectors. Notes: What’s been tried, what works and why? Would assess the factors responsible for commercial energy consumption and the interventions which shape it.	High policy relevance given Industrial strategy focus on improving business energy efficiency.
2.3	The significance of split incentives in obstructing energy efficiency investment. Notes: This review would assess the proportion of decisions affected by some form of split incentive, and the empirical evidence for the importance of this in obstructing energy–efficiency improvements.	Not clear that this fulfils the criteria of an area with conflicting and/or confusing evidence.

No.	Topic	Comments relating to TPA criteria
2.4	<p>How strong is the evidence base on which the potential role of active demand side participation by domestic consumers is based?</p> <p>Notes: Active demand response by consumers (time of day pricing, smart/responsive appliances, vehicle charging) can play a significant role in minimising the cost of integrating large volumes of intermittent renewables. However the empirical data on consumer preferences, understanding, willingness to pay, and price elasticity are based upon a very limited range of trials.</p>	Fulfils all TPA criteria and very topical.
2.5	<p>Rebound effects from energy efficiency improvements – what have we learnt over the last ten years?</p> <p>Notes: Updating the UKERC rebound review to reflect the very large increase in empirical research since the review was published. The work could be undertaken jointly with some of the end use energy demand centres.</p>	May not meet the criteria of a pressing policy need and/or relevance.

Table 4: Topic Group 3: Innovation and technological change

No.	Topic	Comments relating to TPA criteria
3.1	<p>What is the evidence on the effectiveness of UK low carbon/energy innovation policy?</p> <p>Notes: Recent policy developments, including ‘Mission Innovation’ and the industrial strategy green paper focus on enhancing innovation in energy and low carbon technologies. The review would examine UK institutions and funding arrangements and compare to international experience.</p>	Question as framed may not meet the criteria of a pressing policy need and/or relevance. Reframing the question may address this but is the evidence base sufficient for a systematic review to yield useful answers?

No.	Topic	Comments relating to TPA criteria
3.2	<p>How realistic, and how uncertain, are the assumptions made about technology roll out in decarbonisation scenarios?</p> <p>Notes: Would build on 'innovation timelines' rapid evidence TPA to assess feasibility of assumptions about technology roll out made in scenarios and modelling exercises.</p>	May not meet the criteria of a pressing policy need and/or relevance but fulfils other criteria reasonably well.

Table 5: Topic Group 4: Consumer and economic effects, environmental impacts

No.	Topic	Comments relating to TPA criteria
4.1	What is the potential impact of Brexit on UK and international energy markets and interconnections?	Fulfils the policy need and/or relevance criteria but question may need to be more focussed. Not clear that the evidence base is sufficient for a systematic review.
4.2	What is the link between energy price and economic development? Is the assumption that decarbonisation harms competitiveness and/or economic development necessarily true?	A very broad question that would need to be narrowed since as currently framed it may not meet the criteria of a pressing policy need and/or relevance.
4.3	What are the life cycle emissions of different energy technologies, and how have these changed over time? For example, has the decreased cost of PV also resulted in a lower carbon intensity?	May not meet the criteria of a pressing policy need and/or relevance.

No.	Topic	Comments relating to TPA criteria
4.4	<p data-bbox="337 285 954 478">How do methods used to assess the impact of government policy on consumer bills differ and to what extent can this explain what makes the role of government/utilities/market in energy prices so controversial?</p> <p data-bbox="337 531 976 842">Notes: This review would deconstruct the methods and assumptions used in a sample of government/independent body/NGO/think tank reports reported in mainstream media in the recent past. The principal goal being to highlight sources of controversy and prospective misunderstanding that might arise from analytical differences.</p>	<p data-bbox="1000 285 1386 352">Fulfil the policy need and/or relevance criteria.</p>
4.5	<p data-bbox="337 858 976 1087">How significantly do recent decarbonisation scenarios rely upon net carbon negative technologies such as Bio-energy to CCS (BECCS)? And how well understood are the technical, social, land use, water, ecosystem and other constraints on BECCS?</p> <p data-bbox="337 1140 976 1535">Notes: UKERC research has already informed the debate on bio-energy, through work for DECC and evidence to the Energy and Climate Change Select Committee. The DECC bioenergy calculator has a very extensive review on a whole range of different scenarios for pellet imports to the UK. Nevertheless the topic of carbon debt remains contested. The review would consider the reasons opinions differ, with a focus on the range and scope of key assumptions.</p>	<p data-bbox="1000 858 1386 1213">May not meet the criteria of a pressing policy need and/or relevance. Is this the right question on bio, on CCS or on carbon negative technologies? Is there a question for TPA that would score higher against the criteria?</p>

Annex 3. TPA topic selection criteria

The TPA team have five general criteria against which prospective TPA research topics are assessed:

1. Does the question reflect the concerns of users?
2. Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?
3. Are there important areas of conflict or confusion that a TPA assessment could help overcome?
4. Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of the TPA?
5. Is the question amenable to a synthesis assessment based on existing evidence? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)

Annex 4. Consultees

Invitations were sent to a wide range of stakeholders, identified by the TPA Director and UKERC Director with input from the UKERC Research Committee and Advisory Board. Over 100 individuals were invited to the workshop. Around 30 individuals took part in the consultation.

Consultation workshop attendees are listed in alphabetical order below:

Simon Bennet, IEA
Dustin Benton, Green Alliance
Simon Bittlestone, NAO
Colin Calder, Passiv Systems
Felicity Carus, Climate Policy Initiative
Alexandra Collins, Imperial College/DEFRA
Guy Doyle, Mott MacDonald
Rob Gross, UKERC
Kirsty Hamilton, Chatham House
Richard Hanna, UKERC
Phil Heptonstall, UKERC
David Joffe, CCC
Keith MacLean, UKERC Advisory Board
Karen Mayor, Ofgem
Jamie Speirs, Sustainable Gas Institute
Xavier Mamo, EDF Energy
Gaia Stigliani, Climate Policy Initiative
Neil Strachan, UCL
Judith Ward, Sustainability First
Jim Watson, UKERC
Matt Berry, Origami Energy
Sarah Williams, Aldersgate Group

Bilateral discussions were held with the following stakeholders who were unable to attend the event but expressed a willingness to provide their input:

Paul Appleby, BP
Ragne Lowe, ClimateXChange (telecon)
Becky Mawhood, UK Parliament ECC Committee secretariat
Barnaby Wharton, RenewableUK
Doug Parr, Greenpeace (via email)
Joe Perkins, Chris McDermott, Chris Spedding, Ofgem

Jon Saltmarsh, BEIS
Rob Saunders, InnovateUK
Jim Wharfe, UKERC Funders Group (via email)
Mark Winskel, Edinburgh University (telecon)