UKERC
UK Energy Research Centre

Theme 5: Responsive Research Topic Consultation

Summary Document

Jamie Speirs (University of Strathclyde)

Richard Hanna (Imperial College London)

Stephen Agyeman (University of Strathclyde)

Hannah Corbett (University of Strathclyde)

Mark Winskel (University of Edinburgh)

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Introduction to UKERC

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.

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1. Background and Purpose

The UK Energy Research Centre (UKERC) has consulted extensively over prospective review topics since it was first established in 2004. In this phase of UKERC (2024-2029) the Responsive Research (RR) team is conducting two in-person consultation activities, supplemented with other engagement activities to understand the topics important to a range of stakeholders. Consultations include wide-ranging discussion of the role and nature of evidence reviews and UKERC/academia in contributing to policy debates.

The RR team is now undergoing a consultation on future projects. The process used for the 2025 consultation is described at the end of this report. Our first consultation event (12th March 2025) discussed a list of prospective topics, and additional topics suggested by consultation attendees. In addition, the RR team followed up bilaterally with key stakeholders who were not able to attend. The primary aim of the consultation process is to identify the priority topics for the RR team in the current phase of UKERC (i.e. until the next consultation in 2026/2027).

The purpose of this document is to summarise the discussions at the first consultation event and conclude on the most popular topics for future consideration. Below we present the topic selection criteria, a list of prospective topics and summaries of the discussions had.

2. Agreed Priority Topics From the Consultation

The topic consultation event produced the top three project topic areas for each of four breakout groups. Most groups also proposed runner-up suggestions. These are presented in Annex 1, along with notes taken for each of the breakout discussions. In addition, bilateral discussions with key stakeholders who could not attend the in-person consultation were conducted. Notes from these discussions are recorded in Annex 2. A priority list of five key topic areas was derived from these discussions. These are:

- Critical minerals
    - Geopolitics; UK exposure and response; UK international partnerships (e.g. Africa)
- Drivers of energy bills and how to get bills down
    - Options for bill reduction; electricity tariffs
- Planning vs markets for the net zero energy transition
    - Centrally-planned and local authority vs market-based approaches
    - Projections of demand and need to deliver the required infrastructure
    - Infrastructure needs beyond 2030

- Industrial flexibility
    - Untapped flexibility opportunities; AI, data centres and other non-energy intensive industries
- Long duration energy storage
    - Technologies and markets; government policy to support/accelerate deployment

Table 1 presents a summary of the priorities identified in the notes from the four breakout groups during the consultation event (see Annex 1). This is colour-coded to highlight areas of concurrence. Beyond the priority list of five topics set out above, delivering a skilled workforce, how to reach sufficient deployment of electric vehicles, and using flexibility technologies to address fuel poverty, were mentioned once across the top three topics for all groups.

Table 1: Summary of Outcomes From the Breakout Groups

Table 1	Table 2	Table 3	Table 4
Top 3 priority topics			
The drivers of energy bills	Planning vs markets in energy system planning and development	Long duration storage: technologies and markets	Technologies for flexibility and impacts on fuel poverty
Projecting demand to build the required system	Critical materials and geopolitics	Untapped industry (and other) flexibility	AI, data centres and non-energy intensive industry flexibility
How to deliver the appropriate skilled workforce	Ensuring sufficient EV deployment	Retail electricity tariffs: review of effectiveness	UK exposure and response to critical materials
Additional topics highlighted			
Energy planning beyond 2030	Infrastructure decommissioning	Equity and energy justice to be considered against all topics	Gov policy to support/accelerate long duration storage
Better citizen engagement	Industrial flexibility		Just transition planning
Closer EU/UK ties and impacts on energy security and net zero targets	Drivers of energy bill reduction		UK/Africa partnership in critical minerals and technology supply chains
	Public attitudes to net zero tech and infrastructure and their lived experience		Energy security and future of gas infrastructure
			Inequity in energy access: community energy participation

Potential research avenues highlighted in the bilateral meetings (Annex 2) are reflected in our top five priority list. These include extensive suggestions on energy bills, prices and electricity market design, as well as potential topic ideas on flexibility, long duration energy storage, and geopolitics and international supply chains. Bilateral consultees mentioned other possible topic areas, in particular related to carbon pricing and clean market mandates, investment and innovation, grid planning and demand-side management, electric vehicles and low carbon heat, hydrogen and CCUS, workforce and skills development, and public engagement.

2.1 Next Steps

At the conclusion of the consultation activity, the following next steps will be taken. These will be based on the proposed priority topics presented in this note:

- The summary note will be circulated to all consultation participants
- The proposed priority topics will be agreed with the UKERC Management Board
- The agreed priority topics will be presented to the UKERC Advisory Board
- Research will begin on priority topics during the summer of 2025

- A future consultation activity, similar to the one documented here, will be scheduled for 2027.

2.2 Responsive Research topic selection criteria

The Responsive Research team have five general criteria against which prospective 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 RR 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 RR?
5. Is the question amenable to a synthesis assessment based on existing evidence or rapid primary method? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)

3. The Consultation Process

1. The RR team produced a list of prospective topics based on key research areas gathered from participants in UKERC events during 2024 and through discussions within the UKERC management board.
2. In advance of the consultation event, the RR team assessed each topic against the selection criteria. The results of this assessment were 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.
3. A consultation event was held (12th March 2025) to discuss the list of prospective topics (and any other topics suggested by consultation attendees). The primary aim of the consultation event was to identify the priority topics for the RR team in the first half of UKERC 2024-2029.
4. The RR team followed up bilaterally with key stakeholders who were not able to attend the consultation event. The topic priorities that emerged from the consultation event and bilateral follow-ups are documented in this summary for dissemination to consultees, the UKERC Co-Directors, and the Advisory Board.
5. The RR Co-Director and the UKERC Director will seek advice from the UKERC Co-Directors and the Advisory Board and then decide which projects will be taken forward.

4. Proposed Research Topics

Tables 2-5 illustrate the guiding topics for the stakeholder consultation. Stakeholders were asked to discuss, modify as well as propose new topics. Emphasis was placed on each stakeholder breakout group proposing three priority topics with notes on why they considered them important based on the topic criteria described above. The breakout groups were also asked to suggest other topics that were outside their top three but worth considering.

Table 2: Responsive Research Topics on Energy Systems and Technologies

No.	Topic	Notes and alignment with selection criteria
1.1	Long duration storage: What is the evidence on technology options, capabilities and costs? - Key emerging challenge given heat electrification / other seasonal dynamics.	Aligns with UKERC Theme 2 work. Is there sufficient new evidence to add to previous work in this area?
1.2	Distributed energy resource: What is the evidence on policy incentives and challenges to unlock potential in the UK? - Key emerging challenges to market reform in long term due to growing share of variable renewable energy.	Is there sufficient evidence that market reform is addressing this area effectively?
1.3	Industry as a source of flexibility: how and to what extent could industry contribute flexibility to a low carbon energy system?	Existing evidence may be limited; may require rapid primary research.
1.4	How to manage increasing energy demand and flexibility needs for AI and data centres?	Is there a sufficient evidence base in this area?
1.5	Green hydrogen as flexible storage: what are the routes and barriers for achieving long-term economic viability?	Existing evidence may be limited.
1.6	Review of the technical and economic viability of CCUS at scale and associated policies: Is the UK on track?	Draws on suggestion from the Wales consultation. Is this topic

		amenable to an evidence review?

Table 3: Responsive Research Topics on Geopolitics and Global Issues

No	Topic	Notes and alignment with selection criteria
2.1	Update on the issues around critical materials, geopolitics and the circular economy: What is the evidence that the UK can have security of supply for green and transition minerals needed for net zero and beyond?	Aligns with UKERC Theme 3 work. Is there sufficient new evidence to add to previous work in this area?
2.2	Geopolitics of the UK and Africa partnership on green and transition minerals - The growing challenge of potential future dependence on single-market sourcing of critical minerals needed for technology development for the net zero transition	Aligns with UKERC Theme 3 work. Is this topic amenable to an evidence review?
2.3	Review of infrastructure decommissioning in the lens of the circular economy - Energy security issues and the need for strategic planning of gas infrastructure assets as UK transitions away from gas	Aligns with UKERC Theme 3 work. Is there a sufficient evidence base?
2.4	What is the evidence on the impacts of international hydrogen trade to the UK - Positive and negative economic impacts, including price of energy in the UK and impacts of a hydrogen export market	Aligns with comments from Scottish consultation and approaches from Scottish Government and UK Government

Table 4: Responsive Research Topics on Consumers and Economics

No.	Topic	Notes and alignment with selection criteria
3.1	Systematic review of changes in public attitudes to net zero and low carbon energy investments	Is there sufficient evidence on public attitude changes?
3.2	What is the existing evidence on the societal impact of smart and social tariffs globally?	Aligns with UKERC Theme 4 work. Is there a sufficient evidence base?
3.3	Revisiting electricity tariff design in the UK: How to decouple electricity and gas prices to deliver consumer benefit? - How decreasing renewable energy cost can effectively pass through to reduce impact of gas import price on the consumer tariff	Is there sufficient evidence that decreasing renewable energy cost would be enough to achieve long-term consumer electricity price reduction?
3.4	What is the existing evidence on gaps between EV deployment and charging infrastructure (public/private)? - The bottleneck challenges to the transition that could be created by this gap	Is there sufficient evidence that public and private charging infrastructure rollout is matching the rate of EV deployment?
3.5	Reviewing market mandate effectiveness and impact on industry: international best practice guide in design and application of the UK's Zero Emission Vehicle (ZEV) mandate and clean heat market mechanism	Is there sufficient evidence internationally on the application of such market mandates?

Table 5: Responsive Research topics on energy policy and just transition

No.	Topic	Notes and alignment with selection criteria
4.1	Review of the UK energy policy-making process. What is the evidence on the match between policy objectives and outcomes? How does this compare to international best practice?	How can the scope be kept relatively narrow? May require sectoral focus.
4.2	Which approaches could work most effectively to deliver a large-scale rollout of low carbon heat whilst achieving an equitable sharing of costs?	Highly relevant to policy now. Is there a sufficient evidence base?
4.3	Addressing inequalities in energy access (racial, gender-based). What evidence supports advancing gender and racial equity in community energy participation, as outlined in the Great British Energy Bill? - Special emphasis on objectives of the new Local Power Plan policy	Drawing on Scotland consultation suggestion. Potential to make a link with EDRC work on equity/fuel poverty.
4.4	Review of workforce transition plans internationally: What is the evidence on strategies to develop a sufficiently skilled workforce for the low carbon energy transition? - Current international evidence on low carbon transitions underway	Draws on suggestions from Scotland and Wales consultations. Some evidence exists but may be limited.
4.5	What lessons can be learnt from the impact of previous energy transitions on jobs and supply chain development?	Is there sufficient and accessible historical evidence?

Annex 1: Outcome of the Consultation

The following boxes contain edited notes from each of the four break-out groups that discussed research topics during the in-person consultation event. The fifth box in Annex 2 contains notes captured during the bilateral consultation meetings.

Box 1: Group A - Agreed Priority Topics and Areas of Interest

Agreed Priority Topics

Priority 1: What are the drivers of energy bills going up or down?
Significant discussion within policy circles and more public spheres (media) around Government's pledge to lower energy bills and how what they are doing and the drive towards net zero will ultimately impact on bills – for residential, industry and commercial consumers. Public discourse is increasingly polarised, and policy action is currently characterised by multiple initiatives (e.g., Ofgem consultations on standing charges, DESNZ action from GB Energy to Clean Power Mission to Warm Homes Discount and Fuel Poverty strategy review). A clear need to bring evidence to bear in terms of immediate policy action but also in shaping public discourse narratives.

How does this topic meet the criteria?

1. Does the question reflect the concerns of users?
   - Clear relevance for those working in DESNZ and other independent bodies such as NESO and GB Energy as well as industry, civil society and UK/devolved elected members.
2. Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?
   - Relevant to several policy processes – at a broader and longer-term level e.g., efforts in relation to Clean Power Mission and GB Energy establishment; and at more specific and immediate level related to REMA, Ofgem Standing Charges Consultation, DESNZ consultations on updating fuel poverty strategy and reviewing Warm Homes discount.
   - Linked to three UKERC thematic areas – electrified energy system, affordability and justice and delivering energy infrastructure.
3. Are there important areas of conflict or confusion that a RR assessment could help overcome?
   - What is causing bills to go up and down in relation to different net zero actions and other factors e.g. geopolitical etc.?
   - Lot of confusion and contention in public discourse narratives where greater honesty and rigour would be beneficial, particularly around the cost and distribution of costs of different energy actions and where they end up e.g. on bills, in taxes, the cost of goods and services etc.
   - Potential gap in knowledge around impact of bills going up and down on industry.
4. Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of RR?
   - Further efforts required to identify questions that are sufficiently narrow/concise.
   - Could build on 2018 UKERC project *What's in a bill? How UK household electricity prices compare to other countries*

5. Is the question amenable to a synthesis assessment based on existing evidence or rapid primary method? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)

- See above.
- The current topic list includes some questions which speak to this issue:
    - 3.2 What is the existing evidence on the societal impact of smart and social tariffs globally?
    - 3.3 Revisiting electricity tariff design in the UK: How to decouple electricity and gas prices to deliver consumer benefit?
    - 4.4 Which approaches could work most effectively to deliver a large-scale rollout of low carbon heat whilst achieving an equitable sharing of costs?

Priority 2: How do you effectively project evolving energy demand to ensure build out of the required integrated energy system?

Increase in electricity demand through heat, transport and other planned transitions and use of AI, creation of new data centres etc. How does continued build out of an integrated energy system need to respond? What's already understood in terms of NESO and DESNZ Mission Control work, as well as academic literature, and where are the gaps in knowledge. Not just around the nature of demand but the roles of different technologies from nuclear (small modular reactors) to gas, storage needs and how to build in appropriate levels of flexibility. It also raised questions around spatial planning e.g., location of new data centres. Currently, a focus on getting to 2030, but can research projects bring a longer-term perspective?

How does this topic meet the criteria?

1. Does the question reflect the concerns of users?

- Fits with current policy focus of DESNZ Mission Control and potential to support them in thinking through how work to 2030 most effectively lays foundations for what happens beyond that point and up until 2050: in terms of timing and sequencing of projects, the balance of different technologies required etc., Projecting demand effectively will not only mean the right energy system is developed, but critical to generating the most positive jobs and GDP outcomes and ensuring value from multiple investments. So useful from government and industry perspective.

2. Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?

- Yes, for reasons highlighted above in terms of relevance to energy policy decision-making. Moving out of the Comprehensive Spending Review period (ends late Spring 2025), decisions will evolve based on how much money is available for things like CCUS and GB Energy and thus have implications for energy system build out and role of different technologies.
- Linked to two UKERC thematic areas – delivering energy infrastructure and electrified energy system.

3. Are there important areas of conflict or confusion that a RR assessment could help overcome?

- What are the opportunities, challenges and trade-offs between different technologies?
- What are the value propositions of different technologies?
- How is demand evolving?

- Knowledge gaps around flexibility in relation to industry and commercial users.

4. Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of RR?

- Several already identified topics speak to this wider area including:
    - 1.1 Long duration storage: What is the evidence on technology options, capabilities and costs?
    - 1.3 Industry as a source of flexibility: how and to what extent could industry contribute flexibility to a low carbon energy system?
    - 1.4 How to manage increasing energy demand and flexibility needs for AI and data centres?
    - 1.5 Green hydrogen as flexible storage: what are the routes and barriers for achieving long-term economic viability?
    - 1.6 Review of the technical and economic viability of CCUS at scale and associated policies: Is the UK on track?
- Missing from the current list (although incorporated to some extent in 1.6 – economic viability of CCUS) is something around determining the relative value of different technologies/storage solutions.

5. Is the question amenable to a synthesis assessment based on existing evidence or rapid primary method? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)

- See above. More work required to identify suitably concise questions with relevant evidence base.

Priority 3: What new strategies and coordination mechanisms do we need to deliver the skilled workforce to drive progress towards 2030 and 2050?

Multiple academic studies, industry exercises, government driven initiatives to understand/characterise the nature of workforce demand and supply related to net zero, but consensus on: a lack of a) appropriate coordinated action and b) consistency in approaches to developing understanding around demand and supply and in turn, building a sufficiently nuanced and rigorous picture to drive efforts e.g., around creating a pipeline of the right types of skilled workforce.

How does this topic meet the criteria?

1. Does the question reflect the concerns of users?

- Clearly aligns with concerns of industry and government users, reflected in the multitude of studies, exercises and initiatives ongoing in this area – at a sectoral level within industry, at devolved level e.g., Skills Development Scotland, Scottish Green Industrial Strategy, at national level e.g., establishment of Skills England, Office for Clean Energy Jobs, GB Energy (and agreement signed by Scottish and UK Governments.

2. Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?

- See above re: policy debates, also indications that workforce and skills will be focus of DESNZ Mission Control going forward. Also links to initiatives such as Project Willow (Grangemouth Transition) and UK Government North Sea Transition consultation just launched.
- Also been a focus of UK Parliament ESNZ Select Committee and Scottish Affairs Committee inquiries on workforce planning and GB Energy/North Sea Transition
- Clear cross-cutting link to all UKERC themes.

3. Are there important areas of conflict or confusion that a RR assessment could help overcome?

- How to translate multiple initiatives and efforts to understand demand and supply in relation to skilled workforce for net zero into coordinated action?
- How to bring more consistency and cross-sectoral approaches to understanding nature of demand and supply?
- What lessons are there from previous transitions in terms of building necessary workforces e.g. digital transformation?

4. Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of RR?

- The focus on 'learning lessons' of current proposed topics on workforce isn't quite the right framing. Focus should be more on effectively characterising demand and supply and how that can be translated into effective and coordinated action.

5. Is the question amenable to a synthesis assessment based on existing evidence or rapid primary method? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)

- Strong potential to build out from UKERC's previous work e.g. What is the evidence that policy support for investment in renewable energy and energy efficiency leads to net job creation? See relevant work.
- But with a refining of question that takes account of changing policy context – e.g., supporting transition of jobs as well as creating new jobs, with pressure to deliver a lot in a condensed timeframe by 2030.

Other topics/notes:

- **Beyond 2030:** Clean power ambitions have focused efforts on working towards the 2030 target. There's a sense within Government that this period from now until 2030 is foundational for what happens beyond 2030. But how do we retain a focus on longer-term planning and efforts. Can UKERC provide insights and analysis that focus attention in this area e.g., by bringing this framing to identified topic areas and/or looking across other countries' target setting.
- **Citizen engagement:** Concern that insufficient attention/efforts concentrated on interacting with public around net zero could ultimately result in already fragile consensus being undermined. Particularly with ambitious 2030 targets, government's language on 'blockers' in relation to planning process, etc. Is there a danger of alienating communities/individuals? Also links to discussion around identified priority area on energy bills and concern that there is not enough transparency, honesty and rigour in the public discourse.
- **Closer EU/UK relationships:** In the current volatile geopolitical context, there have been shifts in EU/UK relationships with closer ties established and proposed. How might that impact on UK energy security and wider net zero transitions?

Box 2: Group B - Agreed Priority Topics and Areas of Interest

Agreed Priority Topics

Priority 1: Planning challenges for the net zero transition

Planning verses markets? How do we meet the emerging planning challenges with the existing organisational structure and market-based approaches?

- Where does the increasingly centrally planned planning model end, and the private market for delivery begin?
- How can we best align these approaches to deliver near term progress?
- What are the international experiences in this area?
- What local authority capacity is there and what alternatives if this capacity is limited?
- How do domestic heat and planning interface, particularly for heat networks and for heat pump systems where individual dwellings need area wide infrastructure planning?

How does this topic meet the criteria?

1. Does the question reflect the concerns of users?
    - Users in attendance were motivated by this topic. With correct framing, a project in this area could highlight the opportunities and challenges with the current organisational structure and provide evidenced basis for action. The recent restructuring of the energy system planning apparatus, and the increasing burden on local authorities are key issues that emerge from discussion of this topic with experts.
2. Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?
    - For similar reasons, this topic is very contemporary and could benefit from independent analysis.
3. Are there important areas of conflict or confusion that a RR assessment could help overcome?
    - Potentially, and with correct framing of research question.
4. Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of RR?
    - Yes. Though decisions on project timeline should be dictated by emerging policy priorities.
5. Is the question amenable to a synthesis assessment based on existing evidence or rapid primary method? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)
    - This is better for some aspects of the question than others.

Priority 2: Critical materials and geopolitics

What are the implications for dealing with critical materials supply for energy technologies and infrastructure?

- What UK soft power can be harnessed in order to secure international supply chains?
- What partnerships are most valuable in meeting UK requirements?

How does this topic meet the criteria?

1. Does the question reflect the concerns of users?

- Yes. This topic was very well discussed in several tables and again in plenary. Material supply chains impact a broad range of net zero issues and therefore of concern to a wide range of users.

2. Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?

- The critical materials issue is rising again in the policy debate, and the DESNZ departmental structure acknowledges this issue explicitly today, which was not the case when previous UKERC research in this area was conducted.

3. Are there important areas of conflict or confusion that a RR assessment could help overcome?

- Key areas of conflict include: the international trade versus industrial strategy/protectionism approach to dealing with critical materials; the role of recycling in securing domestic supply; the domestic material availability option; the geopolitical capital that should be spent on this specific challenge.

4. Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of RR?

- Yes. Again project length depends on assessment of policy priority and timelines.

5. Is the question amenable to a synthesis assessment based on existing evidence or rapid primary method? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)

- Yes. And an aspect of a study in this area could be an update of previous UKERC work.

Priority 3: EV Deployment

What are the solutions to slow or stalling EV uptake in the UK?

- What approaches or policies could drive uptake?
- What is the role of infrastructure in opening the door to greater uptake?
- What international examples are useful to the UK context and what do they say (e.g. Norway)?

How does this topic meet the criteria?

1. Does the question reflect the concerns of users?

- Many positive responses within the room, though EVs did not feature in priority lists in other groups. EV policy challenges are emerging in the policy debate, and appetite for this topic may change.

2. Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?

- The UK pace of EV uptake is currently being debated, and is likely to be subject to new policy formation as the current mandate becomes increasingly challenging approach to drive uptake.

3. Are there important areas of conflict or confusion that a RR assessment could help overcome?

- Current consumer attitudes to EVs may be part of the story of poor uptake, and this is driven by contentious debate on the value, utility, depreciation, policy approach in EVs.

4. Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of RR?

- Yes. Though several aspects of the issue were discussed, and question framing will be needed before taking this forward.

5. Is the question amenable to a synthesis assessment based on existing evidence or rapid primary method? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)

- Yes. There are increasing numbers of studies on this, including research in other comparable countries.

Other topics and notes

- **Infrastructure decommissioning**

This is broad but could be focused on gas infrastructure.
How does work on decommissioning feed into the just transition challenge?
What are the hidden costs of decommissioning and how are they distributed?

- **Industrial Flexibility**

Interesting to the group and possibly an area for primary research in the first instance.

- **Drivers of energy bill reduction**

What are the best approaches to drive energy bills down fastest. This could look at the makeup of a bill, the impact of wholesale price on consumer price, the balancing of tariffs and levies between gas and electricity, market reform etc.

- **Public attitudes and lived experience**

What are the lived experiences of consumers with specific exposure to net zero interventions (heat pump users, electric vehicle owners, those adjacent to energy infrastructure)?
What differences in experience exist between different consumer groups?
What channels of communication exist between users?

Box 3: Group C - Agreed Priority Topics and Areas of Interest

Agreed Priority Topics

Priority 1: Long duration energy storage with markets and technologies
Key emphases were on how to incorporate market dynamics and technologies into the assessment of long duration storage, and whether this topic should be interdisciplinary or kept technical.

How does this topic meet the criteria?
1. Does the question reflect the concerns of users?
- Yes, it is a classic TPA.
- Cost tends to outweigh rent for users when storage becomes too long.

2. Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?
- An important ongoing debate is what type of storage should UK focus on.

3. Are there important areas of conflict or confusion that a RR assessment could help overcome?
- An important ongoing debate is 'how long is long' for energy storage.
- RR could address or provide clarity through evidence review.

4. Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of RR?
- Focus on insights on either markets or the technology aspect of long duration storage (through RR or systematic review).

5. Is the question amenable to a synthesis assessment based on existing evidence or rapid primary method? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)
- Stakeholder indicated evidence exists and but issues around markets could benefit from rapid primary evidence. If evidence exists then, RR or Systematic Review approach could be adopted.

Priority 2: Untapped sources of flexibility
Focus should be industry, data centres and others. The hypothesis is that industry would be the main one, but also others may be equally important. Green hydrogen and CCUS as low-carbon flexible energy provision are embedded in industry as flexible storage.

How does this topic meet the criteria?
1.Does the question reflect the concerns of users?
- Yes, especially potential increasing electricity demand due to emerging AI and data centres.

2. Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?
- Flexible energy supply and storage especially industry, are integral in achieving Clean Power 2030 and addressing potential increased demand beyond 2030.
- Data centres and other flexibility energy systems are relevant in planning of current and future energy policy.

3. Are there important areas of conflict or confusion that a RR assessment could help overcome?
- The question of energy demand dynamics after clean power 2030 agenda is not sufficiently addressed
- Public attitudes around this topic may be limited.

4. Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of RR?

- Industry flexibility is very broad. May have to focus on specific aspect. Data centres related flexibility topic is relatively narrow.

5. Is the question amenable to a synthesis assessment based on existing evidence or rapid primary method? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)

- Focus on untapped sources of flexibility in the 2030 clean power agenda (or beyond), possibly through rapid primary research.

Priority 3: Retail electricity tariffs mechanism - Review of effectiveness

Proposed systematic review on what tariffs have been implemented, what was achieved, who benefits considering equity and justice, and how do we get rent out to consumers. This could be an area to explore equity and energy justice in the UKERC5 phase of research.

How does this topic meet the criteria?

1.Does the question reflect the concerns of users?

- Yes, as issues of high energy price continue to receive traction from all consumers (industry, residential, commercial or businesses).

2. Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?

- Retail energy price is central to UK energy policy reflected in the Clean Power 2030 agenda and the Government's ambition to reduce cost of heating and electricity consumption.

3. Are there important areas of conflict or confusion that a RR assessment could help overcome?

- How to get rent out to those who needs it.
- How to reduce electricity price. Whether through less dependence on the volatile imported gas price or other system charges and levies. Which is the best route for Ofgem?

4. Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of RR?

- Broad but could focus on the rapid evidence of tools applied to address the tariffs in the UK and their effectiveness.
- Not sure if it could also be approached through systematic review of tariffs structure and mechanisms for improvement of consumer benefit.

5. Is the question amenable to a synthesis assessment based on existing evidence or rapid primary method? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)

- It will be suitable to focus on review of existing evidence as policy mechanisms for addressing retail electricity tariffs are both available and accessible
- Another area could be assessing retail electricity tariffs reduction policies from best practices globally and what UK can learn from.
- Where primary research could be beneficial is to consider specific policies and its impact on tariffs (eg. Clean Power 2030).

Other topics and discussion summary

1.Making a success out of strategic planning
- How to speed up drivers of the energy policies
- How to keep agile in planning of energy sector policies
- This topic is important but think it is not on the current policy agenda

2. Decommissioning
- Emphasis on repowering (offshore and onshore)

3. Critical minerals
- Something a bit more focus on foundations (supply, demand, access) and less focus on geopolitics
- The geopolitics keep changing and RR for a year might not be able to address it comprehensively as the issues are very dynamic or stochastic

4. Skills
- Emphasis on who has the skills
- What is needed to develop these skills
- On the area of repurposing of existing workforce for just transition, current topics often focuses on prescription strategies from the supply side but not much on how the workforce themselves understand the transition and what they really want to do. Here is a gap that RR could address to provide insightful evidence

5. Place-based aspect
- How does the model work in implementation especially in the devolved nations

Other general comments
- Stakeholders recommended the consultation could be an opportunity for participants to propose topics that is necessarily to influence policy making
- These selected topics could be tackled in a more interdisciplinary approach
- The issue of equity and energy justice could be addressed through integration into most of the other topics
- There are other equally important topics that is not focused by current energy policy but worth considering an effective approach to address them.

Box 4: Group 4 - Agreed Priority Topics and Areas of Interest

Agreed Priority Topics

Priority 1: What is the role and value of low carbon technology and innovation in energy system flexibility (e.g. via tariffs) in supporting fuel poverty?

Subsidiary or alternative research questions could ask:

- What is the institutional relationship between the fuel poor and actors who can help to deliver appropriate technologies and innovation in tariffs to reduce energy prices for those in need?
- Where is money best spent addressing fuel poverty and economic welfare of subsidies for fuel poor homes?

This topic received the most discussion in the group, in relation to different fuel poverty policy and governance strategies that might benefit low-income and vulnerable households. It was suggested that Distribution System Operators (DSOs) have a low level of connection with consumers, while a general institutional mistrust means that it has been difficult to give away insulation for free to the fuel poor.

How does this topic meet the criteria?

1. Does the question reflect the concerns of users?
   - The proposed topic would help to guide policy design on the productive relationship between policy makers and the fuel poor.
2. Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?
   - Strategies to address fuel poor consumers remain highly policy-relevant given continuing pressures on the cost of living in the UK.
   - Clear links to UKERC Theme 4 and 4.1 in particular on social and flexible tariffs.

3. Are there important areas of conflict or confusion that a RR assessment could help overcome?
   - By way of background, an RR review on this topic could help to clear up debate around how to apply definitions of fuel poverty and who might actually be considered fuel poor, although there is a risk that this could also involve a significant time burden and become too conceptual.

4. Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of RR?
   - The research question would need to be clearly focused on specific technologies and types of innovation (e.g. tariffs) otherwise the scope in this respect is too wide.
   - It might be possible to address different aspects of the topic through research conducted in parallel by researchers with particular skills (e.g. REA and modelling).

5. Is the question amenable to a synthesis assessment based on existing evidence or rapid primary method? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)
   - It would be possible to carry out a rapid evidence assessment of comparable international approaches, although it might be difficult to apply international examples to the UK. Identifying close comparator countries, such as Ireland, could be instructive.
   - The subsidiary question above on best use of expenditure and economic welfare of subsidies would require a modelling methodology.
   - Primary research on consumer barriers and attitudes to uptake could be useful, however this would not match the current skills of the RR team.

Priority 2: How can AI, data centres and non-energy intensive industry contribute to energy system flexibility and how should this be managed? This research question arose from a discussion around proposed topics 1.3, 1.4 and 1.5 and is effectively a merger of topics 1.3 and 1.4. A similar question was considered for other flexible loads such as electrolysers and electric vehicles. Subsidiary or alternative research questions could ask:

- From a whole system point of view, how can new forms of non-energy intensive industry have an optimal effect on the energy system?
- What is the effect of industrial electricity use on wholesale energy prices?

How does this topic meet the criteria?

1. Does the question reflect the concerns of users?
    - The government's industrial strategy has been delayed until Spring next year, so a project in advance of this could be timely.

2. Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?
    - The government mission on AI has energy implications – this needs to be joined up with relevant energy policy.
    - Links to proposed topics 1.3, 1.4 and 1.5.

3. Are there important areas of conflict or confusion that a RR assessment could help overcome?
    - The research could contribute to the question on the extent to which new forms of flexibility help to reduce need for investment in additional grid infrastructure.
    - It could also shed light on how new forms of non-energy intensive industry could be designed to be as flexible as possible.

4. Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of RR?
    - A similar research question to that set out above was proposed for green hydrogen which would have a longer-term outlook. However, combining AI, data centres, non-energy intensive industry, electrolysers and EVs in one research question would be unmanageable for one RR project.
    - Two overall projects could be contemplated, one focused on the short-term (adapting existing non-energy intensive industry) and one on the longer-term (new forms of industry and electrolysers).

5. Is the question amenable to a synthesis assessment based on existing evidence or rapid primary method? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)
    - This was not discussed in much detail, but the evidence base for a review is likely to be emerging and limited given the recent nature of the relevant industries, on the other hand this means the topic is likely to be more cutting edge.
    - Primary research (e.g. interviews) could help to overcome any evidence deficits in reviewed literature.
    - Some evidence exists pertaining to the Northern Ireland energy system operator (ESO) and the relative location of wind turbines and data centres.

Priority 3: What is the UK's current and expected usage of critical minerals? What policies and incentives could help to reduce the UK's exposure to international supply chains for critical minerals over the next decade?

How does this topic meet the criteria?

1. Does the question reflect the concerns of users?

- Not specifically discussed; see answers to point 2 below.

2. Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?

- It would evaluate relative effectiveness of policies and interventions to reduce the UK's demand for critical minerals.
- It would consider how to expand capacity for recycling magnets and lithium.
- Links to second group of proposed topics and work in UKERC Theme 3.

3. Are there important areas of conflict or confusion that a RR assessment could help overcome?

- Dynamics and change in geopolitics, and current contention related to the impact of US trade tariffs on supply chain disruption.

4.Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of RR?

- The TPA team have carried out two previous reviews on critical materials which could be used as a basis for a new rapid review, so that the latter can be focused on only the most recent and relevant evidence.

5. Is the question amenable to a synthesis assessment based on existing evidence or rapid primary method? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)

- There is existing evidence on battery components and technology trends, stock and flow.
- Primary research (e.g. expert survey or interviews) could help to ensure findings are as up to date as possible.

Priority 4: How can government innovation policy help to accelerate scaling in long duration energy storage? This topic was not discussed extensively, but considered in relation to proposed topic 1.1, and the group agreed it was at least equally important as the other three topics.

How does this topic meet the criteria?

1. Does the question reflect the concerns of users?

- Timely and relevant to Clean Power by 2030 target (see below).

2. Is the question relevant to current energy policy debate and/or the objectives of the UKERC and UK energy policy?

- It is related to proposed topic 1.1 and work in Theme 2 of UKERC Phase 5.
- The research question could consider different technology options for long duration energy storage in the context of the government's Clean Power by 2030 target.

3. Are there important areas of conflict or confusion that a RR assessment could help overcome?

- Addressing the current policy gap: how can government policy help to deploy long duration energy storage at scale and relatively quickly.

4. Can the question be made sufficiently concise as to allow it to be addressed within the timeframe and resource limits of RR?

- Not discussed but examples of scaling of long duration energy storage could be limited, and the question as posed could be modified to a more classic TPA around viability of different options and relative potential for scaling.

5. Is the question amenable to a synthesis assessment based on existing evidence or rapid primary method? (For example, is the question sufficiently tightly defined? Is an adequate evidence base both available and accessible?)

- Not discussed, but a rapid review could be complemented with primary research if evidence on different technological options is insufficient.

Other topics and notes

- **A systematic review and case studies of successful just transition planning** were discussed as the basis for an alternative topic. However, defining the scope to be sufficiently narrow for a review could be challenging, given the breadth of just transition as a topic. The evidence base could be somewhat limited given the relative recency of the just transition concept in energy policy, however the review search parameters could be cast quite widely as a first step, followed by a more focussed procedure to select the most relevant evidence and examples for the UK. This topic is relevant to EU covenant mayors and C40 Cities group and the Just Transition Platform Working Groups (https://ec.europa.eu/regional_policy/funding/just-transition-fund/just-transition-platform/groups_en).
- Proposed **topic 2.2** ***(Geopolitics of the UK and Africa partnership on green and transition minerals)*** could include potential to repair solar panels, and there may be an evidence base in relation to capacity building.
- It was noted that proposed **topic 2.3 (*Energy security issues and the need for strategic planning of gas infrastructure assets as UK transitions away from gas*)** represents a research gap.
- Proposed **topic 4.3 (*Addressing inequalities in energy access*)** - on the Local Power Plan and advancing gender and racial equity in community energy participation - is relevant to devolved governments and Mayoral Combined Authorities. There could be a reasonable evidence base on community energy schemes in Europe and North America, contrasting between schemes in rural and urban areas. One possible research question could focus on how to maximise the efficiency of investments.

Annex 2: Notes from Bilateral Consultation Meetings

Box 5: Bilateral Meetings Summary

This box contains notes from a number of bilateral conversations with stakeholder organisations that could not attend the in-person consultation event. These notes are unattributed. Organisations consulted in this way were: Ofgem, EDF, National Audit Office (NAO), Welsh Government, Scottish Power, WWF and the Climate Change Committee.

Feedback on topic areas

Energy prices, bills and markets

- Bringing a focus on energy bills – drivers, composition – linking to questions of affordability and fairness, reflecting consultation discussions and linking to former TPA project on 'what's in a bill'.
- Linked to point on energy bills, what do households/consumers consider acceptable in terms of trade-offs between net zero costs and outcomes.
- Energy bills-evidence on different scenarios to decarbonise the energy system and how it will impact on bills.
- Zonal pricing continues to be an important area and framing right questions to focus is challenging.
- Evidence on zonal pricing is skewed and not focussed on investment requirements.
- Perceptions on network—there is lack of understanding on level of innovation that can be used to drive down the existing network cost. Good to look at expectations of people such as cost of social economic impact.
- Long term infrastructure locational movement or place-based such as NESO planning and compensation to communities.
- What does the evidence say about electricity design and what can we learn from international examples (e.g., the 'Iberian exception' and Spain's decoupling of electricity from gas prices) in terms of decoupling gas and electricity (linking to REMA)?
- Evidence on how to achieve the decoupling of electricity price from gas price-evidence on places that have achieved it and the approaches adopted e.g. dispatching more smart renewable energy to reduce gas in the system.
- Align REMA work on distributed energy systems to see potential for an evidence to deliver policy impact.
- Evidence on impact of social and smart tariffs- to focus on comparing international evidence and lessons for UK to compliment other UKERC work on this topic that focuses on domestic economic impacts.
- Interaction of social and smart tariffs with the delivery technologies.
- Are there specific challenges for non-domestic consumers in accessing energy markets and are government approaches sufficient to address them?
- Review on different policy mechanisms or levers to manage energy demand considering demand elasticities—how price mechanisms work. Increasing flight demand and its elasticity to price of aviation fuel and consequently on emissions in the sector.

Carbon border adjustment mechanism (CBAM)

- Assessing carbon pricing and its impact on bills and the role of CBAM and the sectors which would be involved.
- Building on existing proposal around the UK/EU relationship in relation to energy policy and energy security, is there a value at looking at CBAM schemes which are due to be rolled out in UK and EU in 2026.
- CBAM—issue around investment confidence and social justice.
- Good to look at CBAM as an evolving policy in the context of expanding ETS in the UK.

Clean market mandates

- How effective are clean market mandates in shifting manufacturing and consumer behaviour and how do they need to interact/align with other policy incentives/frameworks? What would be the impact of their effectiveness on the reduction of penalty levels?
- Evidence on international experience on successful implementation of clean heat mandates.

Investment and innovation

- Explore risk appetite of investors and reallocation of public funds and its effect on energy infrastructure—a key observation is moving out of renewable energy project by large players in Europe.
- Worth linking innovation with strategic innovation fund. There is an attempt to deploy impact, but it is challenging to implement.
- How to pin down investment and sustain it in NetZero space. How do we maintain investor confidence.
- Driving investor confidence in green technologies – what's the changing state of this confidence and what's driving it and what it it's impact e.g., on carbon price?

Flexibility

- Framing questions around flexibility not just in terms of systems and technologies and challenges around replacing flexibility provided by gas, but regarding fairness and equity and appropriate policy interventions and incentives.
- Assessing emerging data centres and their influence on large electricity demand.
- Propose a piece of evidence on AI and data centres-especially the cost to do it.
- Systemic review on where exactly system flexibility should be focused considering different views from studies and experts.

Long duration energy storage

- Long duration energy storage - different duration availability to the systems and different ways of providing support schemes.
- Offering insights and analysis on long duration storage including how it's defined.
- More evidence on long duration storage and green hydrogen should be prioritised as it will help to understand how to reduce cost.

Grid planning, demand-side management and electric vehicles

- A grid planning issue is in understanding the headroom capacity of the last mile of distribution networks. Which archetypal homes or areas are more likely to have constrained capacity first and therefore not be able to install new low carbon

electricity technologies such as heat pumps and electric vehicle chargers. And what demand-side technologies could alleviate this constraint, like demand-side management technology?
- Addressing issues around grid connection and how it influences the energy system.
- Identifying evidence to support recommendations on what can be done to achieve desired EV deployment levels.
- Assessing when the differential between public and private charging facilities for EVs becomes politically salient.

Gas, hydrogen and CCUS infrastructure

- Managing the future gas grid and decommission of the gas network.
- Decommission of the gas network/infrastructure is not well addressed in the UK-evidence around modelling different approaches and what the model to deliver will look like is one important area to focus.
- Where does green hydrogen fit and what is its best role in the energy system? - A key focus could be its role as constraint management tool—such as managing curtailment.
- Hydrogen storage should be central to evidence on decarbonisation of the energy system.
- Evidence on impact of international hydrogen trade on the UK sector especially on price and supply. Useful evidence will be to focus the most sensible way to use hydrogen.
- Developing framing on questions around impacts of international hydrogen trade on the UK including what makes sense to import as well as developing an export market.
- A piece of evidence on technical viability of CCUS in the UK-a lot more evidence is on economic and policy-what project has work in the UK.

Low carbon heat

- How has the evidence changed in terms of heat pump installation and the level of retrofitting required, particularly given new heat pump technologies emerging?
- Balancing roll-out of low-carbon heat and the cost to existing gas boilers.
- Assessing funding of policies needed to incentivise electrification of heat sector.
- Global review on incentives to roll out heat pumps for households with emphasis on installation and technology costs.

Geopolitics and international supply chains

- Geopolitics effects on energy infrastructure development and renewable energy projects.
- Establishing what needs to happen to optimise economic efficiency for the UK in an increasingly volatile geopolitical environment – move towards greater harmonisation and for shift to greater protectionism? Where does the UK sit in relation to this and its plan for industrial transitions? Is growth primary and if its green all well and good, but that's no longer the primary driver? What's the UK's approach to accessing global supply chains vs domestic content production?

Workforce and skills

- Workforce attraction and retention in the context of energy transition

In addressing worker and skills challenges, are government actions sufficiently coordinated across departments, and levels (e.g., devolved and national)?
- Evidence on workforce should focus on practicalities of how we can do it instead of reporting on the numbers (numbers are first step but how do we achieve it?)

Public engagement in climate policy and net zero
- Informing public engagement campaigns – what works, what's effective, how can they support consensus building, particularly given the backdrop of fracturing political consensus on climate and the uptick in the 'politics of grievance'. How far are public opinions shaped by changing political narratives?
- Linked to point above and questions around public attitudes to net zero and low carbon investment – how attitudes are changing over time e.g. to new net zero technologies such as heat pumps – and what is influencing the change in attitudes e.g. political narratives, government action (e.g., boiler upgrade scheme) industry shifts (e.g. announcements by BP and Shell on shifting focus back to fossil fuels), peer experiences (e.g. neighbours who have installed heat pumps).

Energy access and inequality
- Inequality is not so high on the agenda of UK energy policy.
- Addressing energy access inequalities also needs to take into consideration class inequalities as well as those linked to race and gender.

Energy policy and devolution
- There is a need to look at evidence on the energy policy from all devolved nations' perspectives, e.g. the isolation of Wales and Northern Ireland from GB Energy issues.
- Need to explore more on interaction of GB Energy and national wealth fund.

Environmental impacts and circular economy
- Need for strategic discussion on environmental impacts of UKERC work in general
- Suggest to UKERC Theme 1 to consider environmental benefits associated with the research projects.
- Assessing community and regional impacts of energy projects and issues about biodiversity such as in the context of circularity (circular economy).

Other considerations in terms of timing and framing of projects/findings
- Moving into a phase of the policy cycle (2025/26) where Government will be seeking out academic/third sector evidence to support ongoing delivery of decisions articulated in their manifesto.
- Comprehensive Spending Review outcomes and changes to funding for energy/infrastructure programmes will need to shape decisions on projects and framing of findings.
- Current project on zonal pricing can bring much needed rigour to debate pre- and post-decision by Government (which is imminent) and into the implementation phase.
- The need to revisit zonal pricing after some time considering UKERC has release a latest report on the subject matter.
- Pathways to address a lot of issues on workforce in the NetZero space.
- Output from RR should consider what offers direct recommendation-key outputs that can be used for communication.

- Other topics worth considering include policy design around security of energy supply.
- Also, on heat networks—can low-carbon heat roll out deliver consumer benefits? Does the evidence support it or otherwise.
- Important to give attention to role of households and residents in systems and flexibility in addition to focusing on industry.
- There is a need for more evidence on energy infrastructure cost option such as pylons.
- Decommissioning of gas infrastructure is not time sensitive but important and hence could be considered for next run of consultation.
- Good for focus on how to get actions to happen on existing public attitude evidence instead of additional evidence.
- There is appetite on policy evidence on mechanisms to get energy companies to share profits to help ease consumer electricity bills.
- There is a need to focus on cross-sectorial needs of skilled workforce for the energy transition—which is often overlooked. Good to come out with timely evidence along with the NetZero workforce action plan to be release by the UK Government.

Annex 3: Consultation Participants

In Person Consultation Participant Organisations

- Imperial College London
- University of Birmingham
- Plymouth Marine Laboratory
- University of Leeds
- University of East Anglia
- Tavistock Institute of Human Relations
- National Grid
- Energy Systems Catapult
- Association for Decentralised Energy
- UK Energy Research Centre
- Innovate UK
- Scottish Gas Networks
- Sizewell C
- SSE
- Centre for Net Zero
- DESNZ
- Energy Savings Trust
- Greenpeace

Bilateral Consultation Organisations

- Ofgem
- EDF
- National Audit Office (NAO)
- Welsh Government
- Scottish Power
- WWF
- Climate Change Committee