



Original research article

The pursuit of interdisciplinary whole systems energy research: Insights from the UK Energy Research Centre



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ABSTRACT

Interdisciplinary whole systems research (WSR) is attracting increasing interest as a way to address to complex societal challenges such as sustainable energy. However, WSR typically involves challenging research elements (*radical* disciplinary scope, *integrative* knowledge production and *transdisciplinary* design), which are seen by some as intellectually and institutionally flawed. Drawing on the interdisciplinary studies literature, this paper considers WSR strategy and practice in the UK Energy Research Centre (UKERC) over its first two phases (2004–14) and compares UKERC to other similar UK-based initiatives. WSR strategy and practice face a number of tensions: integration versus diversity, stability versus flexibility and independence versus engagement. The emphasis in UKERC was on integration in the first phase and diversity and flexibility in the second phase – a pattern largely imposed by funders, assessors and stakeholders, rather than by internal strategy. Though granted ambitious remits, WSR is often funded, practised and assessed in the margins of disciplinary based research systems, rather than as a distinctive research form. There is a need to better attend to the choices and trade-offs involved in WSR strategy and practice, drawing on the experiences of UKERC and other initiatives. As a guide, the paper introduces a number of interdisciplinary WSR archetypes.

1. Introduction

1.1. Background

Interdisciplinary research is often seen as a promising way to respond to urgent and complex societal challenges such as sustainable energy (e.g. [1–3]). The proponents of interdisciplinary responses to complex socio-technical problems tend to have in mind research which reaches across the physical, social and environmental sciences – sometimes referred to as ‘radical’ interdisciplinarity [4] – and which develops an integrated ‘whole systems’ perspective [5–7]. This is found, for example, in a number of recent energy research and policy initiatives aimed at ‘whole systems integration’ [8,9]. WSR approaches may also feature the strong involvement of non-academic stakeholders (policymakers, businesses and civil society groups) in research design and production – referred to a ‘transdisciplinary’ research [10]. Interdisciplinary WSR can therefore be defined as having distinctive *radical*, *integrative* and *transdisciplinary* elements, in various combinations.

Alongside the many advocates and enthusiasts for interdisciplinary WSR research are a few questioning or sceptical voices. Daniel Sarewitz has suggested that such research has very little actual capacity to solve complex problems, and often constitutes little more than hubris [11].

Jerry Jacobs has also questioned the value of integrated interdisciplinary solutions to complex societal problems [12]. Other cautionary voices include senior researchers who have led or reviewed WSR programmes, and who report-back on the difficulties encountered (e.g. [1,13,4,14]).

This mix of enthusiasm and advocacy alongside scepticism and caution suggests the need for empirical studies of WSR experiences. Drawing on the interdisciplinary studies literature, this paper considers the experiences of the UK Energy Research Centre (UKERC) over its first decade (2004–14), within wider WSR efforts on energy in the UK. In analysing the UKERC case, the aim here is to open-up the ‘black box’ of interdisciplinary research strategies and practices [15].

1.2. Design and method

The analytical focus here is the development of interdisciplinary WSR strategy and practice within UKERC (Fig. 1). The paper does *not* attempt to comprehensively assess UKERC’s research themes, projects and researchers. However, UKERC’s pursuit of WSR was greatly shaped by ‘external’ influences – funders, advisors and stakeholders – and these are also part of the analysis. The wider context for energy research – though an important backdrop – is outside the scope of the study, as are

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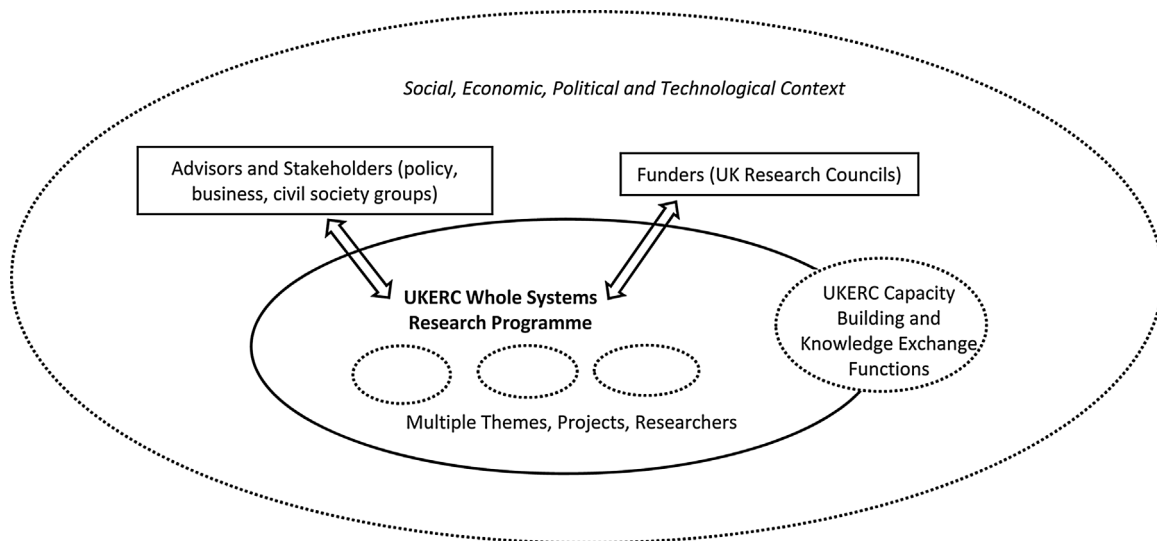


Fig. 1. Case Study: UKERC's Interdisciplinary WSR programme.

UKERC's 'non-research' activities.

The case study is based in-part on empirical fieldwork carried out towards the end of UKERC's first decade. (UKERC is continuing in revised form until 2019, but this 'Third Phase' is not studied here). Fieldwork included a residential workshop of interdisciplinary energy researchers ($n = 49$), a facilitated group discussion of UKERC researchers and stakeholders ($n = 15$), a survey of the UKERC research community ($n = 90$) and a series of semi-structured interviews with UKERC researchers, advisors and stakeholders ($n = 18$). (Fieldwork details are available from the UKERC website). The following codes are used for fieldwork participants:

- EC1, EC2 etc.: Early Career Researchers (PhD Students and postdocs with less than c.5 years' experience)
- MC1, MC2 etc.: Mid-Career Researchers (with at least several years of research experience)
- SR1, SR2, etc.: Senior Researchers (with senior roles and at least 10–15 years of experience)
- AA1, AA2, etc.: Academic Advisor (external academics with an advisory role in UKERC)
- EA1, EA2, etc.: External Academic (interdisciplinary academics with no role in UKERC)
- SA1, SA2, etc.: Stakeholder Advisors (senior figures from industry, policy etc.).

The fieldwork was aimed at soliciting both an inside and external view of UKERC's WSR strategy and practice. Although the fieldwork sample included many participants in the UKERC research programme, it also included many external academics and non-academic stakeholders (policymakers, business and third sector organisations) not directly involved: two-thirds of the interviewees, one-third of group discussion participants and three-quarters workshop attendees were not directly involved with UKERC. (Among those directly involved, most were only part-time and temporary UKERC members, alongside other academic responsibilities).

The case study has also involved a review of relevant internal, grey and public papers, and the personal experiences of the author, who was closely involved in UKERC's research strategy for most of its first decade. While this close involvement has enabled access to documents and a close working knowledge of the case, it may raise concerns about impartiality and objectivity. There are a number of responses: firstly, the paper has the benefit of 'historic distance': it reports UKERC experiences up to 2014, rather than an assessment of its ongoing operations (the author has a reduced role in UKERC Phase 3). Secondly, the

paper is not aimed at assessing UKERC's specific research *outputs* and *impacts* (a number of independent assessments of these were carried out over the period analysed here). The concern here is rather research *strategies* and *practices*, drawing on the views of a wide range of UKERC participants, advisors and observers, as well as the personal insight of the author, so as to contribute to a body of such research in interdisciplinary studies.

While the case study selection is partly based on pragmatism, UKERC is also a compelling case for a study of WSR strategy and practice: a relatively longstanding part of interdisciplinary energy research in the UK, with a particular remit and experiences across two distinct phases set against a changing context. While a number of other comparable interdisciplinary initiatives have published accounts of their interdisciplinary experiences (e.g. [1,13,16,17]), this is the first account of the UKERC experience, and interdisciplinary WSR remains a relatively under-researched topic in interdisciplinary studies.

Any single case inevitably reflects many specifics [18]. For example, UKERC may be expected to reflect a UK 'style' of energy research, involving a relatively fragmented and fluid set of organisations [19,20]. The energy sector also presents a distinctive setting for interdisciplinarity, with a set of pressing policy drivers and statutory commitments, (especially, for this case, the UK Climate Change Act; [21]). In terms of expertise, energy research has a traditional orientation to physical sciences, engineering and economics [22], although more diverse research efforts have developed recently, as UKERC itself exemplifies.

To help discriminate between case specifics and wider patterns (i.e. the 'generalisability' of case findings) the paper includes a review of the relevant interdisciplinary research literature, organised around the challenges of WSR (radicalness, integratedness, transdisciplinarity and institutional contexts) (Section 3). The paper also includes a structured comparison of UKERC and similar UK interdisciplinary initiatives (Section 5). While there are many forms of interdisciplinary energy research, the comparison in Section 5 is restricted to particular UK-based centres and programmes which, like UKERC, were funded by the UK Research Councils as coherent WSR programmes or centres, and which have a body of supporting documentary and empirical evidence, including fieldwork carried out as part of the UKERC case.

The next section (Section 2) presents a narrative, chronological account of UKERC's pursuit of WSR across two five-year phases, based on document analysis and fieldwork. Section 4 is an interpretative analysis of the case study based on themes identified in the interdisciplinary studies literature in Section 3. Section 6 concludes and offers recommendations regarding publicly funded efforts at WSR.

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