

Institution: University of Sussex		
Unit of Assessment: 17 – Business and Management Studies		
Title of case study: Scrutinising Nuclear Policy in the UK: Revealing civil-military industrial interdependencies		
Period when the underpinning research was undertaken: 2013 – 2019		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Andrew Stirling	Professor of Science & Technology Policy	1993 – present
Philip Johnstone	Research Fellow	2013 – present
Period when the claimed impact occurred: 2016 – 2020		
Is this case study continued from a case study submitted in 2014? N		
1. Summary of the impact <p>Stirling and Johnstone's work has uncovered the role that UK civilian nuclear power plays in subsidising UK military submarine capabilities. This has:</p> <ol style="list-style-type: none"> 1) Enhanced citizen and consumer awareness and lead to public scrutiny of UK energy policy 2) Stimulated policy debate and helped open up democratic discussion towards more transparent policymaking in the UK, enabling more robust discussion around the full cost implications of UK civil and military nuclear infrastructures taken as a whole. <p>The research reveals large-scale economic dependencies of the UK military submarine industry by adding hidden consumer funding to taxpayer support for civil nuclear new builds (like Hinkley Point C), so exposing how civilian nuclear power subsidises military nuclear R&D and skills bases. This link is helping to lock the UK into expensive nuclear power, for which consumers bear the cost hidden in elevated energy bills. With implications of several billions of pounds in terms of the potential subsidy from consumer energy bills to defence nuclear activities, beneficiaries include the UK public, electricity consumers and policy actors working in their interests.</p>		
2. Underpinning research <p>As part of the ESRC-funded Discontinuity in Technological Systems (DiscGo) project from 2013 until 2016, Andy Stirling and Phil Johnstone have undertaken research on the policy evolution of UK nuclear power. They have identified the hitherto entirely neglected role that pressures to sustain nuclear submarine capabilities play in driving the UK's 'nuclear renaissance'. The research has clearly indicated the role played in driving the UK's nuclear power revival by the publicly-acknowledged military priority of maintaining the national skills base for building and operating nuclear submarines. They found compelling and previously unacknowledged links in military documentation from 2003-2017 that civilian nuclear capabilities have played a key role in sustaining military-related nuclear capabilities, particularly around submarines. See referenced publications below.</p> <p>[R1] developed and applied a novel set of criteria to compare UK and German nuclear policy, which found that the UK's enthusiasm for new nuclear was difficult to understand based on conventional theories of change in innovation systems and energy transitions. The article outlines that the presence in the UK (but not in Germany) of military nuclear activity (including nuclear submarines) is an important, yet almost entirely unexamined, reason for the UK's attachment to civil nuclear. It calls for greater attention to this issue.</p> <p>[R2] then examines a variety of theories on incumbency and develops a novel analytical approach for researching 'deep incumbency' based on a 'configuring fields' approach. Deep</p>		

incumbency is a term developed by the authors that is attentive to deeper and more distributed power dynamics than are normally addressed in this kind of research – extending not only across the individual sectors on which research usually focuses, but also pervading entire polities. Interdependencies documented in this research between military submarine and civil nuclear power industries exemplify a deep incumbency that evidently implicates several nations. In order to enable research to better address this hitherto neglected form of incumbency, the paper defines contrasting ‘open’ and ‘closed’ topologies of incumbency – as respectively seen under an ‘eagle-eye’ and a ‘worm-eye view’. It is the latter lens that forms the conceptual background to researching the dynamics of military-related nuclear activities impinging on civil nuclear power trajectories.

[R3] builds on the theme of deep incumbency by highlighting – through a detailed documentary analysis of UK military-related and civil nuclear policy documentation – how the UK’s energy trajectory is locked-in to new nuclear due to pressures to maintain nuclear submarine capabilities, which have been entirely neglected by the energy policy community.

[R4] tests the ‘deep incumbency hypothesis’ on nuclear submarines being a driver of UK civil nuclear commitments by conducting an extensive documentary analysis of policy documentation related to both civil and military nuclear power in the UK and using a coding process to organise key statements on both civil and military nuclear power. This involves the publishing of extensive further evidence on how the priority of maintaining UK nuclear submarine capabilities is influencing the intensity of UK civil nuclear ambitions.

In [R5] new substantive evidence that emerged in 2017 was examined including documents, reports and statements by politicians and industry in different countries that highlight military-related nuclear activity as influencing civil nuclear new build. This performed a pattern-matching analysis exploring the relationship between the intensity of different countries’ civil nuclear new build ambitions and their nuclear weapons and military status. A clear correlation was found in which countries with ambitious nuclear new build agendas tend either to be existing or aspiring nuclear weapons states.

These papers provide rigorous empirical analysis and conceptual contributions. Overall, the papers have presented significant evidence of interdependencies between civil and military nuclear activities both in relation to global patterns of nuclear new build and the detailed case of the UK. A crucial finding is that the sustaining of the industrial base for military-related nuclear activities – in particular for nuclear submarine construction, maintenance and operation – is a key (albeit hitherto undocumented) factor influencing nuclear new build with significant economic and democratic implications.

3. References to the research

All references have been peer-reviewed, and R1, R2 & R3 have been double peer-reviewed. R1 is being submitted as an Output to REF2. Insights generated in the working papers contributed to elements of the published papers.

- R1. Johnstone, P. Stirling, A. (2020) Comparing nuclear trajectories in Germany and the UK: From ‘regimes’ to ‘democracies’ in sociotechnical transitions and discontinuities, *Energy Research & Social Science*, 59, pp. 1-27. DOI: <https://doi.org/10.1016/j.erss.2019.101245>
- R2. Stirling, A. (2019) How deep is incumbency? A ‘configuring fields’ approach to redistributing and reorienting power in socio-material change, *Energy Research and Social Science*, 58, pp. 1-23. DOI: <https://doi.org/10.1016/j.erss.2019.101239>
- R3. Johnstone, P., Stirling, A., and Sovacool, B. (2017) Policy mixes for incumbency: Exploring the destructive recreation of renewable energy, shale gas ‘fracking’, and nuclear power in the United Kingdom, *Energy Research & Social Science*, 33, pp. 147-162 DOI: <https://doi.org/10.1016/j.erss.2017.09.005>
- R4. Cox, E., Johnstone, P., Stirling, A. (2016) Working Paper Series SWPS 2016-16 (September) *Understanding the Intensity of UK Policy Commitments to Nuclear Power*, Brighton. <https://www.sussex.ac.uk/webteam/gateway/file.php?name=2016-16-swps-cox-et-al.pdf&site=25>

R5. Stirling, A., Johnstone, P. (2018) Working Paper Series SWPS 2018-13 (August) *A Global Picture of Industrial Interdependencies Between Civil and Military Nuclear Infrastructures*: <https://www.sussex.ac.uk/webteam/gateway/file.php?name=2018-13-swps-stirling-and-johnstone.pdf&site=25>

Grants/Awards:

Geels, Frank W (50%) / Stirling, Andrew C (50%) ESRC ES/K006371/1, £396,408 to Sussex. Open Research Area (ORA) call, *Governance of the Discontinuation of Technological Systems (DiscGo)*, 31 January 2013 to 31 July 2016.

4. Details of the impact

For several decades, the nuclear industry has repeatedly strongly denied any significant link between civil and military nuclear capacities. Uniquely initiated by Stirling and Johnstone's research [R1-5] – which uncovered the role that civilian nuclear power plays in subsidising submarine-related military nuclear research and development needs and skills bases – new policy and public media debates have been incited and informed by the research evidence.

Enhanced consumer awareness and public scrutiny of UK energy policy

Before 2016, there was no acknowledgement at all of the submarine-specific link between civil and military nuclear capabilities and other connections were more generally denied. Since publishing research output [R1] the researchers have engaged in media work, given written and oral evidence to parliamentary committees, and held speaker engagements and meetings to raise awareness of the issue. Initially, there was great difficulty getting the research reported in UK mainstream media outlets, but it was covered by the *New York Times* on 10 October 2016 ('Britain's nuclear cover up') and in the German daily *De Tageszeitung* ('Hidden Money für Atom-U-Boote') on 23 November 2016 [S1a&b]. The coverage first brought this entirely neglected issue into the public domain, with the research gaining international media attention and increasing UK consumer and energy policy awareness.

Evidence submitted to the Public Accounts Committee's Hinkley C inquiry (October 2017) led to the first UK mainstream media coverage of the nuclear subsidy issue, published in a leading British newspaper, *The Guardian*: 'Consumers to fund nuclear weapons through Hinkley C', 12 October 2017 followed by 'The "dreadful deal" behind the world's most expensive power plant', 21 December 2017 [S1c&d]. Based on the research, these articles raised awareness amongst British consumers that higher energy bills due to new nuclear rest in part on military reasons. Subsequent media articles have been published. After presenting the research at the Oxford Energy Colloquia, the authors were approached by BBC journalist Roger Harrabin, who wrote a BBC news article: 'Nuclear: Energy bills "used to subsidise submarines"', 5 June 2019 [S1e]. This led to articles being published on the research in *The Independent* ('Homeowners forced to pay higher energy bills to subsidize nuclear submarines', 5 June 2019), *The Scotsman* ('Energy bills subsidising Scotland's submarines', 6 June 2019) [S1f&g] and later (significantly) a detailed sympathetic feature in *The Daily Telegraph* ('Britain's push for nuclear power makes no sense, unless it is a hidden subsidy for the Royal Navy' online, and 'With the UK case for nuclear power lost, the battle now is one of defence' in print, 16-17 December 2020) [S1h]. This media coverage, directly informed by the research, has enhanced consumer awareness of what energy bills are paying for over several years, challenging established norms.

Stimulated policy debate and opened up democratic discussion towards more transparent policymaking

The researchers' written and oral evidence to the Public Accounts Committee's (PAC) Hinkley C inquiry in October 2017 highlighted the entirely neglected role that sustaining capabilities for the nuclear submarine programme plays in the UK Government's intense support for a civil nuclear programme, and thus helped to highlight this issue to parliamentarians.

The Committee's Chair, Meg Hillier MP, was influenced by the researchers' evidence, which she drew on and cited in a subsequent oral evidence session (9 October 2017) in order to question (Q84) Mr Stephen Lovegrove CB (Permanent Secretary for the Ministry of Defence) on the advantages of a civil nuclear programme for the submarine programme [S2a]. This led (for the

first time on the public record) to a UK Government official confirming that there are linkages between civil nuclear new build and the submarine programme, and that the civil nuclear new build programme was beneficial with regard to submarine capabilities [S2a]. With implications possibly extending to many tens of billions of pounds, this first public acknowledgement of the research findings [R1-5] is very important in terms of transparent policymaking.

This large-scale cost issue – relating to the cross-subsidy of military capabilities by civil nuclear consumer revenues, as well as related assessment and planning issues – was picked up in the PAC's report on Hinkley C [S2a], in which the Committee recommended that:

- a) The Department (BEIS) should tell the Committee how it will ensure there is an independent and transparent assessment of the impacts on consumers, including the impacts on the poorest households, when agreeing future energy infrastructure deals that are paid for through consumers' bills.
- b) The Department should re-evaluate and publish its strategic case for supporting nuclear power before agreeing any further deals for nuclear power stations.

The Government agreed with these recommendations [S2b].

In the year following publication of the research, there have been a number of high-profile reports that have confirmed exactly the same linkages so distinctively highlighted in this research. This includes a high-level report by Ernest Moniz, former United States Secretary of Energy, released on 12 July 2017 [S3a], and acknowledgements in the UK of civil-military linkages by Rolls Royce in their document on Small Modular Reactors published on 12 September 2017 [S3b].

Since the inquiry, parts of Government have been increasingly open about civil-military nuclear linkages. They have not cited this research, but under the circumstances this would not be expected, since it involves implicit acknowledgement of past concealment of these linkages. Yet, in the UK Government's 'Nuclear Sector Deal' document (7 December 2017) [S4] there is frequent reference to the 'synergies' between the two programmes and how the Government aims to ensure the transferability of nuclear workers between them. In another example, Richard Harrington, under-Secretary of State for Business Energy and Industrial Strategy (BEIS), stated on 11 July 2018 that he wants to "include the MoD in everything we do" on nuclear and that the "artificial distinction" between civil and defence nuclear should come to an end [S5]. Such stark statements by Government Ministers have only occurred since this research has been published and publicised in the media.

Most recently, the research, submitted as evidence to the BEIS inquiry into the financing of energy infrastructure and published by BEIS on 5 June 2019 [S6] has influenced parliamentarians to request an inquiry into the link between Civil and Military Nuclear Use, citing research as the basis for calling for an inquiry into this issue [S7].

A motion was lodged in the Scottish Parliament on civil-military nuclear linkages (6 June 2019) explicitly stating that "...the Parliament notes analysis by the University of Sussex, which suggests that energy bills are inflated to partly subsidise the UK's nuclear weapons arsenal" and that this provides "a compelling explanation for the UK's resolute commitment to nuclear energy projects" [S8].

The research has thus changed UK policymaking practice, influencing political moves to influence Government towards greater transparency regarding subsidies for nuclear submarines through energy bills. In short, through this work, the issue has moved from being entirely neglected within UK democratic institutions in 2016 to being a live policy issue under increasing scrutiny by 2019.

5. Sources to corroborate the impact

S1. Media list

S2. Public scrutiny of nuclear subsidy as in:

- a) House of Commons Committee of Public Accounts, statement confirming link by Stephen Lovegrove, Permanent Secretary of the MoD 3rd Report - Hinkley Point C (22.11.2017): <https://publications.parliament.uk/pa/cm201719/cmselect/cmpubacc/393/393.pdf>
 - b) Treasury Minutes on the Government response to the Committee of Public Accounts on the Second and Third reports from Session 2017–19 (25.01.2018): <https://www.parliament.uk/documents/commons-committees/public-accounts/Cm-9565-Treasury-Minutes-jan-18.pdf>
- S3. Linkages outlined by research confirmed in high-profile reports such as:
- a) Energy Futures Initiative (17.08.2017) – led by Ernst Moniz. Available at: <https://static1.squarespace.com/static/58ec123cb3db2bd94e057628/t/59947949f43b55af66b0684b/1502902604749/EFI+nuclear+paper+17+Aug+2017.pdf> and;
 - b) Rolls Royce, UK SMR: A National Endeavour, p.22 (12.09.2017): *“the expansion of a nuclear-capable skilled workforce through a civil nuclear UK SMR programme would relieve the Ministry of Defence of the burden of developing and retaining skills and capability. This would free up valuable resources for other investments.”*
- S4. Industrial Strategy: Nuclear Sector Deal, HM Government (07.12.2017): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/720405/Final_Version_BEIS_Nuclear_SD.PDF [PDF file]
- S5. Richard Harrington, Hansard, Columns 353WH-356WH Nuclear Sector Deal, UK Parliament (11.07.2018): <https://hansard.parliament.uk/commons/2018-07-11/debates/6F49AF80-F000-4AE7-9A1F-D45827C3975E/NuclearSectorDeal>
- S6. Written evidence submitted to BEIS inquiry on financing energy infrastructure (05.06.2019): <http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/busine-ss-energy-and-industrial-strategy-committee/financing-energy-infrastructure/written/99378.html>
- S7. SNP calls for inquiry into civil military links based on SPRU evidence (05.06.2019): <https://www.commonspace.scot/articles/14327/snp-demands-inquiry-link-between-immoral-trident-nukes-and-uk-energy-bills>
- S8. Motion lodged in Scottish parliament on civil-military links citing SPRU research (06.06.2019): <https://www.parliament.scot/parliamentarybusiness/28877.aspx?SearchType=Advance&ReferenceNumbers=S5M-17597&ResultsPerPage=10>