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A Significant Moment in the Development of Nuclear Liability and Compensation: Dealing With the Consequences of the Windscale Fire 1957.

Introduction

The fire at the Windscale Nuclear plant in October 1957 transformed an installation which was once a grand symbol of technological pride into a 'dirty relic of an early nuclear age'.[2] Nuclear power became associated with destruction, accidents and unimaginable apocalyptic images which reinforced human fallibility and the erratic nature of nuclear material.[3] However, Britain's post-war society was oblivious to the threat of a nuclear reactor experiencing a meltdown. In fact, during the fifties, politicians, scientists and the general public hoped that Britain's ambitious atomic energy programme would offer an escape from its dependence on coal for the country's energy requirements and restore the nation's industrial prestige. David Edgerton pointed out in *Warfare State* that techno-nationalism had become a powerful ideology within the realities of 'austerity Britain'.[4] By investing in nuclear technology, Britain was not only creating the right conditions for the country's scientific growth but was also supporting its engineering and power-generating development. Hence, nuclear power was a key facet of Britain's post-war future.[5]

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[2] Russell Jenkins, 'Fifty years on, the deadly legacy of atomic accident to be cleaned up', *The Times*, 5 October 2007, p. 30.

[3] W. J. Nutall, *Nuclear Renaissance: Technologies and Policies for the Future of Nuclear Power* (Bristol: Institute of Physics Publishing, 2005), p. 65.

[4] David Edgerton, *Warfare State: Britain, 1920-1970* (Cambridge: Cambridge University Press, 2008), p. 104.

[5] Peter Hennessy, *Having it so good: Britain in the fifties* (London: Penguin, 2007), p. 460.

Nevertheless, these hopes were dashed when the Windscale fire released radioactive material into the atmosphere. The accident had important social, financial and political consequences not just upon a specific interest group, but also upon post-war Britain's society and economy.[6] The ensuing complex challenges that were created due to the particles of Iodine-131 and Strontium-90, in the radioactive fall-out being carried by the wind across the local area, were unprecedented for the fledgling United Kingdom Atomic Energy Authority. Resultantly, this incident was the first experience within a Western and liberal democracy for which assessments needed to be made in order to calculate compensation for the resulting radiation damage. One of these challenges was the formulation of compensation for the agricultural community which was deeply affected by the accident's recognisable yet invisible damage. Consequently, the Authority felt obliged to 'pay compensation for milk that was disposed of'.[7] The media at the time reported that the Windscale fire was a 'mishap' rather than an accident and the radioactivity produced by the event was played down:

> Ever since the mishap experts have carried out extensive tests in the area for any increase in radioactivity which might endanger the public. They found that the levels of external radiation were very small and not dangerous.[8]

Behind this media coverage, there was concern among the general public and the farming community concerning both nuclear technology and the safety of agricultural produce from the Windscale area.[9] The milk ban was included in the Windscale incident's history but there was only modest reference to the farmers receiving compensation for the milk affected by the fall-out within the media at the time or from historians. Moreover, this important factor was not

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[6] M. G. Segal, 'The role of MAFF following a nuclear accident' in W. A. Crosbie and John Gittus (eds), *Medical Response to the Effects of Ionising Radiation* (London: Elsevier, 1989), p. 209.
[7] *Ibid.*, 18.
[8] 'Milk from farms near Windscale stopped', *The Times*, 14 October 1957, p. 10.
[9] 'Farmers given assurance on reactor effects', *The Times*, 23 October 1957, 6.

included in the coverage of the fiftieth anniversary in October 2007 of the Windscale accident.[10] This is despite the fact that compensation was, and continues to be, a significant part of the event's legacy. Instead, it has been assumed that the 1986 Chernobyl accident was the first case where compensation was awarded to the British farming community for damage caused by a nuclear accident. Zhores Medvedev revealed that the resultant ban on sales and restrictions on the movement of contaminated animals affected three million sheep and lamb sales. As a consequence of this, the British government paid over £4 million in compensation during the first year of the accident.[11] However, the Scottish and Welsh famers, like the farmers affected by the Windscale fire, had to continue working their farms against both the high level of negative publicity in the media and the legacy of the fallout:

> During the 1987 agricultural season, the movement of about 300,000 sheep on 466 holdings remained restricted; two (for some probably three) lambing seasons were ruined on these farms. At the end of 1987, 475,000 sheep could not be sent for slaughter because they had absorbed excessive amounts of radioactivity from grass in upland areas.[12]

Within the historiography of nuclear power, the issue of compensation has only received slight attention. Hence, by emphasising the role that compensation played in shifting Britain's attitudes towards the safety of nuclear power, this article will make a significant contribution to the historiography of nuclear power's development in the United Kingdom. The issue of compensation for the agricultural community affected by the Windscale accident will be examined in this article. Firstly, it will investigate the perceptions of nuclear power as a key to Britain's post-war role and how compensation in relation to nuclear power was an unresolved

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[10] Jenkins, 'Fifty years on', p. 31.
[11] Zhores Medvedev, *The Legacy of Chernobyl* (Oxford: Basil Blackwell, 1990), p. 218.
[12] *Ibid.*

dilemma. Then it will take into account and reveal the criteria used to determine the compensation that the farming community would receive from the United Kingdom Atomic Energy Authority, hereafter: the Authority. Lastly, it will suggest the idea that controlled compensation within the framework of nuclear power was vulnerable to influences outside of the legal criterion. The entwined aspects of nuclear energy and agriculture contributed towards the perception of the quality of farm produce, and the environmental implications and safety of nuclear power. In addition, it is worth considering other contextual factors which affected compensation as a result of Windscale; including the concern expressed to reduce farm subsidies in 1955 by Harold Macmillan, the Chancellor of the Exchequer.[13] Consequently, the restricted compensation for the Windscale accident became shrouded and understood within the limits of a conspiratorial perspective.

To conceptualise compensation in the context of the history of nuclear power it needs to be re-defined to take into account the unique challenges that radiation presented for liability claims. Kent E. Calder in his work on post-war Japanese politics defines compensation as a conceptual variable whereby 'material benefits, usually distributive in character … [are] … extended to support groups exerting strategic political efforts on behalf of the grantor'.[14] Yet, it is my contention that compensation, in the context of nuclear power, was not simply a politically motivated conceptual variable. John Lewis Gaddis argues against conceptual variables and instead promotes the idea of interdependent variables since 'you can hardly break things up into their component parts because so much depends upon so much else'.[15] In respect of the Windscale accident, both Calder's and Gaddis's arguments were not mutually exclusive, yet they can help clarify the intricate nature of how compensation was conceptualised as a result of the

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[13] 'Balancing Farm Subsidies', *The Times*, 31 October 1955, p. 12.
[14] Kent E. Calder, *Crisis and Compensation: Public Policy and Political Stability in Japan, 1949-1986* (Princeton: Princeton University Press, 1988), p. 159.
[15] John Lewis Gaddis, *The Landscape of History* (Oxford: Oxford University Press, 2002), p. 52.

Windscale fire of 1957. The thesis that I will put forward is that the issue of compensation in association with nuclear power was an intricate political, social and economic subject rather than solely a material transaction between two parties. It became an interdependent variable because compensation within this field was dependent on other components outside the subject's legal criteria. This meant that compensation was controlled in order to protect the fledgling Authority from unrealistic damage claims. Hence, this type of compensation evoked strong emotional, economic and political connotations beyond the legal forum.

The limits of ambition and nuclear liability

The aspirations for Britain to establish a powerful role in atomic energy led to the 1954 Atomic Energy Authority Bill. This created the United Kingdom Atomic Energy Authority as a statutory corporation to oversee the development of atomic energy. During the Bill's debate in the House of Lords, the Liberal Viscount Samuel affirmed that if the Bill was passed as an Act of Parliament then history and future generations would look back upon this event as 'the beginning of a new industrial age'.[16] Therefore, his support for the bill evoked the future benefits of legalising it. He characterised nuclear technology within a grander narrative which provided Britain with another chance of showing its capacity to lead the world.[17] Reductions in world oil and coal supplies along with the increased price for these resources, may make us 'dependent upon new raw materials required for [future] atomic development'.[18] However, during this debate Lord Wilmot of Selmeston, a former Labour Minister of Supply, voiced his concerns that the Bill was ill-timed and premature as they were 'still in the stage of growth, experiment and development'.[19] These were similar to the comments previously made by the distinguished British engineer Sir Christopher Hinton; a key figure in the development of Britain's atomic

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16 *Hansard Parliamentary Debates* (HL), Fifth Series, Vol. 187 (London: HMSO, 1954).
17 *Ibid.*
18 *Ibid.*
19 *Ibid.*

energy programme who became the Chairman of the Central Electricity Generating Board in 1957. He emphasised at the American Industrial Conference on 31 October 1953 that it was 'absolutely essential to have more knowledge of the safety of nuclear reactors, and that "we should learn more about the effect of an accident"'.[20] Hinton's hesitation suggested that the legislation which brought the Authority into existence, failed to clarify and consider this important point. Thus, the insurance of nuclear reactors was an unresolved process.

Yet, it seems that these pragmatic comments were ignored, and that the hopes of a nuclear future gained centre-stage: 'our need for new sources of power in this little island, with its teeming population, is second to that of no other country in the world. We cannot afford to lag behind'.[21] This sensibility of techno-nationalism was also reflected in the memoirs of the Conservative Prime Minister, Anthony Eden. He recalled on a visit to Washington soon after the Second World War, that a leading official on atomic matters from Truman's administration had said that the UK 'should lead the United States in the development of atomic power for civil use'.[22] Therefore, despite the cuts in the economy, Eden insisted that Britain's 'atomic energy programme should not be hampered'.[23] Hence by 1956, Eden's administration had extensive plans to take the lead in this new 'world-wide technological revolution'.[24] It was also reported in *The Times* on June 1957 that the entire British insurance market intended to expand its sphere of influence with a 'scheme to provide cover for future industrial atomic installations in all parts of the world'.[25] These comments suggest that the British nuclear venture was envisioned to be an organised multifaceted business enterprise that would through co-operation strengthen the British economy. This means that there also existed economic, social and political frameworks

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[20] The National Archives (TNA), AB 16/3068, Extract from a Report of Sir Christopher Hinton's address to the American Industrial Conference Board, in the *The Times* – 31/10/53, 31 December 1953, p. 1.
[21] *Ibid.*
[22] Anthony Eden, *The Memoirs of Sir Anthony Eden: Full Circle* (London: Cassell, 1960), p. 313.
[23] Ibid, p. 314.
[24] Ibid, p. 324.
[25] 'British Insurers' Scheme for Atomic Installations', *The Times*, 25 June 1957, p. 7.

which controlled and shaped 'the public interpretation of science in this field'.[26] Therefore, business opportunities were a growing part of Britain's post-war future as a confident industrial power.

Since Eden understood the possibilities of nuclear power as a new technology, Britain could utilise it to 'produce an increasing array of artificial isotopes for use in medicine, industry and agriculture in Britain and for export to Europe'.[27] The governmental pressure to create an ambitious programme which suited both military and industrial applications was intense. These demands meant that the 1954 Atomic Energy Authority Act became severely detached from the realities of nuclear technology. This distance is reinforced in a letter dated 8 November 1956 from Sir Frank Lee of the Board of Trade to the civil servant Sir Herbert Brittain. Lee believed that the insurance of nuclear reactors was still an 'important and difficult problem'.[28] It could be considered that nuclear plants were liable under Common Law and this was seen as an adequate standing for the fledging Authority. However, from a legal perspective, nuclear power posed immense challenges when insuring against the risks of its operation. This predicament was evident in the response to the Royal Navy's proposal to construct a nuclear reactor at Dounreay. Mr G. P. Humphreys-Davies, an associate within the Treasury, argued that the indemnity towards the Navy's proposed reactor in 1955 would 'create a precedent and might result in the Authority being required to give similar indemnities'.[29] He stressed that if an accident were to take place the 'Atomic Energy project would of course ensure that appropriate arrangements were made to cover disturbance and loss of livelihood occasioned by such an incident'.[30] This

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[26] Brian Wynne, *Rationality and Ritual: The Windscale Inquiry and Nuclear Decisions in Britain* (Calfront St Giles: The British Society for the History of Science, 1982), p. 16.
[27] Veronica McDermott, *Going Nuclear: Ireland, Britain and the Campaign to Close Sellafield* (Dublin: Irish Academic Press, 2008), p. 102.
[28] TNA, EG 1/169, Insurance of Nuclear Risks, Sir Frank Lee to Sir Herbert Brittain, 8 November 1956, p. 1.
[29] TNA, T 225/623, Mr Humphrey-Davies, 31 December 1953, p. 6.
[30] TNA, T 225/623, Dounreay – Fast Reactor, 14 December 1953, p. 4.

meant that the Navy intended to reimburse any party affected by the complications that arose from their reactor in Dounreay.

It has to be questioned whether the consequences of the operation of nuclear power were truly understood and successfully addressed within a legal framework. This line of enquiry was brought forward by Viscount Thurso in the House of Lords on 26 July 1956. Thurso asked the Lord President of the Council, the Marquess of Salisbury, whether Her Majesty's Government had received the complete information on accidents within atomic energy plants in North America. He also asked, 'what new safeguards have been adopted in the light of practical experience during the past year; and whether atomic plants in this country are covered by insurance?'.[31] The Marquess answered that the past year had provided a wealth of important lessons, with new safeguards and modifications being adopted.[32] However, the Marquess's answer relating to the insurance of atomic plants provided an interesting point. He stated that the Authority were 'almost wholly financed from monies voted by Parliament, and they follow the practice of Her Majesty's Government in not insuring their plants'.[33] This lack of legal concern can also be observed in a House of Commons debate on electricity and the proposed new nuclear power station at Bradwell in Essex on 30 July 1956. Since the Bradwell facility was being constructed near the Blackwater estuary, Anthony Greenwood, the Labour MP for Rossendale, inquired why the Minister of Fuel and Power, Aubrey Jones, was disregarding the evidence by expert marine biologists concerning the station's effects upon the estuary's marine life. Along these lines, Greenwood asked what compensation did Mr Jones propose 'to offer to the oyster fishermen and others whose livelihood is likely to be affected?'.[34] Jones answered that he had indeed considered the evidence of these marine biologists and secondly, compensation was a

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[31] *Hansard Parliamentary Debates* (HL), Fifth Series, Vol. 199 (London: HMSO, 1956).
[32] *Ibid.*
[33] *Ibid.*
[34] *Hansard Parliamentary Debates* (HC), Fifth Series, Vol. 557 (London: HMSO, 1956).

'matter for the Central Electricity Authority and not Her Majesty's Government'.[35] These statements from both Houses of Parliament can be interpreted as examples of political management because they reveal the Government's indecisiveness and failure to engage with the real possibility of nuclear liability. Consequently, compensation was an ignored dilemma for the Authority.

Nevertheless, a report published in April 1957 from the British Insurance (Atomic Energy) Commission did conclude that the 'capability of almost the entire British insurance market is now available to provide comprehensive cover for risks associated with the construction, ownership and operation of reactors'.[36] Nevertheless, it must be emphasised that despite all precautions and the most dedicated effort it was not possible to 'make a flawless reactor'.[37] Consequently, G.P. Humphrey-Davies, an associate within the Treasury, proposed that it was inevitable that the Authority would become 'exposed to claims for compensation'. [38] Furthermore, he thought that both 'Parliament and the public would expect the authority to meet them'.[39] Thus the issue of nuclear liability became real with the 1957 Windscale accident because it represented 'one of the public's central fears about nuclear technologies: that the scientists ... failed to consider something important'.[40]

The Accident

The technology inside the Windscale nuclear power plant was a gamble because it was an unknown element for the site's technicians. The technology of Wigner Energy involves the displacement of atom particles in a solid caused by neutron radiation. The American scientist,

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[35] *Ibid.*
[36] House of Commons Parliamentary Papers, 'United Kingdom Atomic Energy Authority. Fourth annual report for the period 1st April 1957-31st March 1958' (London: HMSO, 1958).
[37] Spencer R. Weart, *Nuclear Fear: A History of Images* (Harvard: Harvard University Press, 1988), p. 287.
[38] TNA, T 225/623, Mr Humphrey-Davies, 31 December 1953, p. 6.
[39] *Ibid.*
[40] Nuttall, *Nuclear Renaissance*, p. 68.

Eugene Wigner had expressed concern to the Authority on a visit to the United Kingdom regarding 'the dangers of low-temperature graphite moderation'.[41] Consequently, the Authority created a regular routine of heating the Wigner Energy out of graphite. This procedure was otherwise known as 'annealing'. However, this did not guarantee that the amount of Wigner Energy was reduced. One such incident occurred on 7 October 1957. Despite this annealing process within Pile Number 1, there were still sections of the moderator that contained Wigner Energy. A second attempt was initiated to correct this. However, this resulted in the heating taking place faster than expected. Consequently, the swift release of Wigner Energy caused a uranium fuel canister to burst. This then exposed the uranium fuel to constant streams of air within the facility's cooling system. As a result, the fuel within this canister ignited and created a furious radioactive fire. Previous releases of Wigner Energy had meant that improved new filters were added to the air coolant chimneys which were able to capture 'a significant fraction of the radioactivity released by the fire'.[42] However, radiation did escape from the facility. Once news of the fire reached the capital, it was clear that London was primarily 'concerned with the political, health and public relations aspects of the accident'.[43] The Authority was concerned about the management of this perilous situation which was endangering their reputation. Lorna Arnold believes a reason for their caution was 'the lack of established and well-understood Authority-wide procedures for dealing with major accidents'.[44] Fifty employees from the Authority's Cappenhurst plant who had volunteered in the first stage to decontaminate the Windscale pile alleged that, years later, health and safety standards were 'fatally compromised in the rush to render the reactor safe'.[45] One of the clean-up crew, Les Jenkins believed that the Authority did

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[41] *Ibid.*
[42] *Ibid.*
[43] Lorna Arnold, *Windscale 1957: Anatomy of a Nuclear Accident*, 3rd edn (Basingstoke: Palgrave Macmillan, 2007), p. 60.
[44] *Ibid.*, p. 59.
[45] McDermott, *Going Nuclear*, p. 109.

not 'give a toss for health and safety ... Their attitude was: Let's get this bloody pile safe and then we'll worry about the consequences'.[46]

After the embers of the graphite fire were extinguished, the test results of the surrounding area on 12 October 1957 revealed that material had caused both local and widespread radioactive contamination. The fall-out of 20,000 curies had left a contaminated residue of Iodine-131 on the local flora and fauna. This specific particle was then ingested by local animals. Subsequently, it was discovered that the Iodine-131 passed through the cattle that consumed the affected grass. The toxin then became concentrated in their milk. On 12 October, H. Howells, the Health Physics manager at Windscale, reported to Henry Davey, the facility's general manager, that tested milk samples had revealed high levels of Iodine-131. Consequently, Howell suggested to Davey that they halt the distribution of milk from local farms. However, Davey's decision was further complicated by the fact that there was no recommended level for the intake of Iodine-131. It was discovered that an intake of this particular isotope, which lodges in the thyroid, was not a health risk to most adults but it was harmful to children and pregnant women. The vulnerability of these two groups led to the Windscale health physicists unanimously agreeing to a limit of 0.1 micro curie of Iodine-131 per litre within the radioactive milk. In the light of samples ranging from 0.8 in the Seascale area and 0.4 in the outlying area, Davey decided to commence a milk ban on farms within the local area.

By the evening of that day, Davey arranged the support of the necessary local authorities to co-ordinate such a mammoth task. Members of the local constabulary and the Milk Marketing Board woke the farming community from their beds to warn them against milking their herds and then distributing their milk throughout the local area. The Milk Marketing Board's decision to assist in this disposal placed them in a perilous position. By discarding the affected milk and

[46] *Ibid.*, p. 110.

reimbursing farmers accordingly, the organisation presented themselves as 'the Authority's agents in this matter'.[47] On 15 October 1957, after continued analysis of milk samples from areas such as the Southern Scotland and North Wales, the ban was extended to a 200-square-mile radius. However, until Davey had gained the Authority's permission to stage two local meetings on 16 October 1957, the introduction and extension of the milk ban encompassing around six hundred farms, was surrounded with secrecy, creating suspicions of a cover-up. William S. Newall, the agricultural correspondent for *The Whitehaven News*, posited that within this atmosphere of suspicion rumours such as cattle becoming affected by radiation and consequently being slaughtered were accepted as fact.[48]

Some officials from the Windscale plant decided to engage with the farmers and hear their grievances. At a meeting in Gosforth Public Hall on 24 October 1957, Davey addressed an anxious farming community. Those affected by the milk ban felt as if they were 'regarded almost like lepers by their colleagues outside the affected area'.[49] Newall described the meeting's atmosphere as extremely tense, with the Windscale staff facing a hard battle, as if 'being thrown to the lions with a vengeance'.[50] Moreover, Newall noted that the farmers' responses towards the accident were relative, depending upon the individual. A minority of disgruntled farmers believed that their cattle were 'doomed and their farms valueless'.[51] In fact, they went to great lengths to 'seize on any and every rumour to add fuel to their fires of resentment'.[52] This subjectivity was also reflected in the emphasis that was placed on the meeting's points. These included 'the payment of compensation, the effect of the Windscale incident on the value of farms and cattle,

[47] TNA, AB 16/2326, Note of Discussion at the Ministry of Agriculture on 29th October, 1957, 29 October 1957, pp. 1-2.
[48] TNA, MAF 298/54, Farm Forum – A Momentous Meeting, 31 October 1957, p. 1.
[49] *Ibid.*
[50] *Ibid.*
[51] *Ibid.*
[52] *Ibid.*

and the continuation of the milk ban'.[53] However, the 'paramount concern was animal health'.[54] Therefore, although compensation was an important point, the dominant factor seemed to be the livestock's physical condition. Nevertheless, compensation became an ever-pressing concern.

On 25 October 1957, at the request of Mr Montague Keen, the National Farmers Union (NFU) Parliamentary Secretary, Mr Crooks, the NFU's local representative, held a meeting in his office. This meeting explored the problem of 'how to assess any losses which might be sustained by farmers as a result of the Windscale incident'.[55] However, the meeting minutes revealed that the accident's losses fell under several headings 'such as lack of confidence in milk and milk products leading to reduced sales, lower market prices for livestock and farm produce from the affected area and a fall in land values'.[56] Regardless, the Authority would only compensate for the dairy products affected by the milk ban. As a result of the diverse reasons to claim compensation, Mr Crooks expressed the opinion that the Authority would 'consider sympathetically any cases where farmers could substantiate claims for compensation by showing clearly that losses were directly attributable to the incident'.[57] In response, Mr Keen stated that 'if compensation were restricted in this way it would be unfortunate since farmers would not always be able to prove beyond reasonable doubt that a loss was directly attributable to the incident'.[58]

Conversely, Mr Crooks had previously proposed that the loss due to dairy products was 'comparatively simple to assess but that the long-term effects were more complex'.[59] However, in a discussion at the Ministry of Agriculture, Farming and Fisheries (MAFF) on 29 October, compensation posed complex problems for milk-producers who were also milk retailers. The

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[53] *Ibid.*
[54] *Ibid.*
[55] TNA, MAF 250/210, Notes of a meeting held in Mr. Crooks' office 2.30 p.m. 25th October 1957, 25 October 1957, p. 2.
[56] *Ibid.*
[57] *Ibid.*
[58] *Ibid.*
[59] *Ibid.*

Authority's representatives suggested that these claims would be considered on the condition that it was made 'quite clear that nothing was involved beyond milk destruction and the consequential movement of milk by the Board'.[60] Accordingly, it was evident that the NFU and MAFF understood the importance of this intricate situation. Moreover, these proceedings would set a precedent, because there might be in the 'future a similar problem for farmers in the neighbourhoods of other existing and projected power stations'.[61]

For most farmers, the milk ban remained until 29 October, when the test results of radioactivity within milk were low enough to allow for normal consumption. However, for some farmers on the coast near Windscale, the milk ban lasted until 23 November. Hence, the milk ban was unevenly distributed, with some unfortunate farmers experiencing a milk boycott that lasted over a month. This instilled grave concern within the farming community. Dairy farmers received £50,000 in compensation for the 3,050,000 litres of milk that was destroyed. Moreover, the Authority acknowledged that it would 'reimburse the Board for any extra cost'.[62] However, due to the Milk Marketing Board's intervention in this crisis, the Board had freed the Authority from 'what would otherwise have been a most difficult compensation problem which they would have been ill-prepared to handle'.[63] It can be deduced from this statement that the Authority was extremely ill-prepared for the unforeseen realities of compensation. This naivety can be further observed within the response of Edmund Harwood, the head of MAFF to a letter from Sir Donald Perrott, the head of the Authority, in which he offered the Ministry's assistance to the Authority in this matter. Therefore, Harwood informed the NFU headquarters and the organisation's branches within the Windscale area that they should assist their members 'by bringing together such claims as may be made for compensation and presenting them to the

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[60] *Ibid.*, pp. 2-3
[61] TNA, MAF 250/210, Notes of a meeting held in Mr. Crooks' office 2.30 p.m. 25th October 1957, 25 October 1957, p. 2
[62] TNA, AB 8/763, Copy letter sent to Mr Drake from Donald Perrott, 25 October 1957, p. 2.
[63] TNA, T 225/623, Letter from R. A Thompson to I de L. Randice, p. 20.

Authority on behalf of the claimants'.[64] Harwood intended that the Authority would be given some 'measure of protection against unreasonable claims – and the odium of having to reject them'.[65] Moreover, Harwood revealed that he feared that if the Authority proceeded to handle these claims without the Ministry's assistance, they would 'have a lot of trouble in dealing with some of them'.[66] It was these circumstances that led to the introduction of a procedure to manage compensation claims. In his letter of 31 October, Perrott suggested to Harwood:

> Insofar as we do receive claims for compensation from farmers we shall of course look to the Ministry of Agriculture and Fisheries for advice, although we appreciate fully that the responsibility for settlement of claims must rest with the Authority.[67]

Harwood responded on 1 November by writing that compensation was a 'matter of considerable interest to farmers, not only in the Windscale area, but also more generally'.[68] Harwood suggested that the Authority's course of action should be to put forward an arranged Parliamentary question which would have a broader dissemination in comparison to a local meeting. Harwood also proposed that the three paragraphs, contained within Perrott's letter, which related to liability, should be reduced in size. These sections highlighted that the Authority, like any other body or person, was accountable to Common Law 'for damage caused by any negligence on their part'.[69] Moreover, Perrott included the fact that it was the Authority's duty to prevent the release of ionising radiations as set down in Subsection three of Section five of the Atomic Energy

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[64] TNA, MAF 250/210, Letter from Sir Edmund Harwood to Sir Donald Perrott, 1 November 1957, pp. 24-24A.
[65] *Ibid.*, p. 24A.
[66] *Ibid.*
[67] TNA, MAF 250/210, Letter from Sir Donald Perrott to Sir Edmund Harwood, 31 October, p. 23.
[68] TNA, MAF 250/210, Letter from Sir Edmund Harwood to Sir Donald Perrott, 1 November 1957, p. 24.
[69] TNA, MAF 250/210, Teleprint Message to Mr F. M. Kearns and Mr. K. Harrison-Jones, 4 November 1957, p. 28.

Authority Act of 1954. Consequently, Harwood agreed with Perrott that, whilst the Ministry would remain impartial towards these claims, the final decision would rest with the Authority.

Under this direction, Harwood sent a message to the MAFF regional controllers, Mr Kearns and Mr Harrison-Jones in Newcastle-upon-Tyne, which detailed Common Law liability and emphasised subsection three of section five of the Atomic Energy Authority Act which stated that it was the duty of the Authority not to discharge radioactive waste. Also included within Harwood's message were detailed instructions relating to compensation: 'In the event of being questioned about compensation at the meeting this evening you should read out the above text … and refuse to answer any questions by way of interpretation or explanation'.[70] By creating this environment, Harwood intended to make it clear that 'the responsibility for the settlement of claims rests only with the Authority'.[71] Therefore, Harwood's measure was a form of crisis-management whereby he introduced and disseminated a standard response towards compensation. Despite these attempts to subdue the rumours and the levels of concern surrounding the milk ban, anxiety still existed as an unintended consequence, within the Windscale area:

> In this particular instance there had been conflicting statements from various authorities to the prejudice of public confidence. Nobody denied that the banning of milk and milk products from the Windscale area had been the right course of action to adopt but the way in which announcements had been made could have … [had] … the effect of undermining confidence in milk and milk products.[72]

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[70] *Ibid.*
[71] TNA, MAF 250/210, Letter from E. G. Harwood to K. Harrison-Jones, 1 November 1957, p. 27.
[72] TNA, MAF 250/210, Notes of a meeting held in Mr. Crooks' office 2.30 p.m. 25th October 1957, 25 October 1957, p. 2.

Within the local and national press, there was also some discussion of the issue of compensation but it was this dialogue that led to it becoming associated with controversy and secrecy. Meanwhile, the covertness surrounding the milk ban and its further extension was the factor that gained the spotlight within the press and 'really scared the public both nationally and locally'.[73] In fact, the news of the milk ban created more anxiety within the general public than the fire itself. These unrelenting reports stigmatised the British nuclear venture and had deep ramifications for the reputation of the agricultural and fishing industries which surrounded the Windscale plant. To demonstrate this point, a cow from a Ravengrass herd was paraded in a Manchester studio. This footage was then broadcast on national television with the label of 'radioactive cow'. Additionally, the cattle that were affected by the fall-out which went on sale at that week's Whitehaven cattle market were all marked with a yellow cipher which created 'what one dealer called a "buyer resistance [to their livestock]".[74] There was also news that two Devon farmers had bought five cows from Ulverston Market and were then told by the Exeter police force to destroy the milk produced by the cattle. These news stories further damaged the consumer confidence in livestock and dairy products from the Windscale area.

The issue of compensation within the aftermath of the accident

The Penney Report, published in November 1957, was the official report into the accident. As a result of its hasty creation, the heavily censored account was intended to ease public concerns and hence contained little information about compensation. Harold Macmillan, the Conservative Prime Minister who succeeded Anthony Eden in 1957, understood the wider damage that compensation for the Windscale accident could unleash. Macmillan admitted that every expert in

[73] Tony Hall, *Nuclear Politics: The History of Nuclear Power in Britain* (Harmondsworth: Penguin Books, 1986), p. 62.
[74] *Ibid.*, p. 59.

this field was, 'in one way or another, in the employ of the AEA'.[75] Through these statements, it became evident that the Authority possessed exclusive access to knowledge of this particular scientific field. Therefore, the Authority's scientist had been used 'not only as the expert witness but … [also] … as the spokesman'.[76] This spokesman's status is confirmed within public statements from the Windscale scientists. In the *Sunday Express* of 5 January 1958, Dr Edward Graham, Windscale's Medical Officer of Health, stated that 'to talk of the fall-out having a sterility action is nonsense … It is a question of superstition. Anyone who is enlightened could tell quite directly that the fall-out could not be connected with the complaints'.[77] This aspect of specialist testimony further influenced the subject of compensation against the nuclear energy industry. However, if a compensation case arose against the Authority, it was impossible to gain expert testimony in the light of the Authority's monopoly of atomic energy. Resultantly, if nuclear physicists had testified against their employer they would have seriously endangered their future career.

Within the Parliamentary debates that took place immediately after the accident, there was only a limited time dedicated to discussing compensation. However, politically, compensation was an issue that had an immediate focus after the accident. Jo Grimond, the leader of the Liberal Party and MP for Orkney and Shetland, asked Macmillan, on 8 November 1957 in Prime Minister's questions:

> Presumably there was some slight damage caused to a considerable number of people, and I wonder whether the right hon. Gentleman can make any statement

[75] Wynne, *Rationality and Ritual,* p. 22.
[76] Ritchie Calder, *Living with the Atom* (Chicago: University of Chicago Press, 1962), p. 26.
[77] TNA, MAF 250/210, Sunday Express - Windscale farmers talk of new fear, 5 January 1958, p. 3.

> about their position in regard to compensation. Has anything been decided as to compensation payable?[78]

Macmillan answered 'Yes, Sir; of course, the Authority will accept responsibility'.[79] However, public anxiety had affected the Authority's status to compensate. The Authority was extremely reluctant to process compensation claims for anything other than dairy products. It can therefore be deduced that the general public's interpretations of compensation for anything other than milk would have led to important political, social and economic consequences for the Authority. Moreover, compensation became even more fraught with complications. MAFF was concerned about a foot-and-mouth outbreak in the Windscale area; consequently, if farmers experienced deaths within their livestock, they could assume that these were caused by the radioactive fall-out. There were also allegations that there had been a sudden rise in milk production which was attributed to the farmers having watered down the milk in order to gain more compensation. In response, P. A. Stanway, Regional Officer for the Milk Marketing Board, said that 'one chap who will not get compensated for his alleged eight gallons is the one whose churn contained only two gallons'.[80] This observation was seized on by the media, who then sensationally reported on rumours of milk being diluted in order to gain extra compensation, along with 'stories of explosions in the Windscale reactors and of sterility in cattle over a large area'.[81]

According to a letter dated 3 January 1958 from MAFF Representative James Turner to Rt. Hon. D. Heathcoat Amory, the Head of MAFF, Turner was deeply concerned by the publication of a *Sunday Express* article containing details of a private meeting with local farmers. He believed that there existed a 'real risk that this newspaper would publicise the incidents, and the views alleged

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[78] *Hansard Parliamentary Debates* (HC), Fifth Series, Vol. 577 (London: HMSO, 1957).
[79] *Ibid.*
[80] TNA, MAF 298/54, Farm Forum – A Momentous Meeting, 31 October 1957, ref. TAY28684.
[81] R. F. Pocock, *Nuclear Power: Its Development in the United Kingdom*, (Old Woking: Unwin Brothers Limited and the Institution of Nuclear Engineers, 1977), p. 70.

– erroneous as they might well prove to be – of the local farming community'.[82] However, Turner reported that the newspaper had stopped the publication of this article, but this temporary reprieve did not provide a guarantee against any publicity. On 5 January 1958, the *Sunday Express* reconsidered and published the article which was entitled 'Windscale Farmers talk of new fear'. Within the article, there was a letter written by the Parliamentary Secretary for the NFU, Montague Keen, who wrote that the Authority could 'shelter behind the law because of their desire to reduce financial commitments to the absolute minimum'.[83] The reporter also posited that the farming community had 'talked angrily of their fight for fair treatment'.[84] George Curwen, farmer of Waithan Hall Farm and chairman of the NFU's Millom and Broughton-in-Furness branch, stated that he had received 'fertility complaints from dozens of farmers … [and that] … there is no doubt about it that the fall-out is to blame'.[85] He claimed that naturally 'the Atomic Energy Authority want us to delay our claims',[86] and suggested that the Authority was opportunistic: 'Give them time enough and they'll dodge the issue altogether'.[87] Therefore, within the popular media, compensation became a subject that was associated with secrecy, mystery and conspiracy.

As a direct consequence of the fall-out, if a company or product had associations with nuclear radiation, it seriously undermined their public image and reputation. This became apparent with the compensation claim filed by the chocolate manufacturer Rowntrees against the Authority in February 1958. Despite the fact that the processed milk was not a direct risk to public health, the affected Chocolate Crumb product had to be disposed of: 'We would like to do this as discreetly as possible so that the name of this Company does not become associated with radioactive

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[82] TNA, MAF 298/54, Letter from James Turner to Sir D. Heathcoat Amory, 3 January 1958, p. 28.
[83] TNA, MAF 250/210, Sunday Express - Windscale farmers talk of new fear, 5 January 1958, p. 3.
[84] *Ibid.*
[85] *Ibid.*
[86] *Ibid.*
[87] *Ibid.*

contamination'.[88] After a period of frictional correspondence between the Authority and the chocolate producer, the AEA agreed to pay Rowntrees solely for the milk's destruction. The significance of this was that Rowntrees prudently desired compensation from the Authority discreetly, rather than through a public pronouncement which would have caused potential damage to their Company and their products. Moreover, the contaminated Chocolate Crumb would have attracted further attention towards the accident and the contaminated milk from the dairy farms surrounding Windscale. Hence, in order to understand compensation as a consequence of the Windscale fire one needs to consider liability as an economic, political and social issue.

Yet, some within the farming community did not claim such a victory. This was true of one farmer in particular: T. Wallbank. He believed that his livestock which were grazing near the Windscale plant had suffered abnormalities and infertility as a result of the Windscale fall-out. According to Frank Anderson, the Labour M.P. for Whitehaven, Wallbank together with other farmers had requested his assistance in this matter. At a meeting with Geoffrey Waldegrave, the Joint Parliamentary Secretary of MAFF, Anderson was deeply suspicious of the Government's relations with the farming community after the accident. Anderson was convinced that the 'authorities had behaved, and were behaving, badly in this matter, and were concealing vital evidence'.[89] Moreover:

> The implication was that the troubles that Mr. Wallbank had had with his animals were due to the atomic fallout, that we knew it, and that we were trying to hush it up. Mr Anderson alleged that indignation amongst the farmers was mounting, etc., that they have tried to be reasonable and not embarrass the Conservative

[88] TNA, AB16/2327, Letter from Rowntree & Co Ltd to A. E. Drake, 12 February 1958, E4.
[89] TNA, MAF 298/54, Mr Frank Anderson M. P., 11 September 1958, p. 57.

> Government which most of them supported, and in the last resort had to turn to a Labour M.P.[90]

Waldegrave believed that, despite his best efforts, Anderson remained unconvinced with his explanations.[91] However, the farmers' political organisations such as the Country Landowners Association and the NFU had also investigated compensation for farmers affected by Windscale. Yet, James Turner said that a new investigation would attract damaging media exposure with 'serious consequences well beyond the Windscale area'.[92] This could have meant that 800 farmers would suffer a second 'boycott to the sales of livestock, and a general depreciation in the value of all their commodities'.[93]

On 7 December 1958 in the *Sunday Graphic*, Captain Craven Hodgson wrote that he had heard that some farmers had experienced trouble with their calving cows. However, Hodgson admitted that he was more fortunate than others. Apart from half of his herd shedding their hair, leaving 'large bare patches on their sides,'[94] they had calved more successfully than they had done for some time, and these calves were perfectly healthy.[95] Another example was in an article dated 25 December 1958 from *The Whitehaven News* entitled 'Winning "Windscale" Bullocks', where the correspondent wrote that two prime, prize-winning beef bullocks were further 'confirmation of findings by the N.F.U and the Ministry of Agriculture that nuclear operations on the West Cumberland coast ... [had] ... no ill effects on local dairy cattle and beef industries'.[96] In order to further confirm this, a photograph was attached with the article of the farmer and his wife beside

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[90] *Ibid.*
[91] *Ibid.*
[92] *Ibid.*
[93] TNA, MAF 298/54, Letter from James Turner to Rt. Hon. D. Heathcoat Amory, 3 January 1958, p. 29.
[94] TNA, AB 16/2328, Extract from Sunday Graphic dated 7 December 1958, 7 December 1958, ref. Sunday Graphic dated 7 December 1958.
[95] TNA, AB 16/2328, Extract from Sunday Graphic dated 7 December 1958, 7 December 1958, ref. Sunday Graphic dated 7 December 1958.
[96] TNA, MAF 298/54, Whitehaven News – Winning "Windscale" Bullocks, 25 December 1958, p. 196.

their prize-winning cattle in front of the Windscale nuclear processing facility. These events were valuable public relations opportunities to boost the reputation of the local farming produce. Consequently, the importance of the media's coverage of the details of the compensation for the accident should not be underestimated because not all the media coverage of the farming community was negative.

Accordingly, compensation was an interdependent variable because it had clear and widespread repercussions beyond the subject's legal criterion. Valerie McDermott postulates that, given the extent of the Windscale accident, the British authorities were getting off 'relatively lightly despite their historic and deliberate policy … of keeping the public in ignorance about the less prestigious and hazardous aspects of atomic energy'.[97] In 1969, Richard Curtis and Elizabeth Hogan reported that the 'authorities had to seize all milk and growing foodstuffs in a four-hundred-square-mile area round the plant'.[98] R. F. Pocock argues that this was a gross exaggeration because it implied that the danger was the fall-out.[99] Therefore, the sensationalist news stories, in part, solidified the fire's legacy within the public domain and the topic refused 'to go away and was revived at every point of controversy surrounding the nuclear industry for the next forty years'.[100]

To recapitulate, the Windscale fire of 1957 was a crisis for 'the Utopian faith invested in the nuclear age',[101] and revealed problems of communication and co-ordination between nuclear physicists, engineers, scientists and politicians. Therefore, any publicised compensation cases arising from Windscale further attacked the credibility of nuclear energy and undermined Anglo-

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[97] McDermott, *Going Nuclear*, p. 108.
[98] Richard Curtis and Elizabeth Hogan, *Perils of the Peaceful Atom: The Myth of Safe Nuclear Power Plants* (New York: Doubleday, 1969), p. 13.
[99] Pocock, *Nuclear Power*, p. 71.
[100] McDermott, *Going Nuclear*, p. 110.
[101] Wynne, *Rationality and Ritual,* p. 20.

American relations after the debacle of the Suez Crisis. Likewise, the entwined nuclear and agricultural aspects also contributed to the public's increasing concern for the quality of farm produce, and the safety of nuclear power. However, despite these concerns, it is surprising that the hysteria created by the accident was not greater. Alasdair Horne points out that after the Windscale fire was not good timing for Harold Macmillan's endeavours in Washington to repeal the McMahon Act and restore the sharing of nuclear secrets between the United States and the UK. This was in part successfully achieved, by playing upon the fears produced by the launch of Sputnik in the United States. Nonetheless, the accident could have seriously endangered these negotiations. However, it was through Macmillan's management of the crisis that the 'world's worst nuclear accident ... went largely unnoticed'.[102]

Yet, for the farming community, the damage of the radioactive fall-out had not gone unnoticed and in fact had become an abiding stain upon the Cumberland landscape. They could not escape from the fall-out's legacy, because their beef and dairy produce were viewed with the tarnish of suspicion. The secrecy that had surrounded the milk ban had meant that the agricultural community around Windscale was ignored by both the general public and their fellow farmers. For the Authority, compensation was an unknown element. The Government could not allow compensation *carte blanche* because they had to protect the fledgling Authority from exaggerated, unreasonable and controversial claims; thus confirming McDermott's sentiments that the Authority had avoided a public relation's disaster. Therefore, compensation appeared as a normal transaction and was limited to only the milk products that were affected by radiation. Nevertheless, it was this endeavour to stop opportunistic claims that led to the perception that this restriction was part of a Government conspiracy in order to cover up a nuclear catastrophe and minimise its losses. In addition, the farmers around Windscale, who believed that the fall-out had caused problems with fertility in their animal herds and a significant drop in the value of

[102] Alasdair Horne, *Macmillan, 1957-1986* (London: Macmillan, 1986), p. 50.

their land, responded with anger and ideas of conspiracy against the Authority. This was due to their belief that a fight to gain compensation for their grievances would be a futile and hopeless cause. Therefore, compensation limited solely to milk and dairy products, within this nuclear dimension, became interpreted as part of the conspiracy that the full effects of the fall-out were suppressed as part of a cover-up.

The criterion to compensate for the negligence of nuclear power and radiation was formed by a legal framework. Both the Government and the Central Electricity Authority deliberately avoided establishing a policy on compensation in order to possess the ability to manage and minimise the liability surrounding nuclear energy. A valuable point of insight into this process of legal responsibility for nuclear power can be gained when examining the experiences of the veterans in their fight for compensation as a result of Britain's military nuclear tests which occurred during the Cold War. In 2002, Sue Rabbitt Roff explored the long-term health effects on UK veterans of Britain's nuclear tests in the Pacific and Australia and their relationship with the Ministry of Defence over their claims for compensation.[103] On 1 July 1997 in the House of Commons, the Labour MP for Merthyr Tydfil and Rhymney, Ted Rowlands, asked John Spellar, the Secretary of State for Defence, how many claims by the 'nuclear test veterans had been made; and how many have been settled'.[104] Spellar responded that he did not know how many claims of compensation had been received but that 'nuclear test veterans may receive a war pension'.[105] Rabbitt Roff believed that the MOD avoided the use of the term 'compensation' and instead awarded money to veterans under the guise of pensions. This was confirmed in a letter dated 15 June 1998 to the MP Michael Wills, from the Chief Executive of the War Pensions Agency, G. Hextall. The letter stated that '159 pension claims had been received, of which 30 were awarded – 12 being listed as

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[103] Sue Rabbitt Roff, 'Long-term Health Effects in UK Test Veterans' in Douglas Holdstock and Frank Barnaby (eds), *The British Nuclear Weapons Programme, 1952-2002* (London: Frank Cass, 2003), pp. 101-115.
[104] *Hansard Parliamentary Debates* (HC), Sixth Series, Vol. 297 (London: HMSO, 1997).
[105] *Ibid.*

"radiation award"".[106] It can be affirmed that the interrelated connotations attached to compensation meant that it was a difficult subject. Therefore, to reduce controversy, companies avoided 'compensation' because of its heavily loaded connotations. Instead, they substituted compensation payments with pensions or they specifically mentioned that a payment did not confirm responsibility. In time, the Authority finally understood the importance of compensation through bitter experience, and at a high financial cost.

Conclusion

The impact of the 1986 accident at Chernobyl on agriculture was similar to the one made by the 1957 Windscale accident because it affected three million sheep and lamb sales. The compensation that the British farmers received for their losses was incorporated within the history of the Chernobyl accident. Similarly, in order to take into account the impact of all the aspects relating to nuclear energy, every type of compensation case must become integrated into the history of British nuclear power. The significance of this article is that it places direct emphasis on the issue of compensation. However, in order to understand the unique consequences that compensation entailed for the nuclear power industry, it needs to be redefined. This process involved an integration of Calder's definition of compensation and Gaddis's argument of interdependency. The reason for this is that compensation operated within a legal environment but it was also dependent on other factors beyond the confines of the law. Therefore, compensation is a complex social, economic and political issue rather than solely a legal issue. By working within this definition, one can understand that compensation was an important theme in the development of nuclear power in the United Kingdom and it can also be integrated into the historiography of British nuclear culture. Hence, this article provides a new perspective on compensation during this significant moment in the development of nuclear liability. In the fifties, Britain's atomic energy programme as a business and technological

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[106] Rabbitt Roff, 'Long-term Health Effects in UK Test Veterans' in *The British Nuclear Weapons Programme*, *1952-2002*, p. 106.

enterprise glittered with promise and potential. These optimistic visions reflected how unprepared the Authority was for the reality of nuclear liability. Harrison Jones had to admit to the farming community on 22 October 1957 that 'we cannot pretend that the organisation [the UK AEA] that came into being so very suddenly foresaw all the problems and difficulties that could arise'.[107] However, compensation for the agricultural community affected by the Windscale accident and later Chernobyl, damaged and corroded these dazzling illusions forever.

Bibliography

Manuscript and Archival Primary Sources

The National Archives:

United Kingdom Atomic Energy Authority Records (AB)

AB 8/763, Claims and compensation: consequential claims arising out of the Windscale Incident, October 1957.

AB 16/2327, Windscale accident compensation claims: other than milk (Part I), 1957-1960.

AB 16/2326, Windscale accident compensation claims: milk, 1957-1961.

AB 16/3068, Ministers Case; hazard of Dounreay, 1955.

The Department of Energy (EG)

EG 1/169, Insurance of nuclear risks, 1955-1958.

Ministry of Agriculture and Fisheries Records (MAF)

MAF 250/210, Windscale Accident 1957: compensation to farmers, 1957-1959.

MAF 298/54, Windscale Accident 1957: effects of radioactivity on animal husbandry (Wallbank Case) 2 parts, 1957-1959.

Her Majesties Treasury Records (T)

[107] 'Farmers given assurance on reactor effects', *The Times*, 23 October 1957, p. 6.

T 225/623, Atomic energy reactors: indemnities caused by malfunctioning: payment of compensation to Milk Marketing Board following accident at Windscale plant, 1953-1958.

Printed Primary Sources

'Balancing Farm Subsidies', *The Times*, 31 October 1955.

'British Insurers' Scheme for Atomic Installations', *The Times*, 25 June 1957.

'Farmers given assurance on reactor effects', *The Times*, 23 October 1957.

'Milk from farms near Windscale stopped', *The Times*, 14 October 1957.

Hansard Parliamentary Debates (HC), Fifth and Sixth Series (London: HMSO).

Hansard Parliamentary Debates (HL), Fifth Series (London: HMSO).

House of Commons Parliamentary Papers, 'United Kingdom Atomic Energy Authority. Fourth annual report for the period 1st April 1957-31st March 1958' (London: HMSO, 1958).

Jenkins, Russell, 'Fifty years on, the deadly legacy of atomic accident to be cleaned up', *The Times*, 5 October 2007.

Secondary Sources and Books

Arnold, Lorna, *Windscale 1957: Anatomy of a Nuclear Accident*, 3rd edn (Basingstoke: Palgrave Macmillan, 2007).

Barnaby, Frank, and Douglas Holdstock (eds), *The British Nuclear Weapons Programme*, *1952-2002* (London: Frank Cass, 2003)

Calder, Kent E., *Crisis and Compensation: Public Policy and Political Stability in Japan, 1949-1986* (Princeton: Princeton University Press, 1988).

Calder, Ritchie, *Living with the Atom* (Chicago: University of Chicago Press, 1962).

Crosbie, W. A., and John Gittus (eds), *Medical Response to the Effects of Ionising Radiation* (London: Elsevier, 1989).

Curtis, Richard and Elizabeth Hogan, *Perils of the Peaceful Atom: The Myth of Safe Nuclear Power Plants* (New York: Doubleday, 1969).

Eden, Anthony, *The Memoirs of Sir Anthony Eden: Full Circle* (London: Cassell, 1960).

Edgerton, David, *Warfare State: Britain, 1920-1970* (Cambridge: Cambridge University Press, 2008).

Gaddis, John Lewis, *The Landscape of History* (Oxford: Oxford University Press, 2002) .

Hall, Tony, *Nuclear Politics: The History of Nuclear Power in Britain* (Harmondsworth: Penguin Books, 1986).

Hennessy, Peter, *Having it so good: Britain in the fifties* (London: Penguin, 2007).

Horne, Alasdair, *Macmillan, 1957-1986* (London: Macmillan, 1986).

Nutall, W. J., *Nuclear Renaissance: Technologies and Policies for the Future of Nuclear Power* (Bristol: Institute of Physics Publishing, 2005).

Medvedev, Zhores, *The Legacy of Chernobyl* (Oxford: Basil Blackwell, 1990).

McDermott, Veronica, *Going Nuclear: Ireland, Britain and the Campaign to Close Sellafield* (Dublin: Irish Academic Press, 2008).

Pocock, R. F., *Nuclear Power: Its Development in the United Kingdom* (Old Woking: Unwin Brothers Limited and the Institution of Nuclear Engineers, 1977).

Roff, Sue Rabbitt, 'Long-term Health Effects in UK Test Veterans' in Douglas Holdstock and Frank Barnaby (eds), *The British Nuclear Weapons Programme*, *1952-2002* (London: Frank Cass, 2003), pp. 101-115.

Segal, M. G., 'The role of MAFF following a nuclear accident' in Crosbie, W. A., and John Gittus (eds), *Medical Response to the Effects of Ionising Radiation* (London: Elsevier, 1989) pp. 195-223.

Weart, Spencer R., *Nuclear Fear: A History of Images* (Harvard: Harvard University Press, 1988).

Wynne, Brian, *Rationality and Ritual: The Windscale Inquiry and Nuclear Decisions in Britain* (Calfront St Giles: The British Society for the History of Science, 1982).