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DESPITE CLAIMS TO the contrary throughout the cold war, Russia admitted in 1993 that, for decades, the Soviet Union routinely had dumped radioactive waste into the sea. Although Westerners had long suspected as much, the extent of the dumping provided appalling evidence of the abuses possible without public participation in or international accountability for environmental policies. In addition to discharges and packaged wastes, the Soviet Union sank as many as eighteen nuclear reactors, some still containing fuel, into areas where dumping was prohibited by international law.¹

The Soviet Union not only had denied that it dumped radioactive waste into the sea, but also had repeatedly condemned Western countries for doing so, or as its propagandists preferred to say, 'for poisoning the common wells of humanity'. The question of waste disposal led to heated exchanges at international meetings: the Soviet delegate to the International Atomic Energy Agency (IAEA), Vassily Emelyanov, walked out of one in 1961, while vowing never again to speak to the director-general, Sigvard Eklund, whom he called a puppet of Western industrialists. At the time, Britain's Atomic Energy Authority (AEA), which dismissed such melodramas as cold war dogma, attributed them to the Soviet Union's strategy of trying to exploit weaknesses in the West's nuclear programmes; an example of a scientific and environmental issue becoming another

I thank the Institute on Global Conflict and Cooperation, San Diego, for financing the research for this article, and Kurk Dorsey, Ronald Rainger, Lawrence Badash, Michael A. Osborne, and Fredrik Logevall.

¹ S. Leskov, 'Lies and Incompetence (Russian Nuclear Dumping)', *Bulletin of the Atomic Scientists*, xlix (June 1993), 13-14. The ecological disaster of the Communist bloc has given rise to numerous studies of the environmental consequences of these closed societies. At the very least, it has forced a reappraisal of environmental deterioration as the direct result of industrial capitalism alone. See M. Feshbach, *Ecological Disaster: Cleaning Up the Hidden Legacy of the Soviet Regime* (New York, 1995), and Z. Wolfson, *The Geography of Survival: Ecology in the Post-Soviet Era* (London, 1994). In the post-Soviet era, environmental crisis provided a rallying point for activism, acting as a surrogate for other movements. See J. I. Dawson, *Eco-Nationalism: Anti-Nuclear Activism and National Identity in Russia, Lithuania, and Ukraine* (Durham, N.C., 1996).

manifestation of cold war antagonism. Nevertheless, despite the controversy's origins, it led both to the first international agreements setting limits to the disposal of radioactive waste at sea, and to widespread international acceptance of the use of the sea by small, industrialized countries when disposing of radioactive waste.

The disposal of radioactive waste at sea provides a historical example of the interplay among expertise, national environmental policies, and international relations. Today, the connections between environmental issues and high-level politics are widely recognized. Green political parties are influential in many countries, and schoolchildren know about Earth Day. In the United States in 2000, two of the three leading candidates for president (though not the winner) had devoted parts of their careers to drawing national and international attention to the environment and had written books on the subject. Arguments about the scientific merits, legal enforceability, and political implications of international agreements such as the 1997 Kyoto Protocol command attention at the highest levels of government.¹ The international ramifications of environmental pollution are obvious: industrial emissions policies from one country may have disastrous repercussions upon another, particularly if it lies 'downwind'. Garrett Hardin's discussion of public space shows that accountability is vague and the pursuit of national self-interest to be expected. Although he focuses on the effects of overpopulation, few repercussions are more dire than environmental contamination, as standards are only enforceable if enough governments respect them.²

Environmental policy-making is controversial, in part owing to the ambiguities that mark the exchanges between politics and science. Permissible doses of radiation, for example, have remained contested partly because scientists disagree about how to frame questions likely to provide the most accurate and broadly applicable assessment of the dangers from testing nuclear weapons and operating nuclear installations. Similarly, scientists disagreed about the need to build the first hydrogen bomb and continue to disagree on the feasibility of ballistic missile defence systems. Some scholars argue that science cannot be expected to provide consistent answers; that, even if it could, decisions ostensibly taken on the basis of scientific expertise rest in fact on public opinion, international pressure, or

¹ A. Gore, *Earth in the Balance: Ecology and the Human Spirit* (Boston, 1992); R. Nader, *The Menace of Atomic Energy* (New York, 1977); P. Coy, 'Daily Briefing – Global Warming: Bush's Double Blunder', *Business Week Online*, 9 April 2001.

² G. Hardin, 'The Tragedy of the Commons', *Science*, clxii (13 Dec. 1968), 1243-8; K. Dorsey, *The Dawn of Conservation Diplomacy: US-Canadian Wildlife Protection Treaties in the Progressive Era* (Seattle, 1998); and L. Susskind, *Environmental Diplomacy: Negotiating More Effective Global Agreements* (New York, 1994).

political preference.¹ Accordingly, the international regulations devised during the 1960s to govern the disposal of radioactive waste at sea were blended from scientific expertise, diplomacy, and political expediency.

Few states deployed diplomacy and political expediency as effectively as Britain, the most vocal advocate of disposal at sea. As soon as the practice became controversial in the early 1960s, the United States restricted its dumping to its own territory. The Soviet Union, meanwhile, criticized others for the practice while secretly dumping large amounts of waste in the Arctic Ocean. Despite being the target of the Soviet attacks, during the 1960s Britain continued to dump radioactive wastes in the sea, seemingly regardless of international opinion. Even after the end of the cold war, Britain has become notorious for ignoring the terms of the European Union's environmental agreements; for being, in Jonathan Golub's words, 'a particularly awkward partner', with a distinctive environmental policy style emphasizing its own sovereignty.²

Despite Britain's efforts to preserve the option of unilateral action, in the 1960s it helped to shape international attitudes to waste disposal in the sea, though only to persuade other states to share the responsibility for practices it had never seriously considered discontinuing, despite scientific controversy and threats to safety. Initially, its goal was to blunt Soviet criticism; in time, it created a European bloc to act against opponents who presented reasons, often based on scientific expertise or public protest, why they should stop. This article explains how the threat of international opposition, led by the Soviet Union and fuelled by mishaps at sea, led Britain to forestall having to change its practices and to bid for international acquiescence through effective diplomacy. A strategy of promoting the practice among other small, industrialized countries, thereby sharing the burden of criticism, extended the life of one the most environmentally controversial practices of the second half of the twentieth century.

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Whereas scientists recognized during the 1950s the potential hazards of disposing of radioactive waste at sea, the subject commanded little

¹ On radiation safety, see B. C. Hacker, *Elements of Controversy: The Atomic Energy Commission and Radiation Safety in Nuclear Weapons Testing, 1947-74* (Berkeley, 1994), and J. S. Walker, *Permissible Dose: A History of Radiation Protection in the Twentieth Century* (Berkeley, 2000). On political dimensions of scientific expertise in the realm of policy-making, see G. Herken, *Cardinal Choices: Presidential Science Advising from the Atomic Bomb to SDI* (Stanford, 2000). On the multiplicity of spaces of knowledge production, see M. Gibbons, C. Limoge, H. Nowatny, S. Schwartzman, P. Scott, and M. Trow, *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies* (London, 1994).

² J. Golub, 'British Sovereignty and the Development of EC Environmental Policy', *Environmental Politics*, v (1996), 700.

attention among governments; both the United States and Britain had decided unilaterally to dump wastes into the sea.¹ Britain, which began as early as 1946, codified its regulations in the Atomic Energy Authority Act of 1954, which shared responsibility for dumping into international waters among the Atomic Energy Authority, the ministry of housing and local government (MHLG), and the ministry of agriculture, fisheries, and food (MAFF). Nobody expected foreigners to complain. The foreign office reported after an international meeting on radiation hazards in 1956 that the disposal of radioactive waste in the sea was 'non-controversial' compared to the more pressing issues of nuclear testing and fallout.²

Britain looked to the sea as a cheap, safe repository for its radioactive wastes. Although it stored some waste on land at Drigg in Cumbria, the AEA knew that, with little land to spare, Britain, far more than either the United States or the Soviet Union, would need to use the sea. More common than dumping were discharges. The most well-known came from the nuclear power station at Windscale, also in Cumbria, which began to discharge its effluent into the Irish Sea in 1952, and does so still under its new name, Sellafield.³ The press paid more attention to the dumping of packaged wastes, primarily because solids were tangible and visible: a few fishermen dredging up a mysterious drum marked 'Property of United Kingdom Atomic Energy Authority' could cause greater anxiety than a discussion of the dispersal of radioactive chemicals through pipelines. Ironically, one of the reasons why British officials felt that the public overreacted to the dangers from packaged wastes was their minuscule levels of radioactivity compared to the levels in the discharges from pipelines at nuclear reactors. For example, when scientists tried in 1963 to assess the dangers of dumping drums of radioactive waste into the Hurd Deep in the English Channel, an AEA health and safety branch scientist, Huw Howells, set them at ease: 'the amount of activity disposed of in the Hurd Deep in the last 13 years was equal to about a week's discharge from the pipeline at Windscale.'⁴

1 Studies of the feasibility of radioactive waste disposal in the oceans were discussed, in the late 1950s and early 1960s, by the Scientific Committee on Oceanic Research (SCOR), an international body which sought to co-ordinate and plan research activities relevant to the global community. See J. D. Hamblin, 'Oceanography and International Co-operation during the Early Cold War' (Ph.D. dissertation, California at Santa Barbara, 2001).

2 Galbraith to Brown, 16 Oct., Dixon to F[oreign] O[ffice], 30 Oct. 1956, Brown, minute, 31 Oct. 1956 [Kew, Public Record Office], F[oreign] O[ffice Records] 371/123132.

3 Windscale became infamous after the nuclear accident there in 1957. See L. Arnold, *Windscale 1957: Anatomy of a Nuclear Accident* (London, 1992). Sellafield continues to make headlines, as its critics have linked it both to increased cancer risks and to environmental degradation in the region. See, e.g., M. Forwood, 'Sellafield: The Ugly Duckling', *Ecologist*, xxix (1999), 417.

4 Phillips, note of mtg., 17 April, 1 May 1963 [Kew, Public Record Office], A[tomic] B[oard Records] 54/15 [Waste Disposal - General - To Sea].

Britain developed a philosophy of waste disposal markedly different from that of the other nuclear powers. In some countries, the United States in particular, many of the political problems over the siting of repositories arose from the need to contain the waste for fear that radioactivity might harm the environment or the local inhabitants: radioactive waste was something to isolate in steel drums, deep in caves, or lying harmless on the seabed.¹ Such fear of radioactivity, pervasive throughout the cold war era, is understandable. The nuclear accidents that captured public attention, at Windscale in October 1957, Three Mile Island in March 1979, and Chernobyl in April 1986 released harmful amounts of radioactivity into the environment. By the end of the twentieth century, scientists who still looked to the sea as a repository for radioactive wastes were careful to stress that they planned to bury it beneath the seabed, not to allow it to mix with the water.² In Britain during the 1950s and 1960s, however, the AEA pursued the opposite strategy, of dispersal rather than isolation. Its objective was to release radioactivity into the environment, and by dispersing it, render it less harmful; in the AEA's view, the greater the dispersal, the less the danger. The sea was so attractive because it provided a cheap and natural vehicle to wash away radioactivity and distribute it so widely that the danger from it would disappear.³

The AEA'S philosophy led to a disagreement with the US National Academy of Sciences Committee on Oceanography (NASCO). In September 1962, the *New York Times* announced that NASCO had developed a 'new rule-of-thumb for determining how much radioactive material might be dangerous'.⁴ It stipulated as a principle that humans should never exceed the allowable amount of radioactivity, given that the radioactive proportions of chemical elements (that is, their specific activity) in the sea were kept below the allowable amount for human consumption. Thus, NASCO adopted the requirement 'that disposal must be conducted in such a way that no human food fish contains more radioactivity than is acceptable for a continuous seafood diet by man'. NASCO recognized not only that radioactive waste could fall into areas of marine life, but that micro-organisms would develop on the drums themselves, which would attract creatures such as crabs, fish, and squid. These fish, highly irradiated, might migrate to the surface and find themselves on someone's

¹ *Public Reactions to Nuclear Waste: Citizens' Views of Repository Siting*, ed. R. E. Dunlap, M. E. Kraft, and E. A. Rosa (Durham, N.C., 1993) and G. Jacob, *Site Unseen: The Politics of Siting a Nuclear Waste Repository* (Pittsburgh, 1990).

² S. Nadis and C. D. Hollister, 'Burial of Radioactive Waste under the Seabed', *Scientific American*, cclxxviii (Jan. 1998), 60-5.

³ See J. Golub, 'British Sovereignty and the Development of EC Environmental Policy', *Environmental Politics*, v (1996), 700-28.

⁴ '40 Sites Chosen for Atom Wastes', *New York Times*, 30 Sept. 1962, p. 13.

dinner table. NASCO's somewhat ecological approach cast doubts on the validity of the ocean's capacity for chemical dispersal, for it meant that all dumping would have to occur in deeper water than human food fish go, which NASCO estimated to be about 1,200 fathoms. Disposal sites, it argued, should therefore be located away from coastal basins, seamounts, trenches and canyons, and submarine cables.¹

To the AEA, such limitations on dumping completely ignored the basic value of the ocean as a repository, namely its power to render radioactive waste harmless through dilution. A scientist in the radiological protection division of the AEA's health and safety branch, H. J. Dunster, was dismayed at the Americans' conservative attitudes: 'it seems to me', Dunster wrote to the director of the Scripps Institution of Oceanography, Roger Revelle, 'that some of these decisions have resulted in unreasonably large safety factors.' To him, it was the equivalent of assuming that some individuals get all of their food from the part of the sea that was only five centimetres thick above the seabed. He argued: 'While this may well be true of the first stage of transfer from the drums to the local organisms, I find it difficult to believe that the radioactivity is then transferred, without subsequent isotropic dilution, to a foodstuff derived solely from a localised area.'² The American scientists had urged that the radioactivity of all waste, dumped in water shallower than a certain depth, should be sufficiently reduced prior to being dumped. AEA officials, by contrast, insisted upon perceiving the sea as an integral part of the waste-disposal dilution process, not merely as a repository.

The attitudes of the United States and Britain towards sea disposal continued to diverge. At the end of 1962, the United States had dumped some 86,000 containers of radioactive waste into the oceans since beginning such operations in 1946. But between 1959 and 1962, the United States Atomic Energy Commission (AEC) had dealt with at least eight instances of waste materials being recovered by ships or being washed ashore to be discovered on American beaches. In some cases, evidence that the containers belonged to the AEC was inconclusive, or the incident a false alarm or a hoax. But at least one, netted in water only 275 feet deep, was a genuine container of radioactive waste. One AEC spokesman said that 'it was in the furor over that report that people thought we were dumping in those close-in areas, in those quantities, that we in effect stopped all ocean dumping for all practical purposes.'³ Further, in April 1962, the AEC

¹ Working Group of the Committee on Oceanography, *Disposal of Low-Level Radioactive Waste into Pacific Coastal Waters* (Washington, DC, 1962), pp. 4-6, x.

² Dunster to Revelle, 17 July 1961, AB 54/16 [Waste Disposal - General - To Sea - Liaison with France, 1960-2].

³ US Congress, House of Representatives, Subcommittee on Fisheries and Wildlife Conservation and

denied an application by a private firm to dump low-level radioactive wastes into the Gulf of Mexico, reasoning that any dumping by the United States there 'would have seriously harmful effects on our friendly relations with Mexico'.¹ Sensitive to the growing public discomfort and international difficulties caused by radioactive waste disposal in the oceans, the United States concentrated its activities on land, which appeared largely to absolve it of international accountability.

* * *

The AEC's decision not to dump in the Gulf of Mexico reflected a growing concern for the effects of waste-disposal policies on international relations. The United States, with its huge land area, could afford to divert its attention to land-based disposal, and thus attempt to avoid such problems. Britain, however, strode headlong into the international fray. Britain had been dumping with impunity for decades, and specifically radioactive waste since 1946. When the AEA conducted its dumping operations, it acted on authorizations outlined by the Atomic Energy Authority Act of 1954, and although the AEA carried out the operations, the authorizations for radioactive discharge and dumping were negotiated among the responsible ministries of the British government. Authorizations for individual disposal operations were the cornerstone of Britain's radioactive waste regulation,² and to the British, these authorizations were more than enough to ensure that operations, site selection, and overall safety were properly looked after. Although such emphasis on national prerogative would last a long time, indifference to international opinion would not.

Until the late 1950s, there was no recognized body to establish, through formal agreement, standards and procedures for radioactive waste disposal in the sea. The International Commission on Radiological Protection (ICRP), established in 1928, which made recommendations about the permissible doses of radioactivity and was supposed to be impartial, was not tied to a binding international agreement. One of the results of the United Nations Conference on the Law of the Sea in 1958 was to assign this responsibility to the International Atomic Energy Agency (IAEA). In June 1960, a technical panel composed of representatives from nine countries agreed that radioactive waste disposal to the oceans should be regulated to ensure that only safe levels were dumped. Led by Swedish atomic energy official Harry Brynielsson, the panel recommended a number of limitations

the Subcommittee on Oceanography of the Committee on Merchant Marine and Fisheries, *Ocean Dumping of Waste Materials*, Hearings, 92nd Congress, 1st Session, 5-7 April 1971, pp. 235-40, esp. 238.

¹ 'AEC Bars Waste Plan', *New York Times*, 22 April 1962, p. 26.

² F. Berkhout, *Radioactive Waste: Politics and Technology* (London, 1991), p. 140.

on dumping, the most significant (and the only one ultimately accepted) being a restriction on dumping in water of less than 2,000 metres depth.¹ Despite the restrictions, the Brynielsson Report, by developing recommendations on how to regulate, implicitly acquiesced in the practice.

The Soviets chose to pounce on the Brynielsson Report, characterizing it as an implicit acceptance of the worst evils of industrial capitalism. When an IAEA legal panel met in Vienna in January 1961 to discuss the results of the report and to outline a plan of action, the volatility of the issue became clear. Delegates from the Soviet Union claimed that they themselves restricted discharges into the environment by ensuring safe levels prior to release, whereas the British released dangerous levels and depended on the environment to dilute them. The Soviets insisted that such pollution was unwarranted, and that its own practices bore this out. However, one AEA official noted cynically (and correctly) that although discharges to the environment by the Soviet Union supposedly were small compared to those in the United Kingdom, 'it is extremely unlikely that they discharge *nothing* into the environment as they would have had the lawyers believe.'²

Most of the panel agreed that dumping could be allowed, and that any regulatory criteria should be based upon the Brynielsson Report. However, although the report had recommended that dumping be regulated (recommendations eventually leading to Britain abandoning one of its most convenient dumping sites, in the English Channel), the Soviet delegates let it be known that they were irate that dumping was to be allowed at all. Supported by the delegates from Poland, they spoke out against any radioactive waste disposal into the oceans, claiming that scientists had not yet shown that it could be done safely. Indeed, they questioned not merely the Brynielsson Report's legality, the topic of discussion, but also the scientific and technical conclusions on which it was based.

The Soviets raised an international alarm over the Brynielsson Report. An article in *Pravda* included what one British ministry of science official, M. I. Michaels, described as a 'somewhat vitriolic attack on Brynielsson and by inference on Sweden generally'.³ The article, entitled 'Poisoners of Wells and Their Accomplices', dramatically accused the United States and Britain of being 'monopolists', of improving upon the 'old method' of sinking poison into wells and taking it to a much higher level, by poisoning the world's oceans. Even worse, the article pronounced, they were using the IAEA to establish the legality of their 'dirty and dangerous business', to lure the international community into actually condoning the poisoning of

¹ Berkhout, *Radioactive Waste*, p. 141.

² Memo, Trevor, 'Panel on Disposal of Radioactive Waste into the Sea', 25 Jan. 1961, and memo, Garner, 'Panel on Disposal of Radioactive Wastes into the Sea', 31 Jan. 1961, FO 371/157243.

³ Michaels to Hainworth, 15 Feb. 1961, FO 371/157243.

the oceans. The article was particularly hard on Brynielsson himself, the West's accomplice, accusing him of abusing his position and misleading the world: '[Dag] Hammarskjöld's compatriot Brynielsson tries to prove what cannot be proved – that the disposal of radioactive wastes into the sea is not dangerous. In his report, Brynielsson intentionally conceals the fact which leaves nothing of his "scientific" conclusions ... that already today as a result of nuclear tests radioactivity in the Pacific Ocean has nearly reached the limit of the permissible level.' The article also insinuated that the report was written 'on order' from the atomic monopolies of the United States and Britain. It added, as another insult to Brynielsson, 'no wonder that its author is intended for the post of director-general of the IAEA.'¹

Although such international measures forced the British to pay closer attention to international opinion, they did little immediately to influence the AEA's actual dumping practices. In early 1961, for instance, it planned to make a fourth dumping based upon an authorization given in 1954. The AEA, fearing the international interest that the Brynielsson Report had stirred up and the criticism that such a unilateral authorization might provoke, particularly from the Soviet Union, affirmed that it should not make any public statement of its intention to carry out the operation. For Britain, it was business as usual and there was no cause for special comment. Although there was no question of its legality, officials thought it unwise to let it be known that an operation was happening at all, given that the site for dumping was 150 miles west of the Madeiras, owned by Portugal. 'It has been decided here,' an AEA official, G. M. P. Myers, wrote to the ministry of science, 'that this location ought not to be made public in view of the possible reaction of foreign Governments who may feel that their interests are adversely affected.'²

Just to be safe, however, the AEA drafted a list of possible questions by the press, and the responses that officials should give. The list illustrates British attitudes towards the international implications of waste disposal. For example, it advised that authorizations for operations were required only by MHLG and MAFF. Because they are done on the high seas, 'the question of special rights, therefore, does not arise ... In the absence so far of any system of international consultative or regulatory machinery for the sea dumping of radioactive wastes, there has been no formal national or

¹ Unofficial trans., 'Poisoners of Wells and Their Accomplices', *Pravda*, 19 Jan. 1961, FO 371/157243. Brynielsson had been considered for being the first director-general of the IAEA, and had lost out to Sterling Cole, the US candidate. Brynielsson was being considered again around the time of the report, but he withdrew his candidacy. It is unclear whether he did so in response to the international controversy over his recommendations. In any case, the Soviet attack on him ruined his chances. For more on the appointments of IAEA directors-general, see D. Fischer, *History of the International Atomic Energy Agency: The First Forty Years* (Vienna, 1997).

² Myers to Thompson, 30 Jan. 1961, FO 371/157243.

international consultation.' Furthermore, British practices had been public knowledge for years and, because it was a safe and simple way of getting rid of radioactive waste, the British would continue indefinitely to dump in the ocean. The Soviet attitude, the AEA wrote, 'can only be regarded as part of their political opposition to all operations by Western countries which might conceivably be associated with the military uses of fission materials'. Moreover, as there was plenty of land in the Soviet Union in which to dump such materials, compared to Britain, it was natural that Britain should be obliged to dump more at sea.¹ Upon reviewing the list, the ministry of science cautioned the AEA to tread lightly on these international issues, especially given the Soviet propensity to criticize: 'We do not intend to change the practice because of these attacks,' a ministry of science official, R. A. Thompson, informed the AEA, 'but it is desirable to minimise the scope we give for further criticism.' In particular, it was unwise to refer to 'the rather tricky question' of the authorizations made by the act of 1954, as other nations might not agree, for instance, that 'the 1954 Act, a domestic measure, really empowers the two Ministries concerned to authorise disposal of waste on the high seas.'²

Britain was frustrated by the Soviets' ability to criticize with impunity. Because of both Soviet and British secrecy, it was difficult to demonstrate to the British public that the Soviets could not possibly be achieving zero release of radioactivity, as they often claimed. Therefore, 'it is to my mind essential', wrote J. McAdam Clark, of the foreign office, 'to say that in fact their statement is untrue. We must ... consider some counter attack.' From various public and secret sources, the foreign office knew a number of damning facts about the back-end of the Soviet nuclear-fuel cycle: for example, that the Soviets discharged radioactive waste into their sewers at levels more than a hundred times the recommendations of the ICRP, and that certain rivers contained high levels of waste, undoubtedly from nuclear installations. Also, radiation exposure in Czechoslovakian uranium mines was well above acceptable limits, and some rivers in that country were radioactive above commonly accepted norms of safety. Foreign office officials were confident that there would be much more to tell, if they put more effort into finding it out.³ However, they also feared the ramifications of such a blatant propaganda counter-offensive, and judged it unwise to make public allegations based upon secret information. 'To uncommitted countries,' the foreign office's Anne Stoddart noted, 'a violent campaign might seem too obvious a cover for our own activities.'⁴

¹ 'Disposal of Waste by Sea Dumping: Answers to Possible Press Questions', n.d., FO 371/157243.

² Thompson to Myers, 15 Feb. 1961, FO 371/157243.

³ Clark to Michaels, 18 April 1961, FO 371/157243.

⁴ Minute, Stoddart, 25 April 1961, FO 371/157243.

The Soviet attacks, however, ultimately did compel the British to disclose more information about their own operations. In late August 1961, the Soviet oceanographic vessel *Mikhail Lomonosov* left Kaliningrad to study the Gulf Stream; according to *Le Monde*, its object was to prove that currents were strong enough to bring submerged radioactive waste to the surface, thus endangering human life.¹ To the foreign office, this was further evidence that the Soviet attacks on dumping in the sea would continue for some time. Consequently, it suited the British to provide Soviet propagandists with as little fuel as possible. However, a few weeks later, in September 1961, the foreign office concluded that it profited the AEA nothing to continue its practice of keeping its disposal sites at sea secret for fear of provoking other countries; instead, it reasoned that if the AEA stood behind the safety of its practices, then the sites should be disclosed, not only as a measure of good faith but to lend credibility to the practice.²

With the prospect of waste disposal becoming a more publicly visible activity, the need to counter Soviet propaganda became imperative. The AEA thus sought to develop some international co-ordination in the handling of bad publicity. Fortunately, the French atomic energy establishment had begun to feel the political strains of its own waste-disposal policies, when in October 1960 the French press began to raise questions about plans to dump radioactive waste into the Mediterranean Sea. It soon became a widely debated issue. Looking for a story, representatives of French Radio contacted the AEA, requesting that it provide a spokesperson to answer questions of 'public interest' regarding the controversy in France. The AEA answered that it had a working dialogue with the French Commissariat à l'Énergie Atomique (CEA) and 'we considered it inappropriate to comment publicly on matters which were currently of embarrassment to them.'³ However, the French government's embarrassment inspired the AEA to propose co-ordinated action with another country facing similar attacks on its waste-disposal practices. A week later, British and French atomic energy officials met and agreed that, although sufficient liaison already existed through the IAEA for the discussion of technical questions, direct liaison was needed for 'having discussions on the means for dealing with the public relations aspects'.⁴

The AEA thought that the French controversy provided a perfect environment in which to strengthen the ties between the two atomic energy establishments, to build a cordial working relationship with the French over the next year, and to construct diplomatic support for sea disposal. As

¹ See Todd to Michaels, 7 Sept. 1961, FO 371/157244.

² Minute, Stoddart, 23 Sept. 1961, FO 371/157244.

³ Williams to Myers, 12 Oct. 1960, AB 54/16.

⁴ Williams to Myers, 28 Oct. 1960, AB 54/16.

Ian Williams, of the AEA's health and safety branch, noted, 'We have every reason to believe that the French will be valuable allies in wider international discussions on these matters rather than the reverse.'¹ The French were certainly willing to be such allies, as the CEA was expanding its infrastructure and expected not only to dump wastes at sea but also to discharge wastes into the English Channel. This prospect could not have pleased the AEA more, and the two agencies sought to co-operate in planning for it. To the AEA, there were 'political advantages in associating with the French in a field where hitherto we have tended to bear the brunt of Russian attacks on sea disposal of radioactive waste in any form'.² If closer liaison could be accomplished, they not only could help each other, but also could promote the international acquiescence in radioactive waste disposal in the sea.

* * *

Just as such liaison was being established in 1962, ocean disposal received a major blow by further bad publicity, this time for Britain. On this occasion, the Soviets had nothing to do with it. On 28 June 1962, as AEA and CEA officials met in London to discuss prospects for further collaboration, French officials announced that fishing trawlers in the Bay of Biscay twice in the past month had discovered drums of waste in their nets, on 29 May and 2 June. On the first occasion, the fishing vessel had been trawling at a relatively shallow depth, about one hundred miles from the coast; on the second occasion, the vessel had been about sixty miles from the coast. At least one of the three drums recovered, on each occasion, was marked as the property of the United Kingdom Atomic Energy Authority. Here the international implications of radioactive waste disposal appeared tangible, as the waste from one nation's nuclear establishment had found its way to contaminate the food supply of another. Over the next few months, the AEA conducted an inquiry into the matter and drafted in November 1962 an internal report summarizing the event and identifying problems with selecting the disposal area, packaging the wastes, and navigating on the high seas. The board of inquiry, chaired by R. F. Jackson, determined that weather conditions had forced the ship's master to rely on dead reckoning for navigation, and thus the drums had been dumped in the wrong place. The board concluded that the dumping area was too small (and thus not allowing for enough margin of error), and the navigational equipment was not accurate enough.³

¹ Williams to Gaunt, 24 July 1961, AB 54/16.

² Overseas Relations Committee, Radioactive Effluent Disposal at the CEA Centre de la Hague, note by Authority Health and Safety Branch, 5 June 1962, AB 54/16.

³ Report of a Research Group Board of Inquiry into the Circumstances Relating to the Recovery of Authority Radioactive Waste Containers from the Bay of Biscay on 29th May and 2nd June, 1962,

While the AEA was drafting the report, other members of the international community were arriving at more scathing conclusions. Some French officials attributed the incident to British incompetence and total disregard for the safety of human life, in this case of fishermen. At an international scientific colloquium held at the French CEA research centre at Saclay on 16-19 October 1962, R. H. Burns, of the AEA's industrial chemistry department, overheard the director of Saclay, Jean Debiesse, harshly criticizing the AEA. In Burns's view, the director was giving an exaggerated version of the incident to an international group of delegates: 'The group of people to whom he was talking contained several of the American delegates and he asked M. [Paul] DeJonghe (Belgium) to interpret for him. M. DeJonghe in his translation, endeavoured to "play down" the incident but there was no doubt that the version, as given, gave rise to considerable interest and criticism.'¹

DeJonghe perhaps wanted to 'play down' the incident because Belgium recently had turned over some of its own waste to be dumped by the AEA. When the conversation ended, the panicked DeJonghe made his way towards the British delegation, which tried to reassure him that no Belgian waste had been involved. Still, the incident had caused, in Jackson's words, some 'rather unfortunate publicity', and had convinced the AEA to divulge its conclusions about the navigation problems, 'to let the Americans and if necessary the Belgians know the true facts without letting them have a copy of the report'.² Although it was reluctant to divulge such information, the AEA found that disclosures to a limited international group could be useful: the AEA needed to reassure dumping-friendly nations that the British methods were safe, and that this problem had occurred only because carefully planned methods had not been followed.

Also in 1962, the Soviets exhibited a rare moment of political dexterity by adopting in principle the disposal of radioactive waste at sea, if stringently regulated. For a short time, they had hinted that they might let up on their condemnations of waste disposal. At the IAEA annual general conference in Vienna in September 1962, the Soviet representative, Vassily Emelyanov, indicated that the Soviet position was not as uncompromising as previously thought, that there might be permissible levels of radioactivity that could be discharged into the oceans. Surprisingly, the Soviet official line allied itself with the recommendations of the American scientists who had warned against transfer of radioactivity by marine animals: in the Soviet journal *International Affairs*, Emelyanov had stated

UKAEA Research Group, Atomic Energy Research Establishment, Harwell, Nov. 1962, AB 54/5 [Inquiry into the Dumping of Active Waste into the Bay of Biscay, April 1962].

¹ Burns to Vick, 26 Oct. 1962, AB 54/5.

² Jackson to Burns, 22 Oct. 1962, AB 54/5.

that such disposal caused legitimate anxiety because, just as NASCO had noted, radioactivity could contaminate marine flora and fauna, and thus be consumed by humans at the end of the food chain. Thus, it was 'above all necessary to establish scientifically the permissible levels for the content of radioactive substances in the water, the soil, and the air. These levels should be binding on all countries.'¹ This was a major turnaround for the Soviet Union, which had taken a comparatively radical stance against the Brynielsson Report: with considerable drama, Emelyanov had then sworn not to have any contact with the IAEA's director-general, after Sigvard Eklund (like Brynielsson, a Swede) was appointed to the position in 1961.²

The token concession by the Soviets, however, was simply a catalyst for adopting a new strategy for their attacks. By accepting the US views of the dangers of fauna contamination, and by agreeing that such dumping ought to be regulated by the IAEA, the Soviets acquired a renewed moral authority. Rather than denouncing everyone involved in ocean waste disposal, they embraced the concept of international regulation, which they would use to charge the West for failing to honour international agreements about the permissible levels of waste disposal. In November 1962, a Soviet newspaper, *Water Transport*, condemned the United States, Britain, and France for their systematic disposal of radioactive waste into the world's seas and rivers, specifically naming the United States for its Pacific and Atlantic dumping, and Britain for discharging wastes from Windscale into the Irish Sea. The newspaper challenged the West to abide by the articles of the 1958 United Nations Convention on the Law of the Sea (UNCLOS), which stated that all nations should take measures to prevent such radioactive pollution. Unlike the West, *Water Transport* stated, the Soviet Union buried most of its waste and processed liquid waste to safe levels prior to discharge.³ Unlike its previous denunciations of the dumping practices, this one claimed adherence to an international agreement that was being violated systematically by the West.

Both the AEC in the United States and the AEA in Britain now found themselves having to defend their actions as legal and safe before the international community. The AEC did so, but lent little credibility to oceanic waste disposal when it immediately informed the *New York Times* in November 1962 that 'principally because of economic considerations', most radioactive waste in the future would be buried on land.⁴ Britain, however, felt it could not afford that luxury, and strongly defended sea

¹ See Walker to Williams, 'IAEA Annual General Conference, 1962, Radioactive Waste Disposal', 1 Oct. 1962, AB 54/15.

² Fischer, *International Atomic Energy Agency*, p. 85.

³ 'Radioactive Waste "Polluting Sea"', *The Times*, 16 Nov. 1962, p. 10e.

⁴ 'AEC Rebutts Soviet on Pollution of Sea', *New York Times*, 16 Nov. 1962, p. 17.

disposal. *The Times* published the AEA's rebuttal just underneath the report of the Soviet condemnation: the rebuttal reflected the AEA's belief that discharges into the sea 'cannot reasonably be considered an automatic infringement' because the IAEA recommendations, not as yet defined, certainly would allow for some dumping. At present, the levels of discharge were drawn from the recommendations of the International Commission on Radiological Protection (ICRP), 'by considering the possible routes, including fish and edible seaweed, by which members of the public might be irradiated'.¹ This view reflected yet another component of Britain's philosophy towards waste disposal, namely that the permissible level of disposal ought to be based upon the 'critical pathways' approach. This meant that the ICRP recommendations, based upon simple metabolic models, or indeed the permissible levels to be agreed upon in the IAEA, would be interpreted based upon local conditions. As Alan Preston, a scientist at MAFF, later said, 'the way in which you apply these models to the environment depends on your personal taste ... It is a question of how you wish to apply the recommendations of ICRP to your particular situation.'² In Britain, the personal taste for the 'critical pathways' approach provided for considerable flexibility in the amount disposed. The AEA insisted that each nation would exercise its own discretion in carrying out international recommendations, and that its present practices did not violate the spirit of any future international law.

The IAEA did have an effect, albeit slowly, in changing British policies. One such change was the AEA's grudging acceptance in 1963 that international opinion might eventually force it to abandon its most convenient dumping area, namely the Hurd Deep, in the English Channel. The admiralty had used the Hurd Deep for some thirty years as a dumping ground for unstable munitions, and more recently, radioactive sludge had been dumped there at the rate of about 1,240 tons per year. However, because of the IAEA's likely recommendation against the disposal of solid or packaged waste in such shallow water (less than 2,000 metres), not to mention the close proximity of the Hurd Deep to the coast of France, some at the AEA felt it would be politically expedient to give up the site. Because the French planned to begin discharging their own liquid waste just a few miles from the Channel Islands, the AEA thought any advisory role it might take in the French operations would be more credible if the Hurd Deep had been given up by that time.³ If the location was given up, all operations would be shifted to the Atlantic Ocean. However, others in the

¹ 'Discharge Control at Windscale', *The Times*, 16 Nov. 1962, p. 10e.

² *Proceedings of the Seminar on Marine Radioecology, Cherbourg, 3rd-6th December 1968* (Paris, 1968), p. 141.

³ Note, Phillips, 1 May 1963, AB 54/15.

AEA believed that the Hurd Deep should not be given up simply because of international pressure: the IAEA regulation could be circumvented simply by regarding the sludge as quasi-liquid, as the drums were expected to burst at a certain depth anyway, releasing the material into the environment.¹ In any event, the AEA did make an effort to comply with the IAEA in the letter, if not in the spirit, of its recommendations.

One of the few tangible goals of the IAEA during the early 1960s was its Register of Marine Disposal of Radioactive Materials. Begun in 1962, it was designed to provide an internationally accessible account of how much radioactive waste each country dumped into the oceans. However, the register, relying on material submitted to the IAEA, was based on very limited information. When its figures for 1959-60 became available to atomic energy establishments in February 1963, the AEA did not like what it saw: Britain appeared to be making by far the most use of the oceans for radioactive waste. Annoyed, an official at the ministry of science, B. C. Peatey, wrote to the AEA: 'As you will see, the UK takes up a great deal of the draft, India is silent, and the whole thing is pretty unbalanced. The US contribution is in a completely different form from anyone else's.'² The AEA dreaded the register, which promised to make Britain look bad. Certainly there were operations in other countries that had not been reported: the AEA knew, for example, that France dumped packaged waste into the Atlantic Ocean, in addition to discharges to the Seine and Rhone described in the register, but that French officials were unlikely to admit it officially. Moreover, the AEA itself had dumped Belgium's waste, the US figures did not lend themselves to easy comparison, and there was little information about the practices of some other countries. There was, however, little to be done about their lack of candour. Although Britain would suffer from being so forthcoming while other countries were not, an official at the AEA, R. J. Garner, insisted cheerfully that 'we do have to recognise, of course, that the UK does discharge quite a lot!'³

Although the AEA was intent on pursuing its own policies, the spectre of international opinion seemed poised to deprive Britain of its autonomy in matters of waste-disposal policy. On 25 May 1964, the director of France's radiation protection service, Pierre Pellerin, informed his British colleagues of another troubling incident: once again, fishing boats on the high seas, this time trawling off the coast of Brittany, had discovered drums of waste in their nets, all of which were of British origin, and some, they said, contained radioactive material.⁴

¹ Dunster to Morgan, 31 May 1963, AB 54/15.

² Peatey to Phillips, 18 Feb. 1963, AB 54/15.

³ Garner to Phillips, 5 March 1963, AB 54/15.

⁴ Phillips to Spence, 28 May 1964, AB 54/27 [MAFF Conditions for Authorisation, and Contract with

The incident prompted a brief reassessment of a dumping operation planned again for the Bay of Biscay. The AEA acknowledged that, in light of the recent embarrassment, they might choose a different site, perhaps one further from the coast, but although this course seemed a wise public relations move, the present location was the most practical.¹ Nevertheless, the AEA had to be cautious in proceeding with its dumping plans because of divisions within the government: the two international incidents, one in 1962 in the Bay of Biscay and now apparently another off Brittany, were having an adverse effect on MAFF's willingness to approve further dumping operations. Anticipating MAFF's reticence, the AEA quickly identified a sacrificial lamb: the Hurd Deep. It had planned to abandon it anyway, and now was an opportunity to do so with the appearance of having conceded something.² However, the immediacy of the situation evaporated when AEA officials determined that the recovered drums off Brittany had not contained radioactive materials at all. Questions of accountability and safety seemed to fade into irrelevance, and the AEA looked forward with renewed confidence that MAFF would not interfere with its future dumping operations. To the AEA officials, all was well, and their reservations vanished.³

Less than a month after deciding in June 1964 that there appeared to be no immediate need to reassess dumping operations, another incident occurred which might have been the AEA's greatest international blunder yet. On 13 July 1964, the MV *Halcience*, docked at the Royal Naval Armament Depot in Gosport, was loaded with nearly a thousand tons of radioactive waste. Most of the waste (778 tons) came from the Atomic Energy Research Establishment (AERE) at Harwell, and the rest came from the Atomic Weapons Research Establishment (AWRE) at Aldermaston. The concrete case on one of the Aldermaston containers, which were of new design, had broken up while being loaded, and inside, a drum of oil 'had "blown up" due to gassing and had apparently burst'. As the loading crew explained to the AEA's escorting officer, W. H. King, the container had been dropped a few feet during the loading operations, and in fact most of the lids of the Aldermaston containers had come off during the loading procedure. Although King made a note of it and judged that the containers were shoddily constructed, he did nothing more.⁴

The *Halcience* set sail on 17 July for the Bay of Biscay, and three days

Commercial Firm, 1963-5].

¹ Phillips to Potter, 9 June 1964, AB 54/15.

² Potter to Garner, 18 June 1964, AB 54/15.

³ Ibid.

⁴ King, Report on Unusual Incidents during Atlantic Dumping Operation no. A.101, 28 July 1964, AB 54/31 [Sea Dumping of Radioactive Wastes, 1963-4].

later, dumping commenced.¹ In the early afternoon, the crew spotted two white packages floating about 150 yards from the vessel, on the port beam. Over the next two hours, seven packages appeared, all over an area of about a quarter of a square mile. They recovered surgical gloves, some polythene containers sealed in a bag, and a pint-sized bottle labeled 'Milk Sample Bottle. Property of AWRE, Aldermaston'. Alarmed by the bottle, King requested that no further Aldermaston drums should be dumped. Over the next several hours, more items were observed and retrieved, including a parcel of small bottles marked 'U-235'. King concluded that at least two or three Aldermaston containers had broken up prior to achieving sufficient depth to prevent items from floating to the surface. As they recovered the items, they became aware of the many Spanish boats fishing in the dumping area throughout the day. In his report, King wrote that it 'cannot be emphasised too strongly that had the conditions not been perfect, many packages could have been missed'. Examining some of the remaining drums, he found that many of them appeared to have the same poor-quality concrete cap that he had seen at port. That, combined with 'remembering the recent deliberations regarding dumping in the Bay of Biscay', convinced King to return with a large amount of waste material still on board the *Halciencie*.²

It could have been an international fiasco, but the AEA was fortunate that its containers had failed immediately, so that the *Halciencie* could recover the items before anyone else discovered them. Nevertheless, combined with the previous international incidents, the *Halciencie*'s close call forced Britain to evaluate dumping operations. At an AEA executive meeting on 31 July 1964, the immediate question was not one of safety but one of publicity. Although there had yet been no publicity at all, some wondered if it might be appropriate to issue a warning to vessels and coastal inhabitants: the meeting concluded, however, with the conviction that there was 'so far no evidence that this was necessary'.³ Despite such confidence, an official at MAFF, Sir John Winniffrith, was sceptical. Compounding the mistake of 1962 (also in the Bay of Biscay), he wrote on 10 September 1964 that 'this incident, combined with the accounts in the report about the containers used for the waste at Aldermaston, is still most disturbing.' Winniffrith felt that the time was right to appoint a committee to 'examine the whole question of the dumping of radioactive solid waste at sea'.⁴

The AEA reacted defensively to Winniffrith's suggestion, claiming that

¹ Bott to Potter, 6 July 1964, AB 54/31.

² King, Report, 28 July 1964, AB 54/31.

³ Minutes, AEX (65) 13th mtg., 31 July 1964, AB 54/31.

⁴ Winniffrith to Hitchman, 10 Sept. 1964, AB 54/31.

no wholesale re-evaluation of sea disposal was in order, as 'it is surely accepted that some material must be dumped in the sea, under, of course, adequate safeguards.'¹ The AEA argued that MAFF had overreacted to the accident; after all, there had been only two instances of failure to comply with the parameters of authorization over the span of several years. Still, Winnifrith pointed out, the two instances raised the question as to whether *any* margin of error was acceptable: if none was acceptable, the practice itself might not be feasible.² 'You may be quite right when you say that some material must be dumped in the sea,' he wrote, 'but I am not sure that this is self-evident.' He continued: 'There really is a problem about dumping at sea. We have had too many uncomfortable moments lately when containers have been trawled up off the coasts of France. The sea is still probably the right place but I suspect we need more stringent rules about the safeguards. And some things they dump are probably too risky for the sea, whatever the safeguards.'³ Probably in an effort to placate the AEA, Winnifrith noted that he had not envisioned any formal committee in any case, but rather a series of discussions between interested parties.

In the end, MAFF retreated, and no re-evaluation of radioactive waste disposal at sea occurred. The AEA eventually determined at a meeting on 15 October 1964 that the only real problem was that the appropriate precautions, in terms of canister design and handling procedures, had not been taken,⁴ and in the policy review that ensued, the AEA defined the issues in terms of technology and responsibility, not in terms of whether to dump or not to dump. The most obvious technological challenge was in the design of the waste receptacle, and the problem of polythene, which often floated even when canisters imploded at the expected depth and which could be seen rather easily. One official, F. A. Vick, noted that no matter how successful an operation was, polythene items most likely would be picked up eventually in nets or on beaches. 'By then,' he added sanguinely, 'it is hoped that the items will have been well-washed.'⁵ But because they could not count on fishermen and beachcombers to understand that, the AEA needed to devise a way to keep polythene from floating, by weighing it down, incinerating it, melting it around metallic waste, or allow it to float and simply shred it to prevent people from ever recognizing it.⁶ Winnifrith's re-evaluation policy ended up having little to do with policy.

1 Sharp to Winnifrith, 17 Sept. 1964, AB 54/31.

2 Winnifrith to Hitchman, 10 Sept. 1964, AB 54/31.

3 Winnifrith to Sharp, 2 Oct. 1964, AB 54/31.

4 Minutes, AEA (64), 18th mtg., 15 Oct. 1964, AB 54/31.

5 Vick to McLean, 28 Sept. 1964, AB 54/15.

6 Burns to Vick, 25 Aug. 1964, AB 54/31.

After the second Bay of Biscay incident, the AEA recognized that *all* radioactive waste establishments should have to conform to the same standards, lest bad publicity for one of them should damn the practice for all. Harwell, for example, had to shoulder some of the blame for the incident, because it had agreed to dump materials for another establishment 'without fully realising that they must in consequence accept the full responsibility for the material dumped'. Presiding over the dumping would have forced Harwell to make certain that all packages, not merely its own, met with the proper standards. As Jackson wrote: 'This seems a parallel with the kind of responsibility you accept in taking somebody else's parcel through customs!'¹ The attitude, a marked contrast to Britain's earlier conviction that accidents in international waters should have no legal ramifications, would have wider ramifications for other nations' nuclear establishments.

* * *

Despite the internal crisis brought on by the failed Bay of Biscay dumping in July, there were in 1964 favourable prospects for the international endorsement of radioactive waste disposal on the high seas. In April, several Soviet atomic energy officials visited Britain to observe methods of waste disposal. The British tried to demonstrate that the AEA conducted scientific work and monitoring programmes in areas of discharge and dumping, and the Soviets appeared impressed. The Soviet leader, Kolychev, admitted that the Soviet position was probably unreasonably inflexible, and that for smaller countries perhaps it was the best option.² The Soviets were also impressed by the measures taken to provide the safest conditions for disposal, and presentations on British monitoring work 'took the Russians by storm'. Although Dunster expected that the Soviets would not relent on the political front, he believed that 'at least a number of their influential technical people now recognise our point of view and some of them at least sympathise with it.'³

There were other signs of acceptance by the European states, all stemming from each state's own struggle to find an economical answer to radioactive waste disposal. Sweden authorized two of its nuclear institutions to dispose of its radioactive waste products in international waters.⁴ In West Germany, meanwhile, waste disposal on land had become an acutely

¹ Jackson to Vick, 8 Oct. 1964, AB 54/31.

² Dunster, note for the record, exchange visit with the USSR on waste disposal, 9-18 April 1964, n.d., and Williams to Michaels, 4 May 1964, AB 54/46 [Waste Disposal - General - Liaison with the USSR, 1963-8].

³ Dunster to Hill, 21 April 1964, AB 54/46.

⁴ Extract from *Applied Atomic*s, no. 461, 29 July 1964, AB 54/15.

difficult problem and, by mid-July, all of its storage depots had nearly reached capacity. The government's plan for the immediate future had been to use an abandoned salt mine for the wastes, but the problem of storage, hitherto most sharply felt by Britain, led its ministry of scientific affairs to determine that the sea might prove even cheaper.¹ Consequently, West Germany devised an 'experimental' dumping operation of about one hundred drums of radioactive waste to be dumped in 1966 (later changed to 1967), the location of which would be based upon the advice of scientists at the Hydrographic Institute in Hamburg.² As the West Germans were anxious to have as little international controversy as possible, they hoped, as part of the experiment, to include a number of post-dumping checks, such as photographs of the drums on the seabed, the use of dyes to track dispersion, or some kind of monitoring programme. An AEA official, M. Phillips, noted that 'their purpose is largely a public relations one.' More important, the West Germans avoided the appearance of unilateral action by referring their plans to the European Nuclear Energy Agency (ENEA) to gain some degree of international acceptance: they hoped to invite other countries to participate in the experiment or to be associated with it in some way.³

The German experiment struck Britain as a perfect opportunity to promote the international acquiescence in sea disposal and to establish common operating standards. The AEA wished to make sure that any results of the experiment would be valid. Just as Harwell had to cast its lot in with Aldermaston's, so Britain felt that it should be involved enough in the German enterprise to ensure that the practice of sea disposal was not compromised; that the practices of one should not ruin the practice for all. Burns explained that if, for example, the German containers burst because of a design problem, 'then there is a real danger that sea dumping would be damned. At the very least it could give our critics further ammunition.'⁴

The AEA, believing that the Germans should take its advice in order to ensure that the experiment begin properly, tried to be involved from the outset. In July 1965, AEA officials drafted a plan for British collaboration and presented it to the ENEA. The Germans, however, hesitated to discuss the draft, as they had agreed upon many of their plans already and did not want to see Britain take over the entire operation. For example, they had already packaged the waste in the form of sludge incorporated into concrete. More important, West Germany had tried to ensure that its

¹ Extract from *Applied Atomic*, no. 460, 22 July 1964, AB 54/15.

² Phillips to Burns, 8 May 1964, AB 54/26 [ENEA Collaboration on Sea Dumping of Radioactive Waste, 1964-9].

³ Phillips to Burns, 8 May 1964, AB 54/26.

⁴ Burns to Phillips, 14 May 1964, AB 54/26.

experiment would be perceived in a positive, scientifically oriented light (going so far as to call their dumping exercise an 'experiment'). Germany even chartered for the operation the German research vessel, *Meteor*. To the British, the choice of *Meteor* was silly, and they doubted whether such a vessel, rigged to conduct scientific research, was suitable for dumping operations. The Germans, however, reasoned that it was necessary to have an intensive research programme associated with the dumping, and that this was the best way to achieve it.¹

Because of the potential of such disagreements to spoil the German experiment, Britain decided to emphasize its objective of international acquiescence. In October 1965, the ENEA met to discuss widening the project to include not only observers from other countries, but also waste from other countries. Representatives from Britain, France, the Netherlands, West Germany, Belgium, and Italy (as an observer), concluded that the Atlantic Ocean was an entirely acceptable dumping ground for radioactive waste, and that they should move forward with an international dumping operation which would include waste from Sweden, Norway, the Netherlands, Belgium, West Germany, Britain, and France. The foreign office determined that 'it is very much in the United Kingdom's interest to obtain international recognition of the safety of dumping solid radioactive wastes at sea.'² In March 1966, a working party between MAFF and the AEA reaffirmed that ocean dumping was the best disposal method for certain kinds of radioactive waste, and even if a suitable land disposal site was found, Britain would still look forward to an extended period of ocean dumping: it was, therefore, in its best interests to gain some international acceptance of the practice.³ To Britain, the ENEA operation seemed to offer the best chance of widening the club of dumping countries.

The AEA, despite the operation's challenge to its pride, stuck to its international objective. Germany made it clear by March 1966 that the success of the operation depended largely on British participation, but it also 'hinted delicately that too much UK dominance might not be universally acceptable'.⁴ The AEA therefore readily agreed to act primarily behind the scenes, with the ultimate aim of the international endorsement of, and even co-operation in, dumping radioactive wastes at sea. 'For the reasons you appreciate,' Vick wrote a British representative, Ian Williams, in the ENEA, 'the UK must not be suspected of making the running in this

1 ENEA Steering Committee for Nuclear Energy: Health and Safety Sub-Committee, extract from note of meeting of the restricted working group established by the sub-committee to review the programme and prepare a schedule of work for 1966, 15-16 July 1965, AB 54/26.

2 Cargill, minute, 10 March 1966, FO 371/189438.

3 Williams to Burns, 11 March 1966, AB 54/26.

4 Ibid.

exercise,' and would be satisfied by sufficient involvement to ensure that certain specifications and procedures were followed.¹

This entailed enduring occasional abuse, as in October 1966 when the ENEA drafted a press statement to explain the purpose of the international dumping exercise. The original version noted that 'many European countries are experiencing difficulty in dealing with the disposal of their solid radioactive waste,' and that 'traditional methods of burial or storage ... present difficulties in densely populated regions.' Consequently, the draft stated, the ENEA was now 'undertaking a study to establish a safe and economic means of disposing of such waste into the Atlantic Ocean'. To the British, however, this read like an indictment: the term 'traditional methods' attached some novelty to ocean dumping, despite the fact that Britain long had considered it the preferred, and thus its traditional, method. The AEA was also dismayed by the implication that, despite Britain's long history of dumping and its professed commitment to safety, only now was a *responsible* body coming forward to establish safe means for radioactive waste disposal in the ocean.²

The AEA made the success of the ENEA experiment a major policy objective.³ The British felt that while Soviet participation in the IAEA enmeshed that body too deeply in cold-war politics, the ENEA was an ideal forum to promote ocean dumping, for membership there was limited to a group of Western nations with whom Britain could deal more easily, and thus avoid the barbs it routinely received from the Soviet Union at IAEA meetings. Whereas previously the British had been 'liable to be pilloried internationally for a practice condemned by many, largely as a result of Russian initiatives', the ENEA operation, precisely because Britain did not initiate it, now provided an opportunity for several countries to encourage the practice and promote it in an international forum.

* * *

Not only did the ENEA dumping operation promise to dissipate the objections of Britain's most severe critic, it also showed the promise of deflecting the criticism of other opponents. The operation also opened a new phase in international relations, when the dangers of ocean dumping became evident to countries nearest the waste-disposal sites. The site for the joint operation was located in the Atlantic Ocean off Portugal; the West Germans, who had gone to great lengths to provide the ENEA plan with sound scientific justification and political endorsement, had chosen the site

¹ Vick to Williams, 22 March 1966, AB 54/26.

² Richings to Clark, 11 Oct. 1966, FO 371/189438.

³ Williams to Burns, 11 March 1966, AB 54/26.

based on the recommendation of oceanographers. They had not, however, given much consideration to the psychological effects on nearby inhabitants; for example, upon finding out about the plans, representatives of Portugal's fishing and tourist industries became alarmed. At the meeting of the ENEA's committee for the dumping operation in June 1966, the Portuguese delegation expressed deep anxiety about the location of the disposal site.¹ But the ENEA pressed on despite the protests of the Portuguese. At another meeting in late September, six European countries (Belgium, France, West Germany, the Netherlands, Norway, and Britain) stated their willingness to participate, bringing the estimates for the number of drums of waste to between 36,000 and 73,000, and the total weight of radioactive waste to be dumped off Portugal would be between 11,000 and 26,000 tons.²

During an ENEA meeting in April 1967, the Portuguese tourist board began in earnest to try to block the operation. Its representatives were worried that such dangerous materials from other countries might endanger the Portuguese people and scare off tourists. Although AEA officials felt that the Portuguese position was unjustified, political expediency motivated them to suggest moving the site. The Germans, however, feared that a move would undermine the credibility that the scientists, who had chosen the site, lent to the operation; they threatened to withdraw completely if the site was moved simply because of Portugal's complaint. The AEA therefore determined that 'to stop the operation or even to move the dumping area further north would undoubtedly cause much more public comment and trouble than merely absorbing any Portuguese protest and continuing the operation.' If they halted the operation, British officials would have to make public statements of explanation, and Europe's press would create havoc; if they moved the location, the Portuguese undoubtedly would make some statement stating that tourists were no longer in danger, which would imply that indeed there had been a danger with the initial site.³

After some discussion at the April 1967 ENEA meeting, the dumping participants joined to oppose Portugal's objection. The British delegation reported that the Germans were angry at the suggestion that 'a manifestly irrational attitude by a relatively small member state should hold up what most other countries deemed a desirable as well as a safe operation.' The French delegation felt that Portugal's objections were based upon emotion;

1 Williams, Report of the Committee for the Experimental Disposal of Radioactive Waste into the Atlantic Ocean, 10 June 1966, AB 54/26.

2 Burns, ENEA mtg. on the Experimental Disposal of Radioactive Waste into the Atlantic Ocean (Paris - 26-27 Sept. 1966), 4 Nov. 1966, AB 54/26.

3 Richings to Kelly, 18 April 1967, AB 54/26.

the French, who had been monitoring dumping operations for years, believed the practice was harmless. Spain, who initially had sided with Portugal, admitted that this operation should probably go forward in the interest of promoting internationally agreed parameters and control for dumping operations. Britain, which obviously wished to see the operation go forward, appreciated Spain's support, particularly if standards could be set by the ENEA, rather than the IAEA.¹ Together, the larger ENEA countries were prepared to override the 'not-in-my-backyard' protests of Portugal, in the interest of setting European standards for waste disposal at sea.

Portugal tried to present some economic and scientific arguments, to no avail. First, it claimed that the operation would have a negative impact upon tourism, but France and the Netherlands assured Portugal that, if their experiences were any indication, no such problems would arise: tourism, they said, had not declined in areas of radioactive waste discharge in their countries. In fact, the Dutch even reported (informally) an increase in tourists to the area of their effluent pipeline. The French also reported that, although a couple of short articles about radioactive waste disposal had appeared in French newspapers, there was no decline in people visiting the coast. Thus, having gathered these ad hoc views, the participant states told the Portuguese that their point had no substance.

Portugal then turned to scientific arguments. German and French oceanographers had determined that only very slow currents, moving northwards, were present in the area, and this had convinced the Germans that the site was safe. But Portuguese and Spanish scientists claimed that the currents actually moved eastwards, towards the Portuguese coast. Initially, this appeared to suggest a serious conflict of expertise, but the exasperated British representatives closed the issue by indicating how little such scientific justification mattered: the dumping would be safe, they said, regardless of what the scientists found. If the Germans were correct, and the area was stable with slight northward movement, the operation could be justified; if the currents were variable, as the conflict seemed to suggest – they did not acknowledge that the Portuguese and Spanish scientists might be completely correct – then the conditions were even better, because the radioactive materials would be well dispersed. In other words, they did not need to know how the currents behaved at all; they could still dump. Portugal's objections appear to have suffered from a steamroller effect. Despite its protests and after some 'long and somewhat emotional' meetings among the delegates, participating countries commenced their operations in May 1967.²

¹ Richings to Kelly, 18 April 1967, AB 54/26.

² *Ibid.* The loading of the British consignment for the ENEA operation is reported in J. T. Daniels to

The ENEA promised to dissipate much of Britain's diplomatic burden, but such international acceptance of sea dumping required a trade-off: the ENEA operation brought waste disposal at sea increasingly into the public consciousness, especially in light of Portugal's intense protest. More than ever, the AEA was now concerned with public relations. The AEA's director of public relations, Eric Underwood, insisted in April 1967 that the ENEA operation had opened up new and troublesome problems. Based largely on Portuguese anxiety about the effects of the dumping on its tourist industry, Underwood expected an assault by British journalists seeking 'to gain further publicity of a dramatic sort'. One official, L. D. G. Richings, reported that, 'in Underwood's view we cannot rule out the possibility of some journalists wilfully seeking an opportunity to, for example, photograph a child or children on or near a train with a background of drums and/or radioactive signs.' Any incident, however small, had the potential of being blown out of proportion by the press. Many journalists, Underwood believed, had consciously been awaiting the start of the first ENEA operation, just to find something sensational to report:¹ reporters were on alert 'in a way that we have not had to face before'. Underwood imagined them sneaking around to get close enough to dangerous materials merely to demonstrate that a mischievous child could do it, and drums rolling off trucks and railway officials being unwilling to handle the materials. Although such incidents were unlikely, 'we shall be laying up a lot of future trouble for the Authority if there *is* an incident and we have demonstrably *not* prepared ourselves for it.'² Britain's involvement in the ENEA operation would begin a new phase of increased public awareness, accountability, and dissent. For the time being, however, it was a major coup in the international acceptance of radioactive waste disposal in the oceans.

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Britain, by far the state most reliant upon ocean dumping, was at the centre of the international dialogue about radioactive waste disposal in the oceans during the 1960s. Its experience underlines the relative weakness of scientific expertise compared to diplomatic machinations in propelling policy action. Britain disagreed with the recommendations of NASCO scientists, on the grounds that they undervalued the ocean as an efficient diluter of wastes. This conclusion reflected not only Britain's scientific findings, but also the environmental philosophy prevalent among British

R. H. Burns, 25 May 1967, AB 54/26.

¹ Richings to Burns, 25 April 1967, AB 54/26.

² Underwood to Fishenden, 8 May 1967, AB 54/26.

health physics officials, that the environment itself was an integral part of the back-end of the nuclear fuel cycle, not just a repository for waste. The British did conduct their own scientific studies of dumping areas, particularly at areas of discharge, in order to determine how much could be discharged in a given area, but in the case of the deep sea, it turned a deaf ear to Portugal's scientific protests before the ENEA operation, claiming that dumping was safe regardless of how ocean currents behaved. In the end, there was little that scientific data could do to shake what many perceived as the basic feature of Britain's radioactive waste policy, namely ocean disposal.

A more important facet of environmental policy-making demonstrated by the British experience is the importance of public relations, which had a slightly greater effect on the AEA's practices than scientific arguments. The opinion of the British public and the international community was not perceived as a positive shaper of policy, but as a constant annoyance, and policy changes such as the abandonment of the Hurd Deep were designed to control damage to public relations. Generally, although British authorities insisted that they were doing nothing illegal, they preferred to keep waste-disposal activities out of the public eye: because British practices placed it in sharp disagreement with many other countries, radioactive waste disposal was particularly susceptible to criticism. The AEA routinely expressed its concerns over how each action would be perceived, or over the possibility of bad press. Its responses to accidents centred on developing new ways to avoid publicity, rather than on re-evaluating the safety of its practices. Part of its fear was of the local media, but primarily it did not wish to fuel the fire that the Soviets were already stoking so well. When Britain sacrificed its veil of secrecy to participate in the ENEA operation, it hoped that promoting an international endeavour would contribute to international acquiescence in waste disposal, and thus render Britain less vulnerable to criticism. When considering how to respond to Portuguese objections, the ultimate task was deciding which response would elicit the least criticism: conceding to Portugal, and thus implicitly admitting that there had been real danger, or absorbing the protests and avoiding subsequent media attention. Its choices were nearly always posed in terms of controlling damage to public relations.

The difficulty of environmental policy-making at the international level is the persistent exercise of sovereign powers to make unilateral decisions. Individual treaties and agreements negotiated in international bodies form the only legal basis for regulating emissions and disposal of waste into the air, the sea, and other areas not governed by any one nation, such as Antarctica and outer space. Still, each nation exercises its own judgement as to how, if at all, agreements are followed. Today, many states are dis-

appointed with the United States for its cavalier attitude towards the Kyoto Protocol, and in 1993, the world was appalled to find that the Soviet Union had secretly dumped vast amounts of radioactive waste into the sea, despite having been the most vocal opponent of such practices during the 1960s. Britain, throughout the cold war, interpreted environmental regulations as it saw fit, employing a philosophical approach to such problems not shared by many other states, thus evading the recommendations of the International Commission on Radiological Protection by implementing them, as MAFF scientist Alan Preston put it, according to personal taste. The British case demonstrates that national environmental policies, often tied loosely to scientific concepts, are not easily changed by specific scientific objections. On the other hand, the AEA *did* change its dumping practices, if only slightly, out of respect or fear of public opinion; in fact, every change in British policies stemmed directly from its desire to combat bad press. Although Britain succeeded in widening the practice and diffusing criticism, only public participation and the spectre of international accountability prompted any action at all.

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