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Waste Not Want Not? Australia and the Politics of High-level Nuclear Waste

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During 1999 and 2000, Australian governments rejected a proposal put forward by Pangea Resources to place an international high-level radioactive waste repository somewhere on the Australian continent. The decision was marked by tensions between competing political objectives, and was driven partly by an unusual alliance between pro-uranium mining governments and anti-nuclear non-government organisations (NGOs). The article begins by placing Australia's current nuclear policies in historical context, focusing on the stances taken by the major political parties. The second section briefly describes the Pangea proposal and the Australian response. The third section considers why Australia might have reacted differently. The fourth section critically reviews some of the reasons why the Pangea proposal elicited such hostility. Finally, the article discusses key policy barriers to the proposal, concluding that these are unlikely to disappear and that as a result Pangea and any other similar organisations would have little chance of pursuing their objectives in Australia.

Few countries have a comfortable relationship with their nuclear industries. Whether it is because of accidents, scandals, protests, cost constraints, lack of waste facilities, or cultural change, most countries are uneasy with developing nuclear facilities, even if they lack alternatives. This relationship between citizen, state and industry is perhaps most hostile in the South Pacific.

But while New Zealand maintains a 'purist' anti-nuclear stance (aided by France's heavy-handed treatment of Greenpeace), Australia is a Janus-faced nuclear power. Australian governments oppose the development of domestic nuclear power. Yet they promote uranium mining. Australian citizens have been the victims, unintentionally or otherwise, of nuclear weapons testing and have spawned powerful disarmament movements. However, their generally internationalist views about the nuclear fuel cycle and weapons proliferation are matched by a fierce parochial resistance to the siting of any nuclear facilities anywhere in their country, regardless of their purpose.

This article explores these contradictions and discusses the political constraints

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on change in the Australian stance towards nuclear materials. The focus of this article is on high-level radioactive waste (HLW), because it is the most intractable nuclear waste problem and because a controversial HLW disposal project has been proposed for Australia by a consortium of nuclear industry players. The article begins by setting out the historical trajectory of nuclear policy in Australia. It then describes Pangea's proposal for a HLW repository, Australia's response to the idea, and some of the reasons that the Pangea proposal elicited such hostility. Finally, the article discusses key policy barriers to the proposal, concluding that these are unlikely to disappear and that as a result Pangea and any other similar organisations would have little chance of pursuing their objectives in Australia.

Atomic Australia[1]

Australia has long played a role on the world nuclear stage. Over the long run, that role has been one of uranium supplier to other nuclear powers, first for military applications and later for the nuclear power industry. Australia's role in the atomic age was for many years shaped by a complex three-way relationship with the United Kingdom and the United States, as it attempted to use the supply of uranium as a bargaining chip to gain access to nuclear technologies from each of the two major powers. Just as Australia supplied uranium for both civil and military uses, so the technologies in which it was interested were of both sorts. Up to the early 1970s, Australian governments sought to secure both nuclear power and independent nuclear weapons-building capacity (Cawte 1992).

Australian governments and political parties were initially internally divided over their attitudes towards nuclear energy and nuclear policy. Successive federal Coalition governments, led first by Prime Minister Menzies and then by Holt and Gorton, were nuclear advocates. However, Gorton's successor, William McMahon, did not share his colleagues' enthusiasm, and his approach to nuclear power effectively stymied the only commercial reactor ever proposed for Australia (Cawte 1992, 128–32; Juddery 2000, 1).

The Australian Labor Party (ALP) was also divided on nuclear issues. In the 1970s, the Whitlam government's Minister for Minerals and Energy, Reginald 'Rex' Connor, was in favour of developing Australia's uranium deposits and if possible its nuclear technologies. Whitlam's Environment Minister, Moss Cass, was in contrast a staunch opponent of such developments.

By the late 1970s, however, it seemed clear that the Coalition parties supported the development of Australia's nuclear resources, if only, as Prime Minister Malcolm Fraser put it, because 'The government ... made its decision with a deep sense of international responsibility ... [W]ere it not for our obligation to provide energy to an energy deficient world, we would not have decided to export uranium' (*Parliamentary Debates, House of Representatives* 25 August 1977). Later, after a 13-year moratorium on uranium mine development under the Labor governments of Bob Hawke and Paul Keating, the Coalition government of John Howard again enthusiastically backed the development of Australia's uranium mining industry. It also supported the funding and construction of a new research reactor to replace the ageing facility at Lucas Heights near Sydney.

[1] I owe this title to the primary work of historical scholarship in this field by Alice Cawte (1992).

The ALP, in contrast, eventually settled uneasily on a policy platform opposed to uranium mining as well as other commercial nuclear developments, while supporting Australian nuclear research and respecting pre-existing uranium export contracts. This stance of opposition to uranium mining, most ardently pursued by the ALP's Left faction, built on that of its federal parliamentary leader in the 1950s, Herbert 'Doc' Evatt, an advocate of 'international disarmament and the banning of the bomb' (Cawte 1992, 86). Others in the party continued to argue that such a stance was pointless if pursued unilaterally; however, their arguments failed to sway the frequent ALP reviews of its uranium policy through the 1980s and 1990s. By the late 1990s, the federal ALP was opposed to uranium mining while the federal Coalition parties backed the development of the industry. The federal ALP also opposed the construction of a new research reactor in Australia (ALP 2001).

Ostensibly, therefore, there were differences between the political parties with regards to the encouragement of nuclear industries. Conservative governments—which in the late 1990s held power at the national level, as well as at the State level in Western Australia and South Australia—were supportive of nuclear power in other countries and could presumably be expected to support the resolution of one major outstanding problem for the industry: waste management. In the late 1990s, they had an opportunity to become engaged with this issue.

Pangea is Run Out of Town

In late 1998, the non-government environmental organisation Friends of the Earth leaked to the media a corporate video revealing that Pangea Resources Australia was developing a HLW disposal concept for Australia (Pentz 1999). Pangea Resources Australia is a subsidiary of Pangea Resources International, owned by British Nuclear Fuels Limited (BNFL) and EHL Canada, the holding company for Golder Associates (UIC 1999, 3). Technical expertise is also provided by the Swiss nuclear waste management industry cooperative NAGRA (Pangea Resources Australia 2001).

Pangea's proposal was for a permanent deep geological disposal site to be located somewhere in the flat, arid Australian outback, probably in South Australia or Western Australia. The primary intention was that it would be a commercially operated facility for receiving HLW from commercial power generation, but it could also store 'suitably conditioned waste materials derived from the dismantling of nuclear weapons' (McCombie et al 1999, 1). The site would receive around 75,000 tonnes of spent fuel over a period of 40 years before a decommissioning process that involved backfilling of access portals, and post-decommissioning monitoring (Pentz 1999).

Waste would be transported by sea from source countries to a dedicated sea terminal, with rail transport from there to the repository. Pangea envisaged that this might take place on a custom-built rail link. The site to which the waste would be taken would be chosen according to many criteria, relating to the geology, climate and hydrology of the site, its remoteness, engineering requirements and so forth—criteria very similar in fact to those used by the federal government to choose Australia's low-level nuclear waste disposal site (McCombie et al 1999; Holland 2002).

While the proposal's advocates were speaking enthusiastically of economic benefits and global responsibilities, Australian politicians were having nothing

to do with the idea. As soon as the issue arose, the Western Australian government indicated that it opposed the concept (*WA Parliamentary Debates, Legislative Council* 3 December 1998, 4844). The West Australian parliament later passed a bipartisan motion that expressed the parliament's

> total opposition to any proposal from any person or company to situate an international nuclear waste repository in Western Australia on the grounds that such a repository poses a significant threat to Western Australia's environment and public safety. (*WA Parliamentary Debates, House of Assembly* 7 September 1999, 644)

In the following months, at the initiative of the Labor Opposition but with the support of the conservative Coalition government, the Western Australian parliament also passed the Nuclear Waste Storage (Prohibition) Act 1999, with the intention of 'prohibiting the establishment of a nuclear waste storage facility in this State or the use of any place in this State for the storage or disposal of nuclear waste'.

The Australian Senate took a similar line, passing a motion that

> expresses its fundamental opposition to the proposal by Pangea to situate an international nuclear waste repository in Western Australia, or anywhere else within the territories of the Commonwealth of Australia, on the grounds that such a repository poses significant threats to Australia's environment, public safety and sovereignty. (*Parliamentary Debates, Senate* 26 August 1999, 7793)

while the federal minister responsible for the issue, Minister for Industry Science and Resources Senator Minchin, indicated that '[t]he Pangea proposal will go nowhere' (*Parliamentary Debates, Senate* 18 October 1999, 9814). Minchin declared that the Howard government's view, which had been communicated to Pangea, was that 'every country involved in the nuclear fuel cycle should make its own arrangements for looking after its own waste' (*Parliamentary Debates, Senate* 18 October 1999, 9813).

In South Australia, similar events transpired during the course of 2000. The South Australian case was made more complex because that State had been selected by the federal (Commonwealth) government as the preferred location for an Australian low-level nuclear waste disposal site (BRS 1997; Minchin 2000) and the Commonwealth–State Consultative Committee on Radioactive Waste Management had in 1997 endorsed the investigation of possible co-location of an intermediate waste store wherever the low-level repository site might be placed (DISR 1999, 10). Since the Commonwealth may have the power to override State laws with respect to nuclear materials, South Australia had to approach the issue in a way that did not bring it into direct conflict with existing federal policies (*SA Parliamentary Debates, House of Assembly* 13 April 2000, 925).

The South Australian conservative government, again under pressure from its Labor Opposition, accordingly passed almost identical legislation to that passed the previous year in Western Australia. The Nuclear Waste Storage Facility (Prohibition) Act 2000 allowed only low-level waste to be housed in the State and, like the Western Australian Act, also prohibited government funds from being spent on encouraging nuclear waste facilities, effectively preventing departments or statutory authorities from even supporting feasibility studies (*SA Parliamentary Debates, House of Assembly* 31 May 2000, 1313–14). Its significance was both to signal that

Table 1. Export destinations for Australia's uranium, 1999

Country	Yellowcake (tonnes)	Percentage of total
United States	2302.0	32.1
Japan	2246.6	31.3
Korea RO	687.6	9.6
United Kingdom	599.7	8.4
France	497.2	7.0
Sweden	366.7	5.1
Canada	171.6	2.4
Germany	158.8	2.2
Belgium	88.4	1.2
Finland	53.1	0.7
Total	7171.7	100.0

Source: ASNO (2000, 85).

Pangea was not welcome in South Australia, and also to signal to the federal government that any Australian nuclear waste other than low-level waste should be stored elsewhere.

Environment-oriented NGOs similarly lined up against the proposal. The Nuclear Information Centre (affiliated to the Conservation Council of South Australia) mirrored Senator Minchin's argument, stating that '[t]he producers of waste should be made responsible for waste treatment/disposal' (NIC 1999, 1). These NGOs argued that foreign multinationals wanted to turn Australia into a nuclear 'rubbish dump' and that transporting the waste long distances simply increased the environmental hazard that it would pose (ACF 2001b). They pointed out widespread public opposition to the proposal (McSorley 2000). Australian governments agreed. By the end of 2000, it thus seemed, as Senator Minchin had put it, that the Pangea proposal was going nowhere other than out of Australia.

Reconsidering the Nuclear Waste Question

Australia's conservative governments have been supporters of the nuclear industries, often in the face of widespread popular criticism. Yet Australia swiftly rejected the possibility of hosting a nuclear waste facility such as that proposed by Pangea. There are nevertheless many reasons Australia would be well placed to host such a facility. Some are ethical, some environmental, some economic, and some political.

First, Australia benefits from the sale of uranium. It retails yellowcake to many countries, including the United Kingdom and Canada, homes to the parent companies of the Pangea venture (see Table 1). The question is whether any ethical responsibilities might come with these economic benefits.

The idea that ethically there should be a link between benefit and responsibilities is one generally accepted by both nuclear industries and their critics (Kasperson, Derr and Kates 1983; Schrader-Frechette 1993; Greber 1996). However, the active pursuit of this principle has generally been confined to those countries that generate nuclear power and thus currently have stored significant quantities of HLW.

The Australian government has adopted the position that there is no relationship between benefiting from selling uranium and taking any responsibility for the waste

produced by its use (ASTEC 1984, 30; DISR 1999, 11). In completely detaching uranium mining and export from the waste issue, the Australian government has set aside the approach advocated by the Ranger Uranium Environmental Inquiry, the report of which in most other respects has formed the blueprint for the development of Australia's nuclear industry:

> While we do not think that the waste situation is at present such as to justify Australia wholly refusing to export uranium, it is plain that the situation demands careful watching, and, depending on developments, regular and frequent reassessment. If, even in a few years, satisfactory disposal methods have not been established, it may well be that supplies of uranium by Australia should be restricted, or even terminated ...
>
> We also suggest that ... [Australia] endeavours to have some internationally acceptable system established for the disposal of high-level wastes, and international supervision of what is done. (RUEI 1976, 178)

A quarter of a century would seem more than 'a few years', but the Australian government's approach to the issue remains that of being a good international nuclear citizen on the basis articulated by the Australian Science and Technology Council (ASTEC) in 1984: that 'Australia will be best able to make a significant contribution [to non-proliferation and nuclear safety] if it is actively involved in the nuclear fuel cycle' (ASTEC 1984, 2; Buttar 1986, 4). This now, however, seems to be confined to exporting uranium, paying little regard to another of ASTEC's recommendations:

> We consider that this contribution [to non-proliferation] would be strengthened if Australia were to participate in appropriate ways in other steps of the fuel cycle. The most suitable basis for developing such activities would be through the joint ownership and supervision of the appropriate facilities by Australia ... Some of these facilities might appropriately be located in Australia. (ASTEC 1984, 13)

Pangea Resources did pick up on this argument, stating that one of the aims of its proposal was to 'provide the host country with the opportunity to play an unprecedented role in enhancing non-proliferation, encouraging nuclear weapons states to disarm' (Pentz 1999, 2).

The possibility that Australia might pick up the ethical and practical concerns articulated by ASTEC and the Ranger Inquiry commissioners has thus been eliminated by a coalition of pro-uranium mining governments (Commonwealth, South Australian and West Australian) and anti-nuclear waste NGOs: in Yandle's terms, a coalition of 'bootleggers and baptists' (Yandle 1989, 19). There are, however, many other reasons why Australia more than most might give some weight to these responsibilities.

The first of these, as already pointed out by Pangea resources (McCombie et al 1999; Pangea Resources Australia 1999; Pentz 1999), is that Australia presents an ideal physical setting for a waste site. It includes regions that are highly geologically stable, relatively flat, have an arid climate, are likely to remain free of glaciation, and are sparsely populated. These arguments have been discussed elsewhere, and the Australian government has endorsed as appropriate the sorts of criteria used by Pangea (DPIE 1992; NRIC 1992; DISR 1999). The potentially large number of suitable sites in Australia that might be available to be chosen amongst in a siting decision process (NRIC 1994) would also enhance the

procedural soundness of site selection (Kasperson, Derr and Kates 1983; Schrader-Frechette 1993; Gerrard 1994; Inhaber 1998).

An important question that never emerged in the debate was whether Australia would prefer to see the waste located in one of the other parts of the world that meet these criteria, or in locations close to where it is currently stored regardless of their long-term suitability (the policy position of the Australian Conservation Foundation (ACF 2001b)). Almost none of the physically appropriate regions are in countries that generate nuclear waste. This makes it more likely that the 'national responsibility' stance supported by the Australian government and embodied in the Joint Convention on the Safety of Spent Fuel Management will eventually give way to an international approach. Sooner or later, it seems likely that nuclear waste will be stored or disposed of in countries that did not generate it, for technical reasons of site safety, or economic reasons of site cost (NAC Worldwide Consulting 2001).

This brings us to the next group of reasons that might have led Australia to consider the question more carefully. These reasons relate to the politics and policy of radioactive waste management. While great emphasis is placed on nuclear-power-generating countries solving their own nuclear waste problems, it is clear those countries are facing almost insurmountable difficulties which are preventing them making progress (Blowers, Lowry and Solomon 1991; Gerrard 1994; SPD 1998; North. 1999). In this setting, a multinational venture, Pangea, backed by major players in the industry, is already setting out ideas for an international rather than national repository. It is worth considering the alternative regions discussed by Pangea as meeting the criteria also met by outback Australia. They include south-west Africa around Namibia, parts of sub-Saharan Africa, parts of the Arabian peninsula, central Asia near the borders of the Russian Federation, and northern Argentina (Miller et al 1999, 8). Pangea—or any other such consortium—could work with countries in any of these areas to develop a project currently rejected by Australia. Such a proposal is being developed for the Russian Federation (not by Pangea), which has been quite explicit in indicating that it wants the proposal as a source of foreign earnings (Brown 2001; NAC Worldwide Consulting 2001; Reuters News Service 2001b). Yet Australia has exhibited greater long-term political stability than these areas, might be better trusted by the international community to host HLW facilities, and could develop an especially strong regulatory capacity for HLW facilities precisely because Australians are generally hostile towards this industry.

As Berkhout has shown, the commitment of nations to the management of nuclear waste has been tempered historically by their commitment to nuclear power as an important element of industrial and strategic policies (Berkhout 1991, 42, 190–5). Australia is unique in being the only developed country that is a major player in the nuclear sector while having only marginal commitments to nuclear energy or strategic nuclear policy objectives (ANSTO 2001; UIC 2001). It is possible that this might make Australia more rather than less suitable as a host country for nuclear waste, as it would not be compromised by the need to keep nuclear power generators afloat. There are thus many reasons Australia might not have delivered such an unequivocal rejection of any role as a host of a HLW facility. A reconsideration that took these factors into account would require significant policy changes, the subject of the final section of the article, but would also require that some specific objections to Pangea's proposal be addressed.

Objections

Objection 1: Accepting Nuclear Waste Encourages the Nuclear Power Industry

There is a perception that 'solving' the nuclear waste problem could encourage nuclear power development (Deese and Williams 1979, 12) by effectively resolving the main obstacle to the further expansion of nuclear power. This is because developing a nuclear waste disposal site would solve technical, economic, and political problems. Technically, a waste disposal system would ease storage bottlenecks at nuclear reactor sites. Economically, a disposal site with definite economic costs could put a lid on contingent liabilities currently facing nuclear plant owners. Politically, the ongoing presence of radioactive waste is believed to contribute to community opposition to nuclear power.

There are, however, arguments against the effectiveness of this policy stance. The nuclear power industry has continued to expand, albeit slowly, in the absence of waste disposal techniques. It continues to do so in some countries, with calls for its expansion now coming from some very influential directions (IEA 1999; Reuters News Service 2001c). Reports of its death, to adapt Mark Twain's classic quip, have been exaggerations, in spite of waste disposal strategies seeming no closer than they were a quarter of a century ago. Indeed, some authors opposed to geologic disposal have advocated expanding waste *storage* programs precisely in order to ensure continuing nuclear energy production (Makhijani and Saleska 1992). While orders for and construction of new reactors continue to be dogged by argument (most recently in Taiwan), the lack of waste disposal strategies is, outside the United States, seldom at the heart of the controversy.

Equally, an Australian waste facility need not necessarily reduce the technical, economic or social pressures on the sector. Indeed, appropriate prices and regulations could increase the costs of the nuclear power sector and create new avenues of legal liability to be faced by nuclear power companies. In other words, developing a nuclear waste facility in particular ways might increase rather than decrease the pressure on nuclear power companies to phase out their activities. It will all be a question of the design of the regulatory and policy framework within which nuclear waste facilities would operate.

Objection 2: Nuclear Waste is More Appropriately Managed in Countries that Have a Nuclear Power Industry

The argument that nuclear waste should be managed by the countries that create it has some credibility. It has the advantage of meshing with equity principles: that the beneficiaries of nuclear power should bear responsibility for waste disposal. This is one of the principles foremost in a number of reviews of waste disposal, mostly from the United States (Kasperson, Derr and Kates 1983; Carter 1987; Schrader-Frechette 1993; Erikson 1994). However, the regulatory track record of countries which have a nuclear industry would seem to mitigate against this argument. Consider as examples the United Kingdom and the United States. Both are countries where the involvement of the state in the industry has made them problematic as managers of waste. Public trust in the regulators is seriously compromised in both cases, though for somewhat different reasons. In the United

Kingdom, nuclear waste policy has repeatedly changed direction, weakening public confidence in that policy (Kemp 1992, 168) and highlighting British government vacillation on the issue (Berkhout 1991, 182). The industry and its regulators have also been damaged by waste management problems and scandal (Greenpeace and Green Action (Japan) 2000; NII 2000a, b). In the United States, while policy vacillation has been an issue (Blowers et al 1991, 332), the main problems relate to the advocacy role taken by the Department of Energy which is also a nuclear regulator (Lenssen 1991; Makhijani and Saleska 1992, ix; Schrader-Frechette 1993, 251). There has also been a long history of nuclear accidents, regulatory failures and declining community support for facilities (Piller 1991; Lochbaum 1996). There are thus signs that in fact nuclear waste management in countries with nuclear power industries might be compromised by the influence of those industries on the regulation of the sector.

Objection 3: Nuclear Waste Should be in Retrievable Storage Rather than Geological Disposal

Some argue that long-term storage of HLW nuclear waste is preferable to 'final disposal' (Schrader-Frechette 1993). By long term is meant storage beyond that required to allow safe handling of the wastes. Some forms of spent fuel, which are the main source of HLW, need to be stored for periods of decades before they can be handled further. The long-term storage discussed in detail by Schrader-Frechette, and envisioned by the nuclear industries in several OECD countries, is anticipated to be for periods of at least half a century.

Long-term storage has advantages, but it is not without problems. It may draw the military further into nuclear waste management. This is because high-level waste would be more accessible—to terrorists, for example—in storage facilities than in disposal sites. Retrievable storage facilities place fewer barriers between the waste and the biosphere, so if they are for some reason abandoned they may pose a greater threat to the biosphere. For reasons such as these, even some opponents of the nuclear industry see little merit in storage rather than disposal (Blowers, Lowry and Solomon 1991, 318).

Long-term storage thus has both advantages and shortcomings. Nevertheless, it is the deliberate or de facto policy of many nuclear-power-generating countries, including the United Kingdom and The Netherlands, and to various degrees Canada and Germany (Berkhout 1991; McCombie 1999; Goodale 2001). The arguments can for the most part be applied equally to the case for Australia hosting long-term storage as for hosting disposal. Indeed, the distinction between the two options may not be that clear. The most recent research has developed four categories of site rather than two: surface stores, near-surface stores, early-seal repositories and late-seal repositories, for all of which retrievability is regarded as technically feasible, though the economic cost would vary (Hill and Gunton 2001, 14–16). Pangea, despite working with a disposal concept, accepts that there must be a 'technically and economically feasible' retrieval option for any facility (McCombie et al 1999, 6). There are thus reasons that debate might focus on siting storage rather than disposal facilities, but this does little to alter the central contention that Australia could play a role in the development and hosting of such facilities.

Objection 4: Pangea Cannot be Trusted

Much of the rhetoric directed against the Pangea proposal concerned the secretive way in which the company seemed to be pursuing its proposal (the promotional video being leaked by an environmental group rather than released by the proponents), and the identity of its backers, particularly BNFL (ABC 1999). The mistrust directed toward Pangea is understandable, yet there was never any discussion of alternative operators of the facility. The debate also seemed to imply that the operator was the only entity in which trust was critical. While trust would indeed seem to be an important issue, standards at any repository would be set by governments and regulators. It has been the relationship between the industry and state agencies, based around questions of regulatory credibility, that has been an important contributor to the turbulent history of nuclear power in the United States since the mid 1970s (Piller 1991; Makhijani and Saleska 1992; Hill and Gunton 2001). Pangea was its own enemy in some respects, encouraging a focus on the science and technology of nuclear safety, when it could instead have placed an emphasis on high regulatory standards in the host country, an approach that might have created a quite different discourse.

Trust in its many guises will be the linchpin around which the fate of nuclear waste management proposals will turn (Piller 1991, 204; Albrecht and Amey 1999). It is understandable that critics of the recent proposal for a waste dump in Australia have targeted Pangea's identity, criticism rendered more acute by a data falsification scandal that engulfed BNFL in 1999 (NII 2000a). But, in the bigger picture, the possibility of an Australian HLW site could be separated from this particular proponent. It is possible that a proponent might be a firm not currently engaged in the nuclear industry, with a reputation for high standards and quality assurance. Could a case be made for Australian engagement in HLW disposal, setting aside the particular proposal just discussed, and its particular proponents? As the next section of this article argues, this would be likely only under a set of conditions that seem unlikely to eventuate.

Key Policy Questions

Einstein (1946) once remarked that 'the unleashed power of the atom has changed everything save our modes of thinking and we thus drift toward unparalleled catastrophe'. The history of much of the civilian nuclear industry has borne out what the physicist said of military applications. The question posed by his remark is: how must our thinking change in order to avert catastrophe? In the context of this article, what are the key policy issues that would need to be addressed if proposals to dispose of—or to store—high-level nuclear waste were to be advanced? Clearing the policy barriers involves changing how the risks that nuclear waste presents are approached. It also involves resolving policy problems that are not unique to nuclear issues: how adequately to safeguard a potentially dangerous facility and ensure accountability of the state authority responsible for its supervision. Knowledge of the worldwide failure of nuclear waste policy to date has several implications in this regard. Communities will need to have confidence in the overall policy direction taken with respect to nuclear waste, and locally they will have to trust the siting process for any facilities that are proposed consistent

with the policy. There will also need to be confidence in the structure, accessibility and effectiveness of the regulatory regime.

Nuclear Policy Choices

The first policy barrier is establishing trust at the national level that hosting an international waste facility is a good political and policy decision. There are many dimensions to this, but two are examined here. They are determining the measures necessary to create circumstances in which relatively hostile governments and NGOs might endorse a proposal; and the requirements for a successful siting process.

The prospects for the development of a political climate in Australia in which nuclear waste issues might be considered afresh are not great. There is some evidence to suggest that the most likely way in which nuclear waste problems will be addressed in a developed country is through linkage to policy initiatives that advance other nuclear policy objectives. Events in Germany and Canada suggest this way forward, but also highlight some limitations on progress. There have been two initiatives in recent years that signal both the opportunities for, and threats to, international nuclear waste solutions. In Germany, a deal was struck between the Greens and the Social Democratic Party over the phasing out of nuclear power in Germany (SPD 1998). That deal was the basis for a German policy shift that ensured the return of German nuclear waste from the reprocessing plant in France, and for further reprocessing of German nuclear fuels. While this was only a resolution of part of one country's nuclear waste problem, the use of domestic policy bargaining to resolve an international policy impasse was notable.

In Canada, discussions took place involving the United States and Russia in an attempt to develop a mutualist military nuclear materials management strategy. This was to have been based on the transfer of US and Russian weapons-grade plutonium from nuclear disarmament being used as mixed-oxide (MOX) fuel in Canadian reactors. Canada was subsequently to dispose of the waste (Griffiths 1997). Experimental shipments of MOX fuel into Canada were approved in September 2000, immediately after Russia and the United States signed a deal on these materials (Reuters News Service 2000); however, these shipments are yet to take place. Canada has also been unable to develop a strategy for a final repository, and Canadian NGOs are bitterly opposed to the MOX scheme (Greber 1996), arguing that in fact it is intended to improve the competitiveness of Atomic Energy of Canada Limited (AECL) in the market for new reactors rather than as a genuine disarmament strategy (Greenpeace Canada 2000).

Both cases reveal situations in which the opportunity for nuclear risk reduction presented an incentive that overcame a barrier to the treatment of nuclear fuel or weapons material, bringing final isolation a step closer. They open up the possibility that trade-offs of this sort might make further resolution of the fate of nuclear waste more likely.

The possibility should not, however, be overstated. Both of these examples leave the final disposal question unresolved, whereas the nuclear waste repository proposed by Pangea was for geological burial. The cases also lend some support to the contention that waste disposal is most likely to be tackled effectively by countries engaged fully in the nuclear fuel cycle (Berkhout 1991). Germany and Canada have in common a capacity to deal with reprocessed nuclear materials.

Both countries have a nuclear power sector. And the deals in both countries continue to attract intense opposition (Griffiths 1997; Eckert 2000; Greenpeace Canada 2000; Macdonald 2001; Moeser 2001; Reuters News Service 2001a). Nevertheless, the examples give at least a fleeting glimpse of the potential for using nuclear waste policy to gain leverage on the nuclear industries by offering to bargain using the inducement of a nuclear waste disposal strategy.

Given the hostility of Australian State and federal governments and NGOs to Pangea's proposal, the only thing that seems even remotely likely to develop any confidence in a political decision to host a HLW facility would be the use of the decision as a powerful bargaining chip in the international politics of the nuclear sector. There is certainly a range of policy contingencies upon which a deal might be struck for the development of an Australian nuclear waste facility. None of them, however, has received any serious discussion. It might be possible to take the approach of only accepting nuclear waste from countries that have legislated plans for phasing out nuclear power, modelling the arrangement on the recent coalition agreement in Germany. It might be possible to impose additional restrictions, such as accepting only Australian-obligated Nuclear Material: nuclear material derived from Australian uranium and managed under bilateral safeguard agreements made within the Nuclear Non-proliferation Treaty framework (ASNO 2000). Such an approach would give emphasis to the ethical linkages, currently rejected by the Australian federal government, between the benefits of uranium production and the burdens of nuclear waste management. An alternative approach would emphasise contractual arrangements between corporations rather than agreements between governments, and be based around accepting waste from companies that contractually commit to exiting the nuclear industry. A quite different approach would be to focus on domestic rather than international policy objectives, linking the acceptance of a waste site to the phase-out of uranium mining in Australia. Such an approach might address concerns of environmental NGOs, although it would be diametrically opposed to current government policy. All of these sorts of approaches have strengths and weaknesses, but they demonstrate that there are ways in which a proposal could be framed that might advance Australian policy objectives in the international arena, allowing the country both to benefit from the income stream associated with a nuclear waste facility, and play a role as an internationally responsible 'nuclear citizen' within the safeguards regime.

The overall political decision is only one level at which confidence in the politics and policy would need to be built. Public trust at all stages of the nuclear waste management process is known to be critical to the political future of every element of the nuclear industry, whether power generation, processing or waste siting (Kemp 1992, 164). The data available on the siting process have clear public-policy implications favouring processes in which communities volunteer to host facilities or are given a veto power against requests that they host facilities (Kasperson, Derr and Kates 1983, 340; Armour 1991; Inhaber 1998). A consultative process aimed at establishing suitable locations for a facility could generate a set of possible sites (NRIC 1992; Schrader-Frechette 1993; CEAA 1998) rather than beginning with such a list and leaving communities in the position of having to react, which is more likely to produce negative results (Kasperson, Derr and Kates 1983; Schrader-Frechette 1993; Greber 1996; Inhaber 1998; Kraft 2000).

Instead of leading to long-running conflict between proponents and opponents crystallised around a single candidate site (as in Nevada), there could instead be an

opportunity to choose between sites that indicated a willingness to be further considered. Indeed, an international bidding process for sites for nuclear waste management would also sharpen the focus on the global choices being made about the location of nuclear waste facilities. Australia might be less confident in its blanket rejection of being a host for a facility when faced with the possibility that poorer states with weaker safeguards and regulatory infrastructure would seek to host the site. Nationally, Australia has already had experience in the siting of low-level waste facilities, though it remains to be seen whether it will live to regret the decision taken in the late 1990s to study only one of eight candidate regions for detailed assessment (BRS 1997; Minchin 2000). That decision has not inspired confidence to this stage, and some interests are now criticising the process (LRQ 2000; ACF 2001a; CCSA 2001). Nevertheless, Australian governments have a cooperative framework within which to approach siting questions, have prior experience in running processes for choosing a location for nuclear waste facilities, and the LLW process revealed communities that were interested in bidding to host facilities.

An Effective Regulatory Regime

The existence of community trust in the regulatory regime is likely to be a precondition for successful siting decisions because, without it, opposition builds regardless of the stance of the state towards the proposal (Luthi 1996). How might an appropriate regulatory environment for a nuclear waste facility be constructed? As observed above, the literature on nuclear waste management has highlighted how perceived regulatory capture is a particular problem in this industry. It is also an industry where attempts to impose conventional regulatory solutions may be less likely to succeed. As Kemp argues:

> Public trust depends on perceptions of who is acting in whose interest, and under whose instructions. If regulatory authorities claim superior scientific wisdom in the pursuit of sectional interests, they undermine confidence in the whole institutional framework and the scientific rationalities deployed in justifying decisions. To avoid these suspicions, agencies are forced into actively promoting their own integrity, usually by demonstrating their independence from the industry they regulate. For the large and frequently monolithic nuclear industry, historically a creature of state intervention, such demonstrations of independence may easily be regarded as disingenuous by those outside the regulatory process. (Kemp 1992, 2)

In this context, two strategies have the potential to ensure confidence in the regulatory architecture: a strong focus on regulatory design, and the use of third-party standing as an enforcement strategy.

One way to approach the problem of regulatory trust would be to base regulatory design on what Braithwaite terms a 'republican architecture of trust': the creation of an environment of governance that aims to 'enculturate trust while institutionalising distrust' (Braithwaite 1999, 92). The kinds of strategies this could involve include:

- ensuring the separation of regulatory authorities from any that develop, promote or operate nuclear facilities (Bradsen 1991, 19; Makhijani and Saleska 1992);

- in liability law, an emphasis on the rights of the environment and citizens, rather than on those of the facility operator (Pelzer 1988, 98);
- giving public interest groups appropriate functions in the regulatory regime, recognising that they may face strong incentives to scrutinise site operations (Braithwaite 1991; Grabosky 1995);
- legislating for a high level of transparency of information; and
- developing rights of third-party enforcement of regulation of the site.

Most of these ideas have been discussed extensively in the literature. The last two points, about transparency and standing, are worth particular attention both because of their pertinence to long-term facilities such as HLW facilities, and because they exemplify the constraints on the politics of nuclear issues in Australia. Central to the issue of trust in the regulatory regime is the issue of standing. Who will be able to seek enforcement of laws that govern a nuclear waste facility? Intergenerational equity looms large in the literature on nuclear issues, because of the long life of radionuclides (eg Weiss 1989). Giving legal effect to this value is difficult, though not impossible (Allen 1994; Gaba 1999). While future generations may be particularly vulnerable to the fallout, as it were, from today's nuclear waste disposal strategies, the creation of nuclear waste facilities may also be understood as one of a class of environmental and social concerns that have sparked a 'search for standing' (Stone 1974; Warren 1983).

Legally, the problem of standing stems from established common law principles which focus on the rights of individuals (rather than collectivities) to protect their interests, defined primarily in monetary or property terms (EDO NSW 1992, 73). The reasons that this is regarded as a problem are that many environmental problems do not obviously harm particular individuals, may be difficult to attribute to particular actions, and may appear to be the results of actions sanctioned by laws. Solutions may involve changes in common law doctrines that widen the scope either of individuals' interests (McGregor 1994, 121) or of what constitutes a nuisance (Brubaker 1995, 39) or legislative action to explicitly create statutory standing. Examples of the last of those solutions include citizen suits under the US Resource Conservation and Recovery Act (Harris, Want and Ward 1984, 182) and US Clean Air and Clean Water Acts (McGregor 1994, 102), and actions by interested parties 'who have suffered no particular damage' which are possible under some Australian law (Bates and Lipman 1998, 121). The ultimate statement of rights of this sort is section 123 of the NSW Environmental Planning and Assessment Act of 1979:

> Any person may bring proceedings in the court for an order to remedy or restrain a breach of this Act, whether or not any right of that person has been or may be infringed by, or as a consequence of, that breach.

As Bates points out, such powers are not confined to the controversial world of environmental laws: similar provisions are found in trade-practices law (Bates 1995, 369). A proposal for such an approach to the regulation of the nuclear industry was put forward by the Senate Select Committee on the Dangers of Radioactive Waste (SCDRW 1996, xvii).

Politically, the problem with using third-party standing and similar vehicles to enhance regulatory trust and credibility is that the trend in government appears to be, if anything, in the opposite direction. The proposal of the Senate Select

Committee—to use this kind of regulatory approach to low-level waste—was rejected by the government of the day (*Parliamentary Debates, Senate* 21 November 1996, 5832). The increasing use of private contractors to deliver services is moving into the realm of commercial-in-confidence information that would once have been regarded as being in the public domain. Far from enhancing transparency, this removes some existing opportunities for public scrutiny. Canada's proposed approach to nuclear waste siting, embodied in the Nuclear Fuel Waste Bill (C-27), goes as far as requiring all reports made to the minister by the waste management organisation to be made available to the public, but stops short of creating any third-party standing. There is little evidence that enhanced transparency or accountability is high on the agenda of governments. There is thus little prospect of placating the enduring distrust exhibited by communities and environmental NGOs towards governments and corporations associated with the nuclear sector. The problem of creating credible regulatory regimes is therefore likely to remain. Regulatory frameworks that community groups can use effectively will be necessary to enhance trust in the policy framework (Bailey and Brash 1989). Creating third-party enforcement provisions could enhance that trust and simultaneously create a legal vehicle for intergenerational equity concerns. Such reforms might make possible a more measured response to the idea of Australia hosting nuclear waste facilities, because it would give citizens greater confidence that they could scrutinise facilities and hold them to the law. However, such reforms would require legislative action from governments that have expressed hostility towards both third-party enforcement in general and toward HLW disposal in particular. It would seem unlikely in these circumstances that Pangea will make any progress with its proposals in Australia.

Conclusion

Nearly 15 years ago, Carter summed up his survey of the problems of nuclear waste around the world by saying that 'an international system of spent fuel and waste management is still very much needed, but despite a few encouraging signs is still beyond the horizon' (Carter 1987, 396–7). He noted that the limited attempts up to that time had suffered from 'political or commercial opportunism'. The experience of Pangea in Australia has revealed the same problem, as has the attempt by Russia to move in this direction. Perhaps the only encouraging sign is the involvement in the Pangea endeavour of Golder Associates, a corporation with worldwide experience in waste management but whose nuclear commitments are confined to the back-end of the nuclear fuel cycle. The active involvement in nuclear waste disposal of a firm that is not committed to nuclear power might be a positive step along the road to a credible treatment of the nuclear waste problem. Yet Golder Associates does not seem to be an obvious candidate to be an operator of a waste facility, as it is primarily a design firm.

This article has suggested that there are many reasons why Australia might play a major role in addressing the nuclear waste management problem. However, it would seem possible only if use of an Australian facility was in some way made contingent on users having contractual or policy commitments to the phasing out of nuclear power, if siting processes were carefully crafted to learn the lessons of previous siting failures, if the facility operator was not associated with nuclear power generation, and if there was transparency and third-party access to the courts

to give citizens confidence that the whole framework would be appropriately accountable. All these things are possible in Australia, in theory. But it seems unlikely that anyone will pursue the idea in the name of good global citizenship.

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