nuclear's wastelands part 1 – landscapes of the legacy of nuclear power

In the first of a series of articles on the local and social legacies of nuclear energy, Andrew Blowers looks at where and why these legacies have come to pass

By IAEA Imagebank - https://www.flickr.com/photos/iaea_imagebank/8657963646/, CC BY-SA 2.0, https://commons.wikimedia.org/w/index.php?curid=56218685

International Atomic Energy Agency experts at the Fukushima Fukushima Daiichi nuclear power plant in 2013

The nuclear industry has left its visible and invisible footprint in landscapes of risk encountered in the 31 countries in which nuclear energy has been developed. In several countries the mark is, as yet, small, related to one or two operating nuclear reactors. At the other extreme there are those

countries with long-established nuclear industries, some involved in both the civil and military sectors, where nuclear operations, including electricity generation, reprocessing and experimental processes, are intermixed with redundant facilities, nuclear wastes, and radioactive discharges onto land and into water and emissions into the atmosphere.

These 'landscapes of risk' include places such as Hanford, the most polluted site in the United States and the world's largest clean-up project; Ozersk in Russia, with a calamitously contaminated landscape 'still beautiful to behold, now dangerous to traverse';[1] and Sellafield, Western Europe's most hazardous location, once described as an 'intolerable risk'.[2]

Such sites were created through the routine, if poorly managed, operations of a complex of nuclear production, reprocessing and waste management facilities. Other expanses of nuclear contamination have arisen as a result of accidents occurring through human error or natural disaster, the areas around Chernobyl and Fukushima being the most notorious examples of evacuated and contaminated nuclear landscapes.

The problems of dealing with such sites are complex, tedious and intractable. While such places present the most formidable challenges, every nuclear site sooner or later exposes the issue of what to do with the radioactive materials and wastes that are left behind during operation and lasting long after operations have ceased.

'Every nuclear site sooner or later exposes the issue of what to do with the radioactive materials and wastes which are left behind during operation and lasting long after operations have ceased. It is the enduring legacy of radioactivity that cannot easily be dispensed with that creates a problem of sustainability at once both physical and social'

It is the enduring legacy of radioactivity which cannot easily be dispensed with that creates a problem of sustainability at once both physical and social. It is physical in the sense that means must be found to control, remove and contain the radioactive hazard so that eventually the land, or that part of it which is not irremediably contaminated, may be released and recovered for other land uses. But sustainability also has a social dimension in the need to ensure the survival and sustainable development of the nuclear communities that have grown up near nuclear sites. In principle, as the International Atomic Energy Authority (IAEA) puts it: 'Radioactive waste shall be managed in such a way that will not impose undue burdens on future generations.'[3]

This article is the first in a series in which I will consider the legacy left by nuclear energy from its local and social perspective, both geographical and historical. I shall consider how nuclear communities have developed, why they are where they are, and what their future prospects are. In particular, I shall try to identify the peculiar characteristics of these nuclear communities and explore the shifting power relations between industry and community and between community and wider society. These relations are not simply matters of economics and politics, but raise some profoundly moral issues of how we should deal equitably with the social aspects of environmental risk, for both present and future generations.

I shall explore these issues through four case studies of nuclear landscapes and related communities in four countries. From these I shall draw out some conclusions, reflections and suggestions on how we should deal with the legacy and the communities that live with it. But first let us look at where and why the legacy has come to pass.

The growth of the legacy

The legacy of nuclear power exists in time and space. It stretches back over time to the earliest days of the nuclear industry. Its origins were military, in the making of uranium and plutonium for bombs. The use of nuclear fission power, 'the peaceful atom', for electricity generation came later.

This early phase of the industry, lasting for around three decades, was a period in which a trust in technology and progress fostered a routine culture of secrecy and unquestioning promotion of nuclear technology. Little thought was paid to the legacy that was building up, much of it left in situ or casually dumped into tanks and ponds, buried in shallow repositories or simply tipped into the ocean. Major nuclear accidents were either covered up entirely, as was the case with the huge releases of radioactivity from the Mayak reprocessing and waste facility at Ozersk in the Urals in 1957, or, like the Windscale accident in the same year, their true dimensions were not revealed until many years later. Indeed, some incidents were quite deliberate, like the now infamous 'Green Run' in 1949, when an experimental release of radioactivity from the Hanford site resulted in a plume stretching far and wide across the farmlands of Washington state.

Over the years, nuclear accidents involving loss of life or extensive property damage have been commonplace, as Benjamin Sovacool[3] records (his

The ghost town of Pripyat in northern Ukraine after the Chernobyl meltdown of 1986

own compilation totalling 99 incidents costing $20.5 billion between 1952 and 2010), and major catastrophes like Mayak (Russia, 1957), Chernobyl (Ukraine, 1986) and Fukushima (Japan, 2011) have occurred every generation, to the point where Charles Perrow [4] has dubbed them 'normal' and therefore likely to be recurrent.

By the 1970s nuclear energy had reached its apogee in public approval, and programmes of nuclear expansion were under way. Subsequently in many, mainly western, countries enthusiasm for nuclear energy gradually diminished as programmes were completed and the long timescales of construction and high costs placed nuclear at a competitive disadvantage to its fossil fuel rivals, coal and oil. It was a period punctuated by traumatic accidents, the near miss of Three Mile Island, and the catastrophe of Chernobyl. Moreover, attention was increasingly turning to the technological problems encountered with reprocessing and other experimental developments.

Above all loomed the problem of poorly managed wastes accumulating at nuclear sites. The Flowers Report had pronounced in 1976 that any solutions to the problem would need to demonstrate 'beyond reasonable doubt that a method exists to ensure the safe containment of long-lived highly radioactive waste for the indefinite future'.[5] This statement has been taken as axiomatic in the subsequent search for a deep-disposal repository site in the UK.

Efforts to find sites have been persistently rebuffed by determined opposition able to mobilise coalitions to prevent their territory from providing a permanent resting place for the nation's most fearsome and dangerous wastes. From the Highlands of Scotland to the lowlands of eastern England successive attempts were rebuffed by entrenched and trenchant opposition, organised, coherent and co-ordinated with singular purpose. The final hubristic attempt to foist the nation's radioactive burden on unsuspecting communities by a tactic of 'decide-announce-defend' met its nemesis in the rejection of the proposed underground laboratory (the Rock Characterisation Facility or RCF) at Sellafield in 1997. By that time the legacy of nuclear power had become the industry's Achilles heel, and what to do about it had become an almost existential issue.

Seeking solutions

By the turn of this century, then, and especially in the UK, the political dynamics had profoundly changed. With the nuclear industry seemingly in retreat and its opponents proclaiming its imminent demise, political space was opening up for mutual focus on the problem of waste. For the industry, a solution to the problem was perceived to be essential to any revival; for the opposition, ridding the country of its legacy would spell the end of nuclear's moment. For a few years an uneasy co-operation ensued between two sides, for whom, though the ends might be different, the means were compatible.

With political initiative, a consensual process based on principles of openness, transparency and public and stakeholder engagement developed through the first Committee on Radioactive Waste Management (CoRWM). Its key recommendation that geological disposal was, within the current state of knowledge,

Courtesy of US Department of Energy

The crest of Yucca Mountain, the site of the proposed US national nuclear waste repository

the 'best available approach' for long-term management of radioactive wastes became the touchstone for policy development.[6] But, in order to hold the consensus together the policy was qualified by the requirement for a programme of interim storage as an integral part of a long-term strategy.

Above all, implementation of disposal would rely on a process of voluntarism, with local communities participating in 'an open and equal relationship between potential host communities and those responsible for implementation'.[6] The focus on local communities in decision-making for radioactive waste was a far cry from the imperious attempts to impose solutions on communities that had failed at the end of the last century.

Even as CoRWM was making its pronouncements the power relations were shifting again. Seemingly from out of nowhere nuclear energy was, in prime minister Tony Blair's words, back with a vengeance, and a 'nuclear renaissance' was proclaimed. At a time of heightened concern about national security in the wake of 9/11 and economic security following the financial crash of 2008, nuclear energy seemed to offer a more secure future as part of the energy mix than fossil fuel or renewable energy. Its proponents claimed that nuclear could provide base-load electricity and a secure energy supply and that, as a low-carbon form of energy, it answered growing concerns about environmental security in the face of climate change.

In the event, new nuclear in the UK has stuttered, with plans and proposals for reactors at six of the eight coastal locations nominated for new nuclear power stations, but none, with the possible exception of the beleaguered Hinkley Point, likely to materialise before 2030.

Meanwhile, the waste issue remains unresolved, although, in its effort to justify new nuclear stations, the government has claimed that policy meets the Flowers criterion on nuclear waste. In a neat piece of sophistry it pronounces itself satisfied 'that effective arrangements will exist to manage and dispose of the waste that will be produced from new nuclear power stations'.[7] But the first attempt to use the voluntary process to find a suitable site has faltered, with the failure to get agreement to proceed with a siting process in West Cumbria. Even in nuclear's heartland, it has so far proved impossible to impose a site from above (the RCF in 1997) or to entice the local community to volunteer one (the Geological Disposal Facility, GDF, in 2013).

The geography of the nuclear legacy, in the UK and in most western countries, is established and unlikely to change very much in the foreseeable future. New nuclear power stations, if they ever come to pass, will be built at existing nuclear locations, adding eventually to the accumulated legacy of wastes. It is conceivable that, in propitious geological and political circumstances, deep repositories will be able to meet the essential scientific and social conditions in greenfield locations. Bure, in France, may be a case in point. But on the whole the evidence points the other way.

In Finland and Sweden deep geological repositories to take spent fuel and highly active wastes are being developed in nuclear communities where wastes are already accumulating. Elsewhere progress towards finding sites, whether at existing nuclear or greenfield locations, has been halting and slow. In the UK, efforts to build a repository near Sellafield in the very place where already two-thirds of the country's wastes are stored have been resisted. In Germany, at Gorleben, and in the USA, at Yucca Mountain, federal government support for repositories in greenfield locations has been mired in political impasse for more than a generation. In most of the

BUNDjugend. CC BY 2.0

sortirdunucleaire. CC BY 2.0

Demonstrations against nuclear facilities in Germany (left) and France (right)

other nuclear countries, disposal is the goal of policy but proposals are at a formative stage.

Periphery and 'peripheralisation'

The nuclear legacy, then, is likely to remain where it is for now and for generations to come, in what may be called 'peripheral communities'.[7] They are places that can be defined in terms of their distinctive physical and social relations to nuclear activities. The physical relations are spatial and environmental. They are, in a spatial sense, remote, whether in terms of distance or inaccessibility from other areas. Environmentally these are places where hazardous activities have visibly contaminated and degraded the landscape or where there are the invisible risks from routine operations and the low-probability/high-consequence risk of a major incident or accident with potentially catastrophic consequences.

The social conditions of peripherality may be characterised as economic, political and cultural. Economically they tend to be monocultural, reliant on a dominant (in this case nuclear) activity, or underdeveloped places experiencing decline or deprivation. Politically they tend to be relatively powerless, with strategic decisions affecting the community taken elsewhere by governmental and corporate institutions. Socially, they manifest what might be termed a 'nuclear culture', a concept difficult to encapsulate very precisely but revealed in an ambiguous relationship between industry and community, in competing but not necessarily contradictory postures, both defensive and aggressive, resigned and resilient, reactive and proactive.

Peripherality is not simply a set of static descriptive phenomena; it is a set of dynamic processes. The geography and endurance of nuclear's legacy is the product of 'peripheralisation', a rather unlovely word to describe a process of political engagement. By this, peripheral communities are created and sustained through a process of push and pull, attraction and repulsion. Peripheral characteristics are the *raison d'être* of these communities, persistently attractive to nuclear activities and ultimately committed to managing the legacy. Elsewhere, communities able to mobilise the power to resist will be able to prevent the intrusion of nuclear activities. This explains the tendency for nuclear activities to gravitate to existing nuclear sites and why it proves difficult to establish a new nuclear presence in greenfield locations. Resistance will be strongest against proposals for sites for the permanent management of the nuclear legacy, especially from areas with little or no experience of the nuclear industry.

The peripheral characteristics of nuclear communities, taken together, seem to portray places that are vulnerable, victims of processes with inevitable consequences of powerlessness, insecurity and inequality. While this is broadly the case, the places managing the nuclear legacy are neither entirely marginal nor powerless; they exercise some economic and political leverage. Economically, they are relatively secure for, once production ceases, there remains decades of clean-up activity, often sustaining a large workforce. Unlike many industrial activities like mining or iron and steel production, the nuclear industry cannot be swept away once production ceases. The legacy remains and must be managed, probably in situ, for generations to come.

Therefore, politically, these communities are able to claim a continuing and open-ended commitment to clean-up from the state, in recognition of the risks they bear on behalf of society as a whole. In some cases there will be support for investment into regeneration and diversification.

Periphery and inequality

The nuclear legacy is unevenly distributed over space and time, and this raises ethical issues of fairness. There is the issue of fairness between places, which arises where responsibility for managing the legacy is devolved on specific places.

And there is also fairness between generations arising from the indeterminate timescales over which the legacy must be managed. So peripheral nuclear communities will experience intragenerational inequality through the concentration of the legacy in space and intergenerational inequality resulting from the continuing responsibility extending indefinitely through time.

It is those places where the bulk of the nuclear legacy is managed that are the subject of this series of articles. They are landscapes of risk that manifest all the conditions of peripherality – geographical, economic, political, and social. They fulfil a fundamental social role in that they take on (or more usually have to accept) the radioactive legacy of nuclear power. They bear the burden of the cost, risk and effort necessary to manage the legacy on behalf of the wider society, a responsibility extending into the far future. At the same time society has a reciprocal responsibility.

This series of articles will look at some of these peripheral places, to try to understand the relationship between the nuclear industry and the community. It will look at how they have developed and the power relations that have moulded and sustained their continuing role. In the next article the focus will be on Hanford, the massive nuclear complex in the north west of the United States, where during the Second World War the plutonium for the bomb that shattered Nagasaki was made. Then I shall look at Sellafield, the heart of the UK's nuclear industry and the focus of conflicts and controversy.

'The problem of the nuclear legacy is ongoing and forces us to confront moral issues about the legacy which we bequeath to future generations'

The following article on France will consider radioactive waste management linking the reprocessing plant at La Hague in Normandy, where spent fuel is managed, with the emerging site at Bure in eastern France, where an underground laboratory to receive radioactive wastes is under construction. The fourth place covered will be Gorleben in Germany, a place identified as the resting place for the country's highly active wastes but where indomitable resistance has provided both symbol and success for the anti-nuclear movement.

In the final article I shall try to draw out some of the issues around what can and should be done about the future management of the nuclear legacy, and what this means for the future, not only of these peripheral communities but for the future of the nuclear industry itself. For the problem of the nuclear legacy is ongoing and forces us to confront moral issues about the legacy which we bequeath to future generations.

● ***Andrew Blowers OBE*** *is Emeritus Professor of Social Sciences at The Open University and is presently Co-Chair of the Department for Business, Energy and Industrial Strategy/ NGO Nuclear Forum. This series of articles draws on his new book, The Legacy of Nuclear Power (Earthscan from Routledge, 2017). The views expressed are personal.*

Notes

1 K Brown: *Plutopia: Nuclear Families, Atomic Cities, and the Great Soviet and American Plutonium Disasters*. Oxford University Press, 2013. This is an evocative comparative social historical study of two communities, Hanford in the north west of the USA and Ozersk in the southern Urals in the Soviet Union, which developed simultaneously in the production of plutonium during the Cold War. Both areas became notorious for the extensive contamination and degradation of the landscape

2 Margaret Hodge, Chair of the Committee of Public Accounts, commenting on the BBC, on 7 Nov. 2012. The National Audit Office also produced a highly critical report on risk management at Sellafield, *Managing Risk Reduction at Sellafield,* 2012. www.nao.org.uk/report/managing-risk-reduction-at-sellafield/

3 See B Sovacool: *Contesting the Future of Nuclear Power*. World Scientific, 2011. These accidents are quite aside from the accidents and near-misses involving nuclear weapons which are chillingly recorded in E Schlosser: *Command and Control*. Allen Lane, 2013

4 C Perrow: *Normal Accidents: Living with High Risk Technologies*. Princeton University Press, 1999

5 *Nuclear Power and the Environment*. Cm 6618. Sixth Report. Royal Commission on Environmental Pollution. HMSO, 1976

6 *Managing our Radioactive Waste Safely*. Committee on Radioactive Waste Management, Nov. 2006

7 The term 'peripheral communities' and the process of 'peripheralisation' were first introduced in a paper I wrote with Pieter Leroy – A Blowers and P Leroy: 'Power, politics and environmental inequality: a theoretical and empirical analysis of the process of 'peripheralisation''. *Environmental Politics*, 1994, Vol. 3 (2), Summer, 197-228