

Dounreay Heritage Strategy: White Heat of Heritage

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Dounreay is a unique site in the history of the nuclear industry in Britain. Situated on the remote northern coastline of Scotland far from major cities, it was, and remains to this day, an experimental facility. Originally, it experimented, on an industrial scale, with the development of fast breeder nuclear reactor technology, firstly, with the Dounreay Fast Reactor (DFR), which went critical in 1959, followed in 1974 by the larger Prototype Fast Reactor (PFR). Both of these reactors represent pioneering examples of nuclear technology and Dounreay is undoubtedly a remarkable testament to the engineering ingenuity of the mid/late 20th century. It emerged as a bold response to the political and industrial landscape of Britain in the 1950s, an attempt by the government to forge a new approach to power generation in a burgeoning industrial economy.

The DFR and PFR formed the heart of a much larger industrial complex which included the Dounreay Material Testing Reactor (DMTR), the Fuel Cycle Area (FCA), numerous light industrial and office buildings, supporting

medical and security buildings and, for many years, its own runway (Fig. 1). This complex operated as a functioning nuclear facility from 1954 to 1996 when reprocessing of fuel ceased at the site.

The end of power generation (with the closure of the PFR in 1994) and the cessation of reprocessing in 1996 did not mark the end of the site's experimental and engineering excellence. The early development of nuclear technology at the site had left it with a legacy of contamination and radioactive risk. Starting in 2000 the UK government set out a 60-year plan to decommission the site; this was accelerated in 2008 to c. 2025.

Delivering this decommissioning in a safe and environmentally sound manner continues to require the development of new engineering processes and techniques to tackle unique contamination and dismantling issues. These include the challenge posed by the use in 1954 of NaK, a sodium-potassium alloy, as the coolant for the DFR. NaK has excellent heat-transfer properties but is highly reactive



Fig. 1: View of Dounreay site mid 2000s.

with air and water, and a quantity as small as one gram represents a fire and explosion hazard. The decommissioning of the DFR therefore posed very particular technological challenges.

Consequently, the decommissioning of Dounreay has required as much ingenuity, innovation and commitment as its creation and operation. The site continues to be decommissioned and its engineering and experimental legacy continues to grow.

Further detail on Dounreay's history can be found in the publically available Dounreay Heritage Strategy document at <https://dounreay.com/community/heritage/>.

Need for a strategy

The DFR's highly distinctive and iconic spherical form (Fig. 2) has long attracted public attention and has become part of the symbolism associated with pro and anti-nuclear material and campaigns; while its control room epitomises the clean lines of a 1950s sci-fi aesthetic (Fig. 3). The decision in 2000 by the UK government to decommission the site and remove all facilities led to questions from the public and professional stakeholders. This ultimately led to Historic Scotland (now Historic Environment Scotland), the Nuclear Decommissioning Authority (NDA) (a UK government funded agency) and Dounreay Site Restoration Limited (DSRL) (the company charged with decommissioning the site) to develop a brief for a heritage strategy to inform the decommissioning plans for the site; taking into account a clear recommendation from public consultation carried out in 2007 by the Dounreay Stakeholder Group to ensure that the End State of the site included “*an open and transparent*

decision on the future of the DFR sphere, taking into account its national heritage significance”.

Atkins was appointed to prepare the strategy in 2008, following a public tender exercise. The author led the team responsible for the development of the strategy.

Approach

Development of the strategy was founded on accepted approaches to heritage conservation management prevalent in the UK at that time. But in keeping with the site's history the strategy sought to innovate and develop from these foundations. The strategy was based on a robust understanding of the site and its cultural values and on a clear recognition of the issues and external factors relating to decontamination, waste management and decommissioning and their interaction.

The strategy was not developed in isolation by the consultancy team and DSRL. The NDA and Historic Scotland were also closely involved in the development of the strategy. In addition, the strategy was informed by discussions with National Museums Scotland, Caithness Horizons and the Dounreay Stakeholder Group¹ (an independent body who provide public scrutiny of the Dounreay site). The draft strategy was also subject to formal stakeholder consultation in 2009/2010.

The broad stages in the strategy's development included:

Stage 1: Understanding Dounreay

This was the starting point for the strategy involving extensive analysis and research to develop a clear understanding



Fig. 2: Dounreay Sphere, 2008.



Fig. 3: DFR Control room, c. 1958.

of the site's history, current form and characteristics. This included a detailed overview of Dounreay's historic development, its current character and the nature of surviving buildings, places, archives and objects. It also explored its social history and some of the defining non-physical characteristics of the site. The aim was to create a broad understanding of the site's development, characteristics and operation.

Stage 2: Exploring Cultural Value

"Cultural Value", as a concept, has long underpinned approaches to the management of places of cultural and heritage significance. A key stage in the development of the strategy was an exploration of its many cultural values using a range of approaches to assess the historic and cultural significance of a place. It began with an exploration of Dounreay in the context of the national and international nuclear industry. This led to the development of a 'Statement of Significance' that addressed the historic, evidential, aesthetic and communal values associated with the site. These categories of value reflected standard conservation thinking in the UK in 2008.

In keeping with the exploratory nature of the strategy, the assessment then moved on to explore two other views of Dounreay and its values. Firstly, a "Change and Creation" approach based on a methodology for understanding 20th century places developed by English Heritage in 2005² and secondly a "View from the Future" which attempted to pro-

vide a speculative review of how the site may be viewed from a more distant historic perspective. This approach, and the wider strategy, was later subject to particular scrutiny by Anders Högberg and Cornelius Holtorf (2014).³

Stage 3: International Comparators

In the global context it was clear that Dounreay was not the only nuclear installation facing the challenge of combining decommissioning and closure with the conservation of heritage value. A key stage in the development of the strategy involved research into a number of establishments across the world which were also moving through this process, including EBR-1, Hanford B Reactor, X-10 Reactor, Chicago Pile-1, Nuclear Ship Savannah, USS Nautilus (SSN571) and Big Rock Point (all in the USA); as well as Chinon A1 in France and Calder Hall in England. The strategy also looked at the US Department of Energy's Manhattan Project Preservation Initiative and Cold War (as it stood in 2008).

Stage 4: Exploring Possible Approaches to Developing a Cultural Legacy

Even before the strategy was commissioned it was clear that Dounreay and its history were worth celebrating, conserving and communicating to future generations. Given this, a key stage of the strategy therefore focussed on what should be celebrated, conserved and communicated and how this

might be safely and cost effectively done; the latter two aspects being important in the wider context of the decommissioning programme and the contamination and safety issues associated with nuclear facilities.

The strategy sought to explore and identify what it was about Dounreay that society should seek to celebrate, conserve and communicate. The various cultural values of the site provided a starting point for developing and assessing ideas for the creation of a cultural legacy. In terms of identifying how such a legacy could be safely and affordably achieved in the context of the lifetime plan, DSRL, in consultation with NDA, has determined the viability and acceptability of various different approaches. This included examining assumptions in the then current lifetime plan for the decommissioning of the site and undertaking further analyses of possible ideas relating to conservation and retention. All of this had to occur within the context of the operational environment and the contamination (and other) issues facing the site.

The strategy explored three broad themes: physical conservation and retention of buildings and objects; retaining evidential material in the form of archives, records and oral history; and communicating and celebrating Dounreay's achievements and wider context; and used these to identify possible options and ideas that, based on available evidence, may have been deliverable; and other ideas and options that, for a variety of reasons, were not feasible.

Stage 5: Options and Way Forward

A key aim of the strategy was to ensure a broad consensus on the way forward for the site, taking into account the wide range of options considered. The draft strategy set out a range of activities that would be delivered by DSRL within the context of its daily operation and by other external parties working in partnership with DSRL. Following consultation these were further revised and additional partnership opportunities were identified.

Stage 6: Implementation

Following publication and adoption of the strategy, DSRL and its partners have focussed on implementing key activities and projects over the last eight years.

Outcomes

The strategy developed and proposed an approach to the heritage of Dounreay that reflected the complex history, values and contaminated nature of the site. During its development the following options for the site were discounted for a range of reasons:

1. Retention of the site in its entirety – discounted due to safety and security issues; decontamination costs and long-term maintenance costs; the extent of ground contamination in FCA; and the need to remove facilities due to contamination and structural issues;
2. Retention of PFR and FCA in their entirety – discounted due to the above reasons and deterioration of the PFR's external cladding;
3. Retention of DFR sphere and DMTR – discounted as the removal of contaminated plant and equipment would have left only the metal shells removing evidential and technological value of the structures; additionally the metal shells would have never been 100% clear of radioactive contamination; there were also very significant care and maintenance costs; and limited public access due to safety and security issues with proximity of waste stores;
4. Retention of buildings and conversion for other uses in the short term – discounted due to restricted public access; safety and security issues; high costs for conversion and maintenance and the lack of a sustainable market;
5. Preservation of all objects – not achievable as many were radioactively contaminated with associated health and safety issues; there was also a lack of suitable storage space; and
6. Development of the site or part of the site as a visitor centre – discounted as there was restricted public access onto the site due to safety and security issues; a low level of projected visitors and funding issues.

The focus of the strategy was not therefore on the physical conservation of buildings and objects. Instead it sought to celebrate and conserve the site's cultural legacy through a range of activities and programmes that would be embedded within the site's operations alongside a range of other opportunities that would be delivered in partnership with other organisations. This partnership approach⁴ was particularly important in enabling DSRL to access knowledge and skills outside of its normal remit.

Key outcomes led by DSRL included:

Object collection and recording – A key aim was the creation of a safe, comprehensive and high quality collection of artefacts to commemorate and interpret Dounreay for the future, as well as the provision of material for any future research. To help ensure long term conservation a partnership was established with National Museums Scotland (NMS) and Caithness Horizons (as local museum) to develop acquisition policies and a Memorandum of Understanding relating to the long-term care and ownership of objects.

Site archive – As a site Dounreay generated a vast wealth of technical and social history documentary material during its active lifetime. The strategy recommended the expansion of the site's technical archive which covered reports, documents, photographs, film and drawings, to include a representative sample of social history material.

Oral history programme – The stories and histories of the workers across the life of the site, including those involved in its decommissioning, were considered to be a valuable resource and a formal oral history has already been

established. This was then expanded and its outputs archived and stored as part of the Dounreay Site Archive.

Building recording – Given the decision to demolish all structures at Dounreay, the recording of buildings became a vital component of the heritage strategy. The strategy recommended that a standardised process was developed across the site to ensure that structures, fixtures and fittings were appropriately recorded prior to decommissioning commencing and during the process of cleaning and demolition.

Publications – Building on existing publications the strategy recommended that proposals for publications relating to the history of the site and the decommissioning story should be supported by DSRL.

Online and virtual material – Engaging wider audiences was a key outcome, beginning with the creation of a dedicated heritage space on the DSRL web-site. Beyond this the strategy advocated further engagement with a range of technical and non-specialist audiences.

Public display and access – It was recognised that a partnership with Caithness Horizons and others offered the opportunity to give the public access to the story of the site and some of its material culture and the NDA provided significant funding to assist the operating costs of Caithness Horizons.

In addition, it was recommended that DSRL and the NDA develop partnerships to deliver funded academic study, off-site exhibitions, an international conference on nuclear heritage and a commemorative installation.

All of the above was to be coordinated and led by a dedicated Heritage Officer, employed by DSRL and based at Dounreay. This post was to be supported by a specialist Heritage Advisory Panel of recognised experts.

Delivery

As set out in a series of articles and project updates⁵ much has been achieved through the delivery of the strategy, including:

- The establishment of a growing collection of engineering and social history objects;
- A range of funded academic studies (mainly PhDs) relating to the site, its history and social impact;
- A growing archive of building recording material and oral history recordings;
- The accession of the DFR Control Room to the National Museum of Scotland and the Science Museum in London, for long term conservation and future public display;
- The display of the DMTR control room at Caithness Horizons as part of a wider exhibition on Dounreay (Fig. 4);
- The transfer of the Dounreay photo archive to Nucleus, the UK’s newly opened purpose built nuclear industry archive;
- Display of objects from the PFR in a new *Energise* gallery at the National Museum of Scotland; and
- A number of technical publications, public talks and lectures.

This has all occurred in the context of an ongoing programme of decommissioning which is gradually dismantling and removing all buildings, waste and material at the site (Fig. 5).

This combination of active dismantling, alongside active curation of the material being dismantled distinguishes the strategy from other historical forms of reactive “rescue” recording or collection. The contaminated nature of the site,



Fig. 4: DMTR control room in Caithness Horizons.



Fig 5: Decommissioning near DMTR.

the complex programming of decommissioning activities and its strict security requirements mean that any heritage programmes have to be carefully planned and delivered; *ad hoc* responses cannot occur. The heritage programmes also have to be delivered in the context of restricted government funding and by organisations whose primary purpose is the safe and efficient dismantling of a complex and potentially hazardous site, not the delivery of heritage outcomes. The external partnerships with organisations such as the National Museums Scotland, Historic Environment Scotland (incorporating the Royal Commission on the Ancient and Historical Monuments of Scotland), local societies and local museum groups are therefore particularly important in attracting funding and expertise to support heritage activities.

However, perhaps the biggest test for the strategy remains. As of yet, the visually iconic centrepiece of the site, the DFR Sphere, remains. While its ancillary structures and internal elements may have been removed the sphere stands, to the uniformed eye, seemingly untouched at the centre of the site. The dismantling of this structure will mark the end of Dounreay for many people. The success of the strategy may ultimately be measured by public and professional reaction to the controlled removal of the DFR Sphere and their level of acceptance that the legacy delivered by the strategy reflects the historic and cultural significance of Dounreay and its sphere.

Considerations for other sites

As a pioneer of nuclear heritage activity there are many lessons, major and minor, that can be learned from the develop-

ment and implementation of the Dounreay Heritage Strategy and many of these have been set out elsewhere⁶, but there are perhaps five key lessons that I would suggest others approaching the conservation of nuclear sites consider:

- Every site requires a unique approach – no two nuclear facilities are the same. They all represent different technologies, different social and temporal circumstances and have different hazard legacies. There cannot be a single pan-industry approach. Strategies need to be developed to reflect the unique characteristics of each site in the context of an industry-wide understanding of nuclear history and heritage;
- Plan and begin early – ideally organisations should plan for heritage issues as the site is designed and built, but that is rarely possible. Beginning planning when the site is still in operation is advantageous as many aspects of its social history can be captured at that point. If that is not achieved then heritage issues should be considered at the very earliest stages of decommissioning planning as complexities and costs make changing decommissioning plans very difficult;
- Build support with politicians, staff and stakeholders – nuclear heritage is contentious and challenging. Each site develops its own institutional culture, each country and region has its own reaction to its nuclear past and present. It is vital that all parties are engaged with the objectives of heritage conservation activity and that their views help shape approaches to a site;
- Work in partnership – no one organisation has the skills and experience required to develop and deliver the sensitive decommissioning of a nuclear heritage facility. Partnerships with nuclear regulators, operators, heritage cura-

tors, museums and others are therefore critical to ensure viable outcomes are achieved; and

- Accept loss – nuclear sites cannot be approached like normal heritage monuments and places. Many have inherently dangerous and unsafe levels of contamination and often key buildings and objects must be lost as part of a safety-led decommissioning process. Accepting this can lead to imaginative and innovative responses utilising technology, people, art and academia to create viable and long lasting legacies.

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Zusammenfassung

Die Dounreay Kulturerbe-Strategie:

White Heat of Heritage

Dounreay ist ein bemerkenswertes Zeugnis industriellen Einfallsreichtums des mittleren/späten 20. Jahrhunderts. Es entstand als kühne Antwort auf die politische und industrielle Landschaft Großbritanniens in den 1950er Jahren, als Versuch der Regierung, eine neue Herangehensweise an Stromerzeugung in einer aufkeimenden Wirtschaft zu schaffen. Der Mittelpunkt des „Fast Breeder“-Reaktor-Programms wurde zur Keimzelle ingenieurwissenschaftlicher Forschung und Kompetenz und brachte den wegweisenden „Dounreay Fast Reactor“ (DFR) sowie den „Prototype Fast Reactor“ (PFR) hervor. Nach der Stilllegung des PFR im Jahre 1994 und dem Ende der Wiederaufbereitung im Jahre 1996 wurde die Anlage abgeschaltet – ein Unterfangen, das sowohl in ingenieurwissenschaftlicher als auch in naturwissenschaftlicher Hinsicht herausfordernd ist.

2008 gaben die Anlagenbetreiber gemeinsam mit Historic Scotland die Dounreay Strategie in Auftrag, um den Abschaltungsprozess zu unterstützen und sicherzugehen, dass das historische und ingenieurwissenschaftliche Erbe hinreichend beachtet wird. Die Dounreay Strategie ermöglichte ein klares Verständnis für die Bedeutung des Kernkraftwerkes und zeigte einen gemeinsam beschlossenen Weg auf, das Erbe für zukünftige Generationen zu sichern und zugänglich zu machen. Die Absprachen führten nicht dazu, dass bestehende Strukturen der Anlage einschließlich der optisch ikonischen DFR-Kugel beibehalten wurden. Stattdessen konzentrierte sich die Strategie darauf, dass eine Reihe von Kulturerbe-Programmen und Kulturerbe-Aktivitäten angeboten wurden. Die fortwährende, erfolgreiche Entwicklung und Umsetzung dieser Angebote hat u. a. museale Ausstellungen, Archive, wissenschaftliche Studien und mündliche Geschichtsjahre hervorgebracht.

Die Kombination von aktivem Rückbau und gleichzeitigem Kuratieren des zurückgebauten Materials unterscheidet die Dounreay Strategie von anderen Formen reaktiver Erfassung oder Sammlung zur „Rettung“. Die Akteure der Dounreay Strategie als frühe Pioniere auf diesem Feld haben einige Lehren gezogen, die für Entwicklungsstrategien in anderen Anlagen von Bedeutung sein können. Diese beinhalten die Notwendigkeit, den Verlust von kontaminierten Gebäuden zu akzeptieren, die oftmals wie gebaute „Wahrzeichen“ wirkten, und starke Partnerschaften aufzubauen, um umstrittene Projekte im Abschaltvorgang zu fördern.

¹ <http://www.dounreaystakeholdergroup.org/>

² <https://www.historicengland.org.uk/images-books/publications/change-and-creation-historic-landscape-character/>

³ HÖGBERG, Anders & HOLTORF, Cornelius, 2014, 343–358.

⁴ See POPE, HOWDLE & GUNN, 2015.

⁵ See POPE, HOWDLE & GUNN, 2015; GUNN, 2012; GUNN, 2015; GUNN, 2017; GUNN 2018.

⁶ GUNN, 2012, 184–185