

# Thermal Reconfigurations of the Industrial Landscape

When Hebburn Colliery commenced in 1792 in the North-East of England, thousands of gallons of water were drained from the pit to allow coal miners workers access. Since the site closed in 1931, water has naturally seeped back into the tunnels and cavities, an organic reclamation of the subterranean wounds of coal mining industry. In 2021 work began on using the flooded mine as a source of geothermally heated water, although the borehole collapsed and the engineers switched to a water source heat pump (WSHP) system. The mine water is being used to generate hot water for local properties, including a block of flats, a swimming pool and shopping centre.

Less than two miles away on the banks of the River Tyne, Viking Energy Network Jarrow (VENJ) have built a solar array and WSHP at the Jarrow Staiths, a wooden pier-like structure previously used for loading coal onto boats that sailed as far as Battersea. A solar array powers the heat pump and depending on weather conditions, draws additional power from the grid to operate continuously. The new energy schemes won't entirely disconnect local communities from the fluctuating energy market but will at least provide a buffer against sharp price increases.

In Seaham, Durham, a new village development is being built around a flooded mine network where the conditions are more favourable for geothermal power. Geothermal systems rely on the constant temperature of subterranean volumes of water, offering a thermal stability entirely at odds with the economic turbulence of the energy market. The Coal Authority claims that mine water is "...one of the best options to help with the decarbonisation of heating", and that "Nine out of

ten of our largest urban centres are above areas of former coal mining activity", suggesting this might be part of a larger strategy to heat properties in the UK.<sup>1</sup>

In 2023 I was selected to undertake an artist's commission at the Hebburn and Jarrow sites, working with the public and engineers to produce work that engaged with these cross sectional and relational shifts in energy industry. This text and photographic series build upon a body of artistic research to consider the transindustrial reconfigurations of people, energy and landscape via the repurposing of historic coal mining sites as locations for renewable energy infrastructure.

## Hebburn

It's difficult to comprehend how important the coal mining industry was in the North-East of England, even amidst the prevailing legacies within communities, histories and archives. Over 150 years coal mining has historically formed intense socio-cultural relationships between labourers, technology and the local landscape. The arrival of the two WSHP projects prompts a reconsideration of these relationships: sites of "dirty energy" production have been transformed into sustainable energy projects, rewiring energy pasts and futures into different configurations.

The broader context of the climate crisis complicates the sense of pride that exists within coal mining communities. Coal miners are simultaneously revered for providing the nation with energy through gruelling work in claustrophobic and dangerous conditions, and yet we now know fossil fuels are unsustainable and must give way to alternatives. Nostalgia for a world before the internet, globalised industry and hyper-capitalism points back to an industrial past they cannot return to. The flooded mine in Hebburn forms a poetic reclamation of their labour, filling the excavated collieries with water that will supply residents with hot water. In this spatial and material reconfiguration of the earth, the histories of coal mining are not erased but become the volumetric container for sustainable energy production.

The energy projects reaffirm a connection between local people and nearby natural resources that have been displaced via the international division of labour and globalisation. The houses closest to the mine will be supplied with hot water — it isn't fed back into an energy grid for use elsewhere. This marks a deeper shift in how local industry relates to the global economy. Instead of shipping coal to Battersea Power Station in London via the River Tyne, the energy projects are designed to operate at a local level, creating a different geographic relationship between local residents and energy production.

The complex geopolitics of the global energy market came into sharp focus for many during the ongoing Russian invasion of Ukraine in 2022. The resulting price hikes, compounded by the grim economic aftermath of Brexit led to many families in the UK unable to heat

<sup>1</sup> Alisdair Lane, "How flooded coal mines could heat homes", *BBC* (07.07.2021).

their homes during the winter. Activist group *Don't Pay UK*, formed in June 2022, urged UK residents to stop paying their energy bills, to levy pressure on the government's reticence to enforce a fair price-cap on energy costs. The economic pressures and practicalities of heating homes were especially felt within many areas of North East England, crushed by years of austerity measures and underfunding from the government.

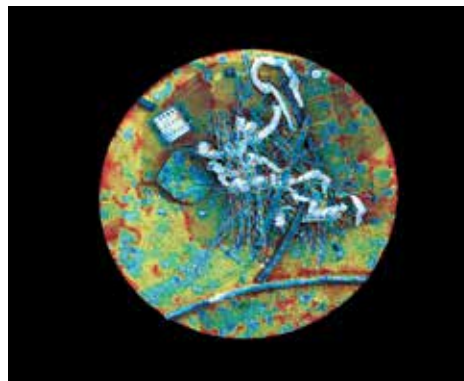
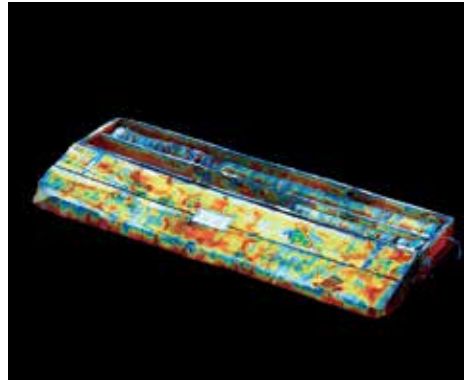
I'm given a tour of an apartment block in Hebburn that is heated by water from the flooded coal mine. The testing stage of the project coincided with an economically brutal and biting cold winter in 2022. The residents of the apartment walked around in shorts and t-shirts whilst the engineers tested the new heating system, temporarily free of charge. The short-lived liberation from worrying about heating bills must have been a huge relief. I take photographs of the domestic technologies that require and produce heat – ovens, radiators, kettles, electric fires, wondering about the ways our domestic routines have changed to protect us from staggering energy bills.

I stand in an empty apartment that has had the fittings and carpets removed. The engineers have removed the old gas boiler and added new pipework in each room, connected to heat pump infrastructure at the top of the building. The cavity where the boiler used to be resonates with the void of the flooded mine, of empty spaces left by the disappearance of previous energy industry. Sunlight streams in through a window onto a black metal fire surround, bringing together cosmic and domestic scales of energy and heat into the living room.

### Thermal Properties

Whilst making the video work *Thermal Properties* (2023) I met with members of the Harton Banner mining community, who worked in South Tyneside coal mines for decades. I asked them to bring an object with them that they used in the mines. I used a mobile phone to lidar scan the objects whilst they described the objects and told stories from their mining careers. Almost all of the objects were related to life preservation—a first aid kit, an emergency morphine box. Along with lidar scans of the interior and exteriors of the industrial sites and homes modified for heated mine water, I used VFX software to subject them to thermal simulations — either simulating the dissipation of heat or melting the 3D objects into puddles of water, trying to find commonalities between them via the movement of water and heat. I took satellite data of the local terrain and subjected it to the same software processes. The resulting work is an 8mn video of these thermal experiments, projected as a video installation at The Word Museum in South Shields.

The simulated dissipation of heat emphasises the thermal connections between domestic technologies, the WSHP infrastructure, the landscape and the objects that miners used to excavate coal. The melting of objects plays with the idea of phase change — when an object turns from one state to another — as a visual



Stills from *Thermal Properties* (2023), 2K digital video, 8mins, Paul Dolan, bottom to top: solar panel debris, borehole sample, anemometer

metaphor for the changing industrial characteristics of energy production. The coal miners' metallic and wooden objects change state from solid to liquid, visualising the role of water and heat within the trans-industrial shift. I was also interested in how this concept of phase change might resonate at a larger socio-cultural level. How might be considered the wider support for sustainable energy as a phase change? What would be required for the transformation to happen at a societal level?

The exhibition contained five thermochromic postcards featuring the miners' anemometer, first aid kit, morphine box, wellies and wrench. When placed near a heat source like a radiator, oven or laptop, the black postcard would reveal the underlying image of the miners' objects, then return to a black state. The postcards were designed for audiences to make connections between the electricity powered objects in their homes and the limited visibility of coal miners working in dangerous conditions. It resonated with the lack of visible light used in the photographic series, and also performed the thermal transfer of energy between people and technology within their homes.



Crane footing, Jarrow, infrared photograph, Paul Dolan, 2023



Infrared photograph of a heat storage tower during construction, Hebburn, Paul Dolan, 2023



Concrete base built on top of the mine, Hebburn, Paul Dolan, 2023



Unoccupied apartment converted for mine water heating, Paul Dolan, 2023



Construction worker in the upper section of the heat pump building, infrared photograph, Paul Dolan, 2023



Pipework connecting the River Tyne and heat pump, infrared photograph, Paul Dolan, 2023



Viking Energy Network water pump building under construction, infrared photograph, Paul Dolan, 2023



Heat storage tanks, Jarrow, infrared photograph, Paul Dolan, 2023

## Jarrow

Down the hill from the solar array and water source heat pump in Jarrow, the concrete bases for cranes that helped load coal onto ships bound for Battersea Power Station are still visible amidst the ferns and brambles. The engineer tells me they plan to redistribute excavated soil to create a new slope for vehicles to access the site rather than sending it to landfill, another reconfiguration of the land sympathetic to waste and excess. The water capture inlet in the River Tyne is housed on steel structures built around the decaying wooden footbridge without disturbing it. Whilst the river slowly rots the wooden walkway, its constant flow fills the inlet pipe and supplies the heat pump. The rhythm of water simultaneously erases the traces of previous industry and generates the new.

Most people aren't aware of where their water comes from or the technicalities of water infrastructure. Taking a shower with hot water powered by the River Tyne could alleviate this disconnect, bringing new ways for residents to conceptually reimagine the relationship between local natural resources and everyday domestic activities like warming a room, drying clothes, washing hands. This transindustrial shift holds philosophical as well as technical value. Perhaps it can lead to a clearer understanding of water and energy provenance, and with it, a stronger sense of responsibility for the local environment.

Making the relationship between a local river and domestic heating more direct may also change the ways in which we think about the "on tap" nature of energy, as more dependent on weather and the sustainable functioning of a planetary ecology: something that can change and fluctuate with tidal movements and the seasons. In *The Question Concerning Technology in China* Yuk Hui references Su Soon's (1020–1101) ancient water-based armillary sphere that used the flow of river water to create an accurate clock and celestial navigation device.<sup>2</sup> Hui describes how time in the Chinese tradition of *sishi* follows the four seasons instead of Western Aristotelian modes in which time is a "movement from one point to another".<sup>3</sup> In contemporary Western life, by comparison, the seasons are merely an obstacle to our on-demand lives. Energy is consistently supplied via coal or nuclear sources to mitigate the variability of wind or solar power. Fruit and vegetables are available all year round in supermarkets.

The expectations we have of nature and technology are often rooted in deep-seated belief and value systems that prevail in stories, myths and narratives. In *The Carrier Bag Theory of Fiction*, Ursula Le Guin traces the dominance of the techno-hero myth back to neolithic times, in which the shooting of a mammoth through the eye with an arrow made for better stories than tales of foraging for vegetables and berries, which accounted for the majority of human diets in temper-

ate climates at that time.<sup>4</sup> For Le Guin, technology is better mythologised as a carrier bag to help us move resources from place to place for survival rather than as a weapon to dominate the environment. This is one way of thinking through how philosophies of technology have shifted in relation to the industrial sites here. The flooded mines with their newly acquired sustainable energy contexts, become better conceptualised as a carrier of energy and thermal transfer, rather than heroic excavation of the ground.

## Foundations

Whilst researching and documenting the WSHP projects, I wanted to draw out different ways of articulating the largely invisible relationships and connections between people, land and technology. I experimented with a range of thermal imaging systems that generated images from heat and infrared radiation beyond the register of human vision.

The photographic documentation of the sites was taken with a converted full-spectrum infrared camera, with a range of lens filters that absorb varying parts of the visible light spectrum. The 695nm filter lets some visible light into the camera, creating intense blue fo-



Fabricated circuit board and coal, installation view at *The World*, UK, Paul Dolan, 2023

liage and vegetation once digitally processed. Colour is arbitrary in all infrared photography — any colour channel can be processed in any hue, although the relationship between colours is locked in a rigid dynamic.

The 850 nm filter blocks almost all visible light, making it difficult to see through the viewfinder even in daylight. The camera's light sensitivity settings (ISO) must be increased dramatically whilst composing and focussing, and then decreased before capturing the image to avoid aggressive digital noise in the image. Following this process, every image is taken through a dark lens — as close to the sensation of a miner's reduced visibility as most people will experience. The resulting images are stark, monochrome landscapes of the changing industrial sites.

The infrared light bounces off the water content of the foliage, making trees appear frosty and snow-covered despite photographed in moderate spring

<sup>2</sup> Yuk Hui, *The Question Concerning Technology in China* (Falmouth: Urbanomic, 2016), 210–211.

<sup>3</sup> Yuk Hui, *The Question Concerning Technology in China*, 211.

<sup>4</sup> Ursula K. Le Guin, *Carrier Bag Theory of Fiction* (London: Ignota Books, 2019).

weather. The infrared heat from the sun and the water content of the vegetation combine to create images beyond the visible light spectrum. On first glance, the images appear to be standard monochrome photographs, creating a sense of continuity with archival images of coal mining activity in the area. On closer inspection, the subtle disruption and inversion of black and white values suggest a break with the past, in which temperature, non-human visibility and energy become the primary basis for the image.

From a selection of around one hundred photographs, taken over two visits to each site, I found the most visually resonant images to be the concrete foundations from old and new industries, once a liquid mixture poured into the ground cavities like the flooded mine. The concrete foundations constitute the first contact between the industrial architecture and the earth. As a photographic series, they become a visual metaphor for the foundations of technological thought — connecting Le Guin and Hui's thoughts about the origins of our technological imaginaries. Perhaps residents seeing their environment in infrared vision will also prompt a reconsideration of the thermal connections between their lives and the local energy industry.

During the commission I worked with a local printed circuit board manufacturer to produce non-functional circuit boards that compressed layers of map data into electronic strata. Working with the water pipe network diagrams, satellite street maps and heat map data used within the WSHP development process, I designed the layout in specialist software for fabrication. The resulting works are small, owing to the micro/macro relationship between technology and agency: tiny circuit boards have huge impacts on the world. Within the exhibition a single circuit board is nested within a mound of coal.

The map layers intersect and create new spaces within the copper, ink and green protective plastic compound. Each trace and line overlaps but is still visible, not entirely occluded by the layer above or below. In the circuit board labs, the layers are printed separately and allowed to dry before the next layer is added, each with a separate chemical process. They point towards the palimpsest of transindustrial land use, whereas each continuous use case never starts afresh, but carries with it the baggage of the past. This can be considered a poetic visualisation of how changing assemblages of local land, industry and people form strata of previous configurations that extend connections through time.

### Transindustrial reconfigurations

The transindustrial shifts in Hebburn and Jarrow prompt a reconfigured perception of the local landscape as a source of thermal movement rather than extraction. Within the relational contexts of climate crisis, globalisation, hypercapitalism and increased socioeconomic disparity, the WSHP projects present a welcome approach to reaffirming a model for locally constituted technology use. The poetic implications of

using local water sources for energy offer opportunities to move away from the broken globalised energy system and towards sustainable and local industrial configurations.

This conceptualisation of the changing industrial landscape is understood as a continuous, emergent, messy network of relations rather than discrete objects of study belonging to the past and present. This helps understand the transindustrial as assemblages of place, people and technology that are continuously rewired into new configurations, exerting agencies and outward forces on each other in an ongoing process of emergence. One of the advantages of adopting a relational approach to the transindustrial is the affirmation of human agency within the assemblage — and how we might act in conjunction with a larger network of non-human actors to nudge nature-tech assemblages into a configuration more favourable for our planet and people. 🌱

### Acknowledgements

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