ORIGINAL ARTICLE

District heating as heterotopia: Tracing the social contract through domestic energy infrastructure in Pimlico, London

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The Pimlico District Heating Undertaking (PDHU) was London's first attempt at neighborhood heating. Built in the 1950s to supply landmark social housing project Churchill Gardens, the district heating system sent heat from nearby Battersea power station into the radiators of the housing estate. The network is a rare example in the United Kingdom, where, unlike other European states, district heating did not become widespread. Today the heating system supplies more than 3,000 homes in the London Borough of Westminster, having survived the closure of the power station and the privatization of the housing estate it supplies. Therefore, this article argues, the neighborhood can be understood as a heterotopia, a site of an alternative sociotechnical order. This concept is used to understand the layers of economic, political, and technological rationalities that have supported PDHU and to question how it has survived radical changes in housing and energy policy in the United Kingdom. This lens allows us to see the tension between the urban planning and engineering perspective, which celebrates this

system as a future-oriented "experiment," and the reality of managing and using the system on the estate. The article analyzes this technology-enabled standard of living as a social contract between state and citizen, suggesting a way to analyze contemporary questions of district energy.
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Christine pads across the waxed floorboards of her flat showing me to a comfy spot on her sofa. Her living room is bathed in sunlight, which floods through the windows and reflects off the modernist white of the walls, the brushed iron pipework, and the shining green leaves of her plants. "It's a gorgeous room," I say, and Christine agrees. "My flatmate calls it his studio," she responds, indicating the drafting table on the opposite side of the room. It transpires that her flatmate is an architecture student. "He must get kudos from the other students for living in this building," I suggest with a laugh.

We are sitting in a sun-drenched corner of the Churchill Gardens Estate in the London neighborhood of Pimlico. The estate was commissioned in 1949 by Westminster City Council[1] and was built in a bubble of post–World War II enthusiasm when such large-scale social housing projects were pockets of the promised future to be crafted out of the rubble of the Blitz. The 10-year construction was approved before bureaucratic reality encroached into the architectural dreams of this new mass utopia (Bullock 1994), and as a result, the estate is one of the examples of postwar mass social housing projects studied and celebrated for its attention to urbanism. Churchill Gardens was designed by modernist architects Powell and Moya, and the landscaping (Harwood 2000); the housing layout, which combines small and large units

(Bullock 1987); and the social mix aimed at by having white-collar and blue-collar rents (Powell 2009) have all been studied as contributing factors in an attempt to realize social democracy through sociospatial organization. This allows for an examination of this neighborhood as a *heterotopia* in Foucault's terminology, a type of space into which society gazes to understand what an alternative arrangement of living might look like (Foucault 1986).

The heating infrastructure was a critical element in turning this neighborhood into a site of social democracy. At the time of its construction, it was more common for homes to have open fires to heat rooms and to boil water for washing, but in Churchill Gardens, the plan was for all flats to have central heating, with heat supplied remotely from Battersea power station and sent through a subterranean network of pipes into the domestic radiators. This was an early engineering experiment to use heat generated through electricity production in a neighborhood-scale district heating system, but it was also an early socioeconomic experiment in the state-managed distribution of heat as a public good. This form of municipal infrastructure became popular in cities throughout Europe in the late twentieth century, owing to its public health and fuel efficiency benefits. The United Kingdom, however, did not go on to establish citywide strategic management of heat (Hawkey et al. 2013; Russell 1993), focusing instead on a different scale and building national electricity and gas grids to supply individual homes with energy. Today such district energy schemes provide only 2 percent of U.K. homes with heat (DECC 2013), which means that the arrangement at Pimlico is still something of a sociotechnical novelty in the United Kingdom.

Christine's cast-iron radiators look like the original ones installed when the flat was constructed. This is possible, because although Christine is renting her flat privately from the owner, the heating infrastructure still belongs to the municipality. Over 60 percent of the flats

on the estate are now privately owned; however, the heating infrastructure was not part of this privatization. I ask her about her radiators. It's a cool day in early spring, and the window is slightly open, but the room is warm. It is unclear whether we're enjoying the solar gains of a sunny day or the output of the district heating scheme. "Are they on?" I ask. "Yes," she replies, "I should ask my flatmate . . . I haven't worked out how to turn them off." "Can you?" I prompt, aware that the original system did not place much emphasis on resident control. That was the job, in fact a primary purpose, of the technology, to remove the labor involved with creating a warm home and free up the citizen for productive work (Egerton 1943). It was up to the system to sense when outside temperatures were dropping and automatically send more heat into flats, maintaining a warm indoor temperature.

This is how it still operates, but today's energy policy landscape places more emphasis on active consumption than on municipal management of resources. The dominant "technoeconomic" policy view constructs the home as a sphere of energy demand in a decontextualized energy system in which end users' buildings, appliances, and behavior all have a theoretical optimum energy performance. The role of the state is to facilitate the system in achieving this optimum through appropriate market mechanisms. From this perspective, Christine's slightly open window and uncertain use of her central heating system could signify energy waste and irresponsible consumption. However, this set of analytical categories is not shared by residents who talk in terms of heating and warmth, and as Wilhite (2005) has argued, such disjuncture identifies a role for anthropology to dig beneath the abstract category of energy and explore the sociotechnical distributed agency that underpins "energy demand" (see also Shove 2010; Wilhite 2008). Following this line of thinking, I interpret the heat distributed by the system as a social good, which creates a set of social relations embedded in neighborhood,

rather than as an individual's commodity, and I see the warmth of Churchill Gardens's homes as an outcome of an energy-oriented contract between citizen and state.

Government attention to citizens' heat consumption is rising today, with the realization that 23 percent of the United Kingdom's energy goes into heating homes (DECC 2013:66), and although district heating remains rare, the spatial scales of energy are shifting. The Greater London Authority has a target to supply 25 percent of the city's energy through neighborhood sources (Greater London Authority 2009) like district heating. This contributes to the United Kingdom's broader statutory obligation to reduce greenhouse gas emissions by 80 percent by 2050. This is recontextualizing energy relations to the neighborhood level and is presented in policy rhetoric as the way the state can fulfill its statutory obligations but also legitimate itself in the eyes of the citizens by responding to contemporary concerns about the power of energy companies, the rising price of energy bills, and unconventional sources of energy (DECC 2014). The rhetoric conjures up a state committed to supporting infrastructure that makes energy not only available and accessible but also socially and environmentally "acceptable" in a social contract with the resource-rational, autonomous consumer. This raises a tension between the idea of heat as a neighborhood resource to be managed through local governance or as an individual's commodity to be managed as part of the national energy system. In Churchill Gardens, the former idea was adopted, allowing this normative model to be examined in relation to the United Kingdom's more dominant normative understanding of heat as an end user's consumer good.

I view the district heating system in Pimlico as a heterotopia to understand how this sociotechnical normative arrangement came to be constructed, and I find that the lens is helpful for analyzing how this system survived, given the radical reworking of housing policy and

energy policy that has occurred in the United Kingdom since the 1950s as well as the shifts in resource availability and technologies that have shaped the affordability and perceptions of energy services in this period. The article is structured according to the historical development of the district heating system. In the first section, I discuss the concept of heterotopia and how this is useful for analyzing district heating in the United Kingdom. I then analyze the logics and resources that were used to create this form of heating in Pimlico, drawing on archival sources to examine the kind of future that engineers were striving to build. I then use local authority records to discuss the process of valuing the heating system and show how this was done relative to changing policy and resource landscapes external to the site, which influenced the costs, values, and relationships internally. I go on to look at the system today and draw on semistructured and informal interviews with two of the engineers, a housing manager, five residents, and a resident's group to reflect on how the system is experienced today. I end by asking what we can learn from this type of anthropological analysis and suggest that this type of research is relevant now, because today, as in the 1940s, the U.K. government is looking at how to organize the built environment to rationalize resource use (Davies and Oreszczyn 2012).

The heterotopic status of U.K. district heating

Heterotopia is a concept from Foucault's short essay "Of Other Spaces" (Foucault 1986), in which he argues that contemporary power dynamics can be revealed in the spatial arrangements of social life. Although the ideas are only roughly sketched, one core idea is the analytical value of looking at the relationship between normative spaces and a society's alternative versions. Another core analytical idea is how disparate elements ordered through space are made sense of through social norms. He particularly indicates that infrastructure

(telephone signals, traffic) is insightful, and yet he does not use these kinds of examples to develop his analysis. Instead, he draws on more classic anthropological spaces—the cemetery, the museum, the honeymoon bed—to argue that such sites of sex, disease, and ritual reveal a hegemonic governmentality by existing outside it. In this article, I return to his opening gambit, that there is something about infrastructure that can help us understand the contemporary era. Building on other anthropological analyses of the relationship between infrastructure and social structures (Alexander 2007; Collier 2012; Humphrey 2003), I follow the material configurations built to distribute energy resources in order to examine the social structures they support.

Making the case for district heating

District heating, where heat generated remotely is transmitted via steam or hot water to a group of buildings, was pioneered in the late nineteenth century in the United States (Lund et al. 2014) and, by the 1930s, was rising in popularity for municipal governments across Western Europe and the Soviet bloc (Heating and Ventilating Research Association 1967). States adopted different technologies and rationales to provide heat as a standard of living for citizens that reflected national priorities and resources (Lund et al. 2014). In Soviet cities, rapid industrialization, urbanization, and central planning saw large-scale systems develop rapidly as the urban proletariat grew and were housed in warmed buildings (Mcintyre and Thornton 1978). In other political economies, such as social democracies in Northern Europe, heat networks grew more slowly and are now a widespread form of municipal infrastructure (Mcintyre and Thornton 1978).

The U.K. engineering community was part of this international trend. The potential to build better cities and rationalize urban energy use was discussed by the profession during the

Second World War, in acknowledgment of the opportunity for renewal that would arrive (Russell 1993). At this time, the potential of district heating was outlined in terms of efficiency gains not only in the badly needed fuel savings but also in the space- and labor-saving potential and improved air quality (Egerton 1943). Discussants contributing to the *Proceedings of the Institution of Civil Engineers* (ICE) in the 1940s argued that liberating the housewife from the tasks of producing heating and hot water could only help the country to prosper; one asked whether "the nation [could] afford to neglect any amenity which would raise the standard of living of the ordinary housewife in the small house, whatever the expense might be?" (Egerton 1943).

The question of whose labor is being saved by technology has been raised by Schwartz Cowan's (1983) seminal work on labor-saving devices in the American domestic sphere. She audits time to understand the extent that the home transitions into a site of consumption: time spent on domestic chores, the replacement of servants' time with the housewife's time, the time spent laboring to achieve new class ideals through cleanliness. By contrast, the auditing required to understand the potential for district heating to turn the home as a site specifically of energy consumption is a Foucauldian spatial audit. The system imagined by the engineers was not a contained appliance brought into the home but a network in which space and labor savings in the home could only be achieved by establishing spaces of energy storage and production outside of it, but linked to it. The engineers' arguments for the "Pimlico pilot" was an argument to see if such spatial rationalization could be achieved in London and whether connected sites of production, consumption, and storage could be built, operated, and paid for by a municipality for wider national gain.

In 1949, the magazine *The Consulting Engineer* published a discussion about the Pimlico District Heating Undertaking (PDHU) that explained the ambition behind the project and the vision guiding it (Figure 1). The article starts:

> It is perhaps indicative of Britain's will to survive and to surmount her economic troubles that this great new housing estate . . . is to have complete space heating and water heating by means of a district heating plant, thus banishing the dust and drudgery of the open coal fire, and the nuisance caused by the delivery and removal of fuel and ash for each block of flats. This plant is unique in two respects: it is the first public heat supply in London, and it also London's first district heating plant[2] wherein the heat is the by-product of electricity generation. [Association of Consulting Engineers 1949:316]

The Consulting Engineer demonstrates the symbolic importance of the pipework being laid and the alternative version of life that could be built. Two points are salient: first, supplying heat as a public service, and second, the use of a combined heat and power (CHP) plant to generate this heat. The City of Westminster was taking on the responsibility of producing a warm home and liberating its citizens from the drudgery of this work. Through this reorganization, Westminster would be offering the nation an opportunity to improve fuel efficiency of electricity generation and generate revenue from the heat produced in the process. In addition, Westminster's streets would be freed from the transport infrastructure required to get fuel in and waste out of the spaces of consumption. These district heating pipes should produce broader social value through rationalizing resource use in the public sphere (clearing London's streets and reducing waste at power plants) and rationalizing the private sphere, substituting labor with technology.

[FIGURE 1 HERE]

Figure 1 Front cover of *Consulting Engineer* magazine, showing an aerial view of the planned district heating scheme, 1949.

Figure 2 shows the technical arrangement of the system; coal was burned in generators to produce electrical and thermal energy, and the thermal energy was sent via a hot water network under the Thames into the district heating system, where it was stored in the heat accumulator or pumped around the estate feeding central heating systems and keeping sanitary hot water supplies warm. The scheme was built as designed, but missing from this depiction are the divisions of ownership and responsibility that governed it. Battersea power station, the generating plant, was owned and operated by the Central Electricity Generating Board (CEGB), whose main operational responsibility was to produce electrical energy and distribute it through the United Kingdom via a national grid. Westminster County Council succeeded in contracting a skeptical CEGB to supply the thermal energy to its district heating scheme (Russell 1993), allowing them to take on the responsibility of providing warm homes. PDHU was owned and operated by the council, who bought the heat from CEGB to distribute and sell it to residents in Churchill Gardens as well as to local shops and facilities. Through this arrangement, the council committed to the provision of warm homes for social renters at an affordable rate.

[FIGURE 2 HERE]

Figure 2 The Pimlico District Heating Undertaking. Diagram reproduced from *The Institution of Civil Engineers Proceedings,* Part 1 (1954), with permission.

Constructing a heterotopia in London

The role of a heterotopia is to create a "real space, as perfect, as meticulous, as well arranged as ours is messy, ill constructed, and jumbled" (Foucault 1986:27). The engineering

discussions demonstrate the process of creating the boundaries around the heterotopia and achieving such order through the network. The system required sociotechnical links to manage the heat circulation, and two elements were particularly critical to achieving this: heat meters and the thermal accumulator. The two technical elements delineated the spatial and temporal domain of the heating network but also established a set of relationships governing residents' participation in the system

Heat metering technology was new, expensive, and not highly accurate. Meters were installed at key points in the system; one recorded the amount of energy leaving the power station, another recorded the amount arriving at PDHU's substation, one measured the supply to Churchill Gardens, and another measured the supply to the neighboring private residential development. The meter data provided information on the distribution of heat energy circulating in the system and were used to charge Westminster Council for the heat it received from the power station. For the engineering community, these meter data were used to evaluate technical and economic viability of district heating for the United Kingdom. The first two years' operating data were scrutinized in the *Proceedings of the Institution of Civil Engineers* by engineers, architects, and interested parties (cf. Noddings et al. 1956; Ratcliff et al. 1954). They found it was hard to separate out the costs of producing heat with the installed technology and discovered that CEGB's plant had operational difficulties further affecting the economics. However, these problems could be separated and removed from the assessment of the "Pimlico experiment," as they called it, by focusing on the heat once it arrived in Westminster City Council's pipes, on the other side of the meter. The engineers used numbers from an optimized cogeneration facility, rather than CEGB's less than optimal reality, and used the meters to create points of ontological certainty within a complex energy system with manifold system losses and

uncertainties. The meters established areas of responsibility and management, which enabled the engineering community to create an ordered and rationalized site out of the messiness of actual operations.

The second critical element in the system's operations and relations of responsibility was the thermal accumulator. This was a cork-insulated water storage tank encased in a decorative glass and steel frame, which stored heat and released it into the system as it was needed. CEGB could generate electricity when the national grid needed it, but the cogenerated heat could be stored until it was needed by PDHU's system. The Pimlico system was designed to supply heat following the rhythm of the working day (from 5:00 AM to 11:00 PM), and the amount of heat to supply to each room was established by modeling the thermal characteristics of the buildings and monitoring external air temperature. As the weather got colder, the PDHU team could adjust the temperature of the water feeding the radiators in each room. In this way, the thermal store afforded PDHU a degree of control over two areas of unpredictability, the weather and the rhythm of residents' lives, and allowed these to be managed within this site. The accumulator provided the flexibility to boost supplies on particularly cold days and to decouple the heating system's operating schedule from that of the CEGB.

Just as the operational data were scrutinized, so was the question of what was acceptable for residents. Residents had a responsibility to participate in the network, and the imagined terms of the contract can be gauged through the engineers' feasibility assessments and debates. Not all engineers reviewing the system were convinced that heat should be backgrounded as a basic standard of living rather than being metered as a consumable. The engineering community felt heat could be delivered cheaply but pointed out that the annual cost to the resident was significant, and they wondered whether, in Britain, there were "enough people who were

prepared to pay to be comfortable" (Noddings et al. 1956:342). One pointed out that "whereas a tenant could shut off his radiators for any length of time, he could not shut off the bill" (Donkin et al. 1954:285). Without meters establishing a private sphere of consumption at the level of the individual home, the heat was supplied as a social rather than a consumer good. This social good was embedded materially in the layout of the apartments. The space needed to store fuel for fires, or tanks for heated hot water, was taken out of individual homes and off-sited to the neighborhood. Westminster Council's side of the contract was to provide heat in the most cost-effective and resource-efficient manner according to the available technology. On the residents' side, they entered into a tenancy contract with the state to live in this heated home and, in doing so, contributed to the social and economic relationships that would make the system work. Both sides were collaborating in a sociotechnical experiment and sharing the risk of the investment needed to pilot the development of heating as a social good. This arrangement turned this neighborhood of London into a heterotopia in which the rules of governing the production, distribution, and consumption of energy were prescribed through an experimental sociotechnical order not found in the rest of the city.

A report from 1956 that reanalyzed the operational costs of the system included an interview with the council's housing manager. Her opinion confirmed that some tenants did not want to move to the Churchill Gardens Estate in Pimlico because "they were fearful of the charge for heat" but that she had not found a single resident who would give up the new system once he or she had moved in. An engineer conceded that "apparently people had become accustomed to the amenities and seemed prepared to pay for them" (Noddings et al. 1956:343).

The changing value of a heated home

This new form of sociotechnical system required a new governance structure. Westminster City Council had to be authorized to act as a utility and sell heat, given that it was not a commercial enterprise. The rules stated that "the charges shall be fixed from time to time by the Council so that, as far as is reasonably practicable, the total income of the Undertaking shall be not less than the total of its expenditure" (Westminster City Council 1960). This licensed Westminster to charge residents for the running costs but also for a share of the initial capital cost of the infrastructure. In effect, the council had to determine how to afford the standard of living it was in the process of creating materially in the form of Churchill Gardens Estate and how to distribute the costs spatially and temporally across the site.

The council's Housing Committee minutes show how the valuing of this energy-oriented social contract happened within this site. The committee had already decided to charge "substantially higher" rent for the flats on the grounds that they were superior quality to pre-1939 housing. They justified that this fulfilled their social responsibility by generating more income for urgent housing reconstruction but also that they would subsidize rent for those most in need of housing and ensure that a social mix of tenants had access to this standard of living. Charges for the heating and hot water rates were not to be subsidized, though, and the tenants' charges were set by modeling expected system costs. The Housing Committee used four assumptions; three relate to the phased construction of the estate in order to factor in the time lag between the current and future citizen body that would be consuming the heat and contributing to the capital costs, whereas the fourth assumption related to the cost of fuel at Battersea, which they predicted would rise by almost 5 percent in the coming year. Charges were set, residents were billed weekly or monthly throughout the year, and at the end of the financial year, the council reviewed the actual costs incurred and revenues accrued in relation to

predicted ones, making adjustments to the next year's charges if the account had a surplus or deficit.

In the Housing Committee discussions, the revenue stream generated through PDHU took on a buffering role, allowing the construction and fuel costs to be recouped over a flexible time period and an evolving citizen body. For example, in 1960, when the charges were reviewed, the first three assumptions used in the model had held, but the price of fuel had fallen more than 6 percent. This meant that the council was generating more income than planned and could expect not only to cover costs but also to generate a surplus of £51,000 over the 30-year investment period. Should this anticipated surplus be a reason to reduce the current rates charged to the tenants? The Housing Committee thought not, suggesting that "it is by no means an excessive margin," particularly given the size of the council's initial capital expenditure of £300,000. They also suggested that keeping this extra was a prudent move given "all the imponderables for an Undertaking" (Westminster City Council 1960).

This economic flexibility echoed the technical need for a thermal store that could create a temporal lag between the commercial drivers governing production and the social drivers and external factors that shape the demand for energy. The costs charged could be massaged to make sure that the first beneficiaries of the system were not overburdened with the development costs or that windfalls accrued through falling energy prices were used to offset future rises. Westminster's municipal responsibility to provide social welfare meant that it could implement this vision of resource rationalization as a social good and adjust how to cost and value it in response to the range of "imponderables" that might appear while developing this system.

Shifting policy landscapes

The imponderables in the pipeline between the 1960s rate-setting exercises and the Housing Committee's 1981 projected breakeven date came to include the obsolescence of Battersea power station's generating technology, the discovery of the United Kingdom's offshore natural gas fields, the OPEC price hike, and the U.K. Trade Union Movement's strikes against coal pit closures. The period also saw the shift away from postwar social welfare thinking and the election of Margaret Thatcher, a prime minister who epitomized a very different vision for public housing and its role in the social contract. These changes constituted a radically different socioeconomic and energy policy landscape for PDHU to operate within and challenged the spatial logic of Churchill Gardens's infrastructure.

A key policy of Margaret Thatcher's new government was the controversial "Right to Buy" scheme of 1980, which introduced the sale of council-owned housing to tenants across the United Kingdom. Westminster City Council had been in firm support of the Conservative Party's ambition to build "a property-owning democracy" since the early 1970s (Westminster City Council Housing Committee 1972:10), and it was one of the first councils to start selling its housing before this became national policy. Although it was committed to the ideology, it was a challenge for the council to carve out property over which private ownership rights could be given. Unwilling to create a patchwork of different tenures within one building, the council decided at the start to sell council houses rather than individual council flats. Having scanned its total housing stock, the committee spotted 28 terraced houses in Churchill Gardens that could be offered up for sale. These had a reassuring alignment of a single-family unit contained within the physical unit of a house, and, being located on the edge of the estate, they were easily annexed from this site of social democracy. However, there was no mention of the shared infrastructure running beneath these single-family units or that the residents inside were

theoretically still paying for the construction costs of these pipes for a further 11 years. The council separated the shell of the building from the services needed to keep this object as a habitable space and, in doing so, established a tension between the materialization of a property-owning democracy and the social contract constructed through the infrastructure of PDHU, which had scripted the home as a warm space in a network rather than as an isolated agent.

This tension erupted in the 1970s and 1980s as the OPEC price shock and industrial action drove dramatic increases in energy prices and the heating infrastructure inside homes started to mobilize political dissent. Although all residents renting Westminster's council housing were ostensibly being provided with the same heating and hot water services, the technologies installed to deliver this in people's homes started to perform as agents of separation and inequality, creating exploitative relationships through the provision of these services. In 1975, Westminster residents with gas and electrically heated systems in their homes saw their bills rise by 60 percent, while PDHU residents' bills went up 38 percent. The fuel price increases were passed on to the residents, although the council meetings in which such rate increases were agreed to were contested by different council members. The minutes record that the councilors frequently divided over whether they should pass or reject the tabled rate increases, uncertain in their responsibility to provide an affordably warm home or a home in which the tenant could be left cold.

It was during this period that the council's Housing Committee stopped using the heading "heating and hot water" services in their reports and started talking about "energy." This change in labeling was not simply a semantic switch but referred to a more profound conceptual reorganization. It connoted the home as a site of energy demand and, in doing so,

licensed central government intervention into homes; regulations on buildings were doubled, and energy efficiency programs were rolled out nationally (Mallaburn and Eyre 2014).

It was this state of crisis that meant that the PDHU had survived the end of its first 30-year supply contract and the decommissioning of its heat source. From the council's perspective, the heating network was, by the 1980s, an anachronistic materialization of an outdated social contract premised on postwar welfare ideals. However, the disaggregating logics of the property-owning democracy, which sought to individualize assets, were countered by the social value of the shared infrastructure, which had proved capable of mitigating some of the fuel price shocks. This meant that in 1983, when Battersea power station closed and PDHU lost its cogeneration heat supply, the network was not dismantled. Even though individual boilers located inside individual flats provided a stronger ontological foundation for a property-owning democracy with its household-scale sites of responsibility, the council took the option to connect more housing blocks to the network (Mackenzie 1999:26). PDHU embarked on a second 30-year contract, buying heat from a private company and entering a calmer period during which the management of energy demand slipped off the central government's agenda, replaced by the state's confidence in the market to drive resource efficiency (Mallaburn and Eyre 2014).

Living with the system today

In 2006, as PDHU's second 30-year contract was coming to its end, the policy landscape and vision for district heating were very different from both the postwar optimism in social democracy and the 1980s energy security desperation. The priority of the most recent decade has been decarbonization, and heat networks are back on the political agenda as the future of

energy efficiency and resource-rational ordering of urban space. Consequently, PDHU was able to apply for a central government grant to invest in its own generating capacity and now generate heat through its own CHP plant and sell its electricity to the national grid. Last year, PDHU generated a surplus of £250,000, which has allowed it to subsidize the rates it charges the people[3] and enabled it to provide cheaper and less carbon-intense heat. The arrangement appears to be working; a 2012 study of operational data found that under current operations, this neighborhood produces 8 percent less CO_2 emissions than it would if all the homes had individual gas boilers, as is standard in U.K. cities (Martin-Du Pan et al. 2014:10).

Through a heterotopic lens, this neighborhood can still be seen as a nonnormative space. Simply by living in this estate, residents have a carbon advantage relative to other Londoners, yet a tension appears through the municipally owned assets generating social value inside individually owned homes. A recent advertisement for a three-bedroom flat on sale in Churchill Gardens explains that the owner will have a £1,200 annual service charge, which covers not only maintenance but also the cost of heating and hot water, arguing that this is "a boon for tenants if [a] buy-to-let" investment.[4] This suggests that there continues to be value in flats that can be "rented warm" and enjoy the benefits of neighborhood-scale heat management, but it also opens the question about who extracts financial returns from pipes developed as a social good and that now produce broader benefits of lower emissions. In the advertisement, it is the private owner who is being offered the opportunity to capitalize on the provision of a warm home. This raises a new angle on the questions first faced by the council: Who has access to life inside this heated territory, and how should expenses and revenues be spread through time and space?

Such a tension is not reflected in the informal conversations I've had with residents, where heating does not typically come up as a concern. The main topics of concern about life on the estate relate to interneighborly relations and the right to live in the remaining social housing units on the estate. Some of the longer-term residents who have either remained as social tenants or who have exercised their right to buy discuss life on the estate in terms of social equity and contribution. There is a sense of injustice that their children and grandchildren have been priced out of the estate through its gradual privatization or because the limited social housing available across the borough means those most in need of emergency housing are prioritized. When I prompt people specifically about the heating, I receive a range of opinions about the system. Having lived in different parts of the estate, some have opinions about which blocks get better supplies, but mostly there's a general acceptance over how the system performs, as long as homes are warm enough and rates are low enough.

Bruno has lived on the estate since the 1990s and has more interest in the technology. When I asked him about the heating, he was aware that it was a neighborhood system. He showed me where the vertical pipe was located that took the supply up to his upstairs neighbor and gestured toward the thermal store still standing prominently in its decorative steel and glass casing. Bruno owns his flat and has covered his radiators because he does not find them very attractive, although he has not thought of changing them. Aside from the aesthetics, he evaluates the system very positively. "It's always warm at Churchill Gardens," he told me. Bruno was less certain of the economics and had the impression that those who'd bought their flats were subsidizing the heating supply for social tenants, but he went on to say that the price was not an issue for him, and he felt happy with this arrangement.

Mary is more ambivalent toward the service. She is a social tenant and has been a Churchill Gardens resident on and off her whole life. She's also lived in different parts of the estate, first with her parents, now with her own children. She comments that a couple of the radiators in her flat don't work, and haven't for years, but she hasn't complained because the flat is warm. I ask if she has additional heaters to top things up in winter, or in the morning, given that she's such an early riser, but she doesn't. "We just put on a jumper," she says with a laugh. The system provides enough warmth, and she adapts to it, knowing the steps to take to make her home warm. Both Bruno and Mary accept and support the system, making sense of it as they need to, enjoying their right to a warm home, and accepting their responsibility to pay for it, or wear more clothes if need be. The local authority is still contracted to manage heat efficiently, and the resident is still contracted to make the system work.

The difficulty of delivering on this contract from the housing provider's perspective came through in an interview with a member of the team. From his perspective, the scale of PDHU is difficult to manage, and the regular system outages disrupt a greater number of people than a faulty boiler in the home would. If a pipe is shut for maintenance, the PDHU team has to provide all homes connected to it with fan heaters. He explains that PDHU tries to make sure closures occur during the day when fewer people are home and that residents have their heating and hot water fees reimbursed for days that the system is down. However, he points out that residents still have to pay for the electricity they use in replacing the centralized heat supply during these periods. People adapt, he says; many have an oil-filled radiator in a cupboard somewhere so they don't have to use the expensive fan heaters supplied by PDHU, but adapting takes time. New tenants to the estate find it hard to understand why they have to pay heating charges through the summer when they don't have the service; for others, the lack of 24-hour

heating is a grumble. Given the challenges, I ask the housing manager if people want to leave the system and if he is receiving requests from private landlords to disconnect. His statement echoes that of his 1950s predecessor: In the two and a half years he's been on the job, he hasn't received a single request to opt out. "Why?" I ask. "There must be something there?" "Because of the cost," he replies. Simply put, PDHU supplies heat cheaply. "It's obviously cheaper to heat loads of flats than just one or two," he explains. It seems the residents still find their side of the contract acceptable and manageable.

The infrastructure creates a mass of connected lives with different expectations of the heating service, and this creates a need for a governance body. The United Kingdom is looking to learn from other European states that have developed legislative and regulatory structures to manage their widespread district heating infrastructure (cf. Hawkey and Webb 2014). In Pimlico, a residents' committee exists to negotiate with the local authority housing team and the PDHU team. One of the members explained that this group actively engages in the management of the district heating system and lobbies around issues such as when the heating supply should be switched off for summer and whether it should be switched on again if there's a particularly cold snap in spring. They also hold PDHU to account over its performance, its service rates, and the maintenance and investment charges. I learned that one of the issues they were querying was the development costs that had been added to the home owners' service charges following the construction of the new energy center in 2006. They felt that the refit had created more generating capacity than was needed in the estate and were inquiring whether Churchill Gardens residents should be expected to contribute to the capital costs of this additional capacity if the council was developing an asset to supply other areas.

The group's concern over how their fees are being spent indicates the sense that the boundaries of this heterotopia are dissolving. With CHP district heating once again being supported by government, the idea of selling heat back across the river from PDHU's energy center to the new housing being developed around the redundant albeit iconic Battersea power station is one that is being mooted (Mayor of London Office n.d.; Wandsworth Borough Council 2012). There is a possibility that their energy center will start to supply an enlarging area of customers, without bringing them into the arrangement of rights and responsibilities that function within the current boundaries.

The lens of heterotopia helps to identify the source of these concerns by showing the neighborhood relations that can be obscured by technoeconomic studies of energy demand embedded in a particular scale and form of agency through theories of rational choice and methodological individualism (Wallenborn and Wilhite 2014). When looking into the mirror provided by Churchill Gardens, we are able to see that homes heated through this neighborhood resource depend not just on a technical network of storage and distribution infrastructure but also on socioeconomic relationships that are able to buffer changes in resource availability and on conceptions of the right to a warm home and the fair distribution of costs and benefits.

Conclusions

In 1956, when the engineering community was reviewing the first few years' operation of the "Pimlico pilot plant," one commented that the experiment had "a value which could not be expressed in terms of money; it demonstrated the feasibility of heat-electric operation for district heating purposes" (Noddings et al. 1956:339-40). In this article, I have tried to show how these calculations of feasibility created a heterotopia by conceptually linking social and

technical elements across shifting temporal and spatial scales. Foucault's essay encourages us to think of heterotopias as real places in which an alternative to the hegemony is possible. This is a question that opens up an avenue of anthropological engagement in the forms of energy consumption and social value that are enabled through sociotechnical arrangements as utopian visions are constructed in real cities.

In this article, I have drawn on two key insights from Foucault's series of thoughts on the concept: first, the idea of heterotopia as a collection of elements that are classified by their spatial relationship, and second, that these sites gain meaning by being imagined as different to the norm. To critically apply this lens, I've followed Foucault's suggestion of carrying out systemic description and identifying how connected elements are classified and valued. This has helped show how the home became the site of energy consumption as the need to store and generate energy was off-sited to the neighborhood. These sites were linked not only by pipework but also through social relationships created within this site, which were marked through roles and responsibilities and established through calculations of feasibility. They were linked through technoeconomic interventions, such as meters that provide information on heat circulation but also purge the system of the messy reality of operations on the other side of the meter. They were also linked through social intervention—reimagining the British occupant as prepared to pay for standards of comfort and willing to adapt to the system and make it work. Through this process of establishing connected categories, it is possible to trace a form of social contract premised on the idea that this site could be an energy-rationalized space in which the council committed to responsible management of heat in a fuel- and cost-efficient way as the resident agreed to be a tenant in this site. It has also been possible to show the continuation of this contract into the present day.

The second critically useful element of heterotopias, that they gain meaning through their opposition to other spaces, helps in understanding historical change as policy landscapes and normative arrangements change. Churchill Gardens and its heating network were marked out by the engineering profession in the 1940s and 1950s as a different type of space, with a technology-enabled standard of comfort for the average urban home. The ability to background heat as a characteristic of the home in this neighborhood has been achieved, and today it is experienced by residents as nothing out of the ordinary but rather simply part of how they keep their homes warm. By continuing to mark out this site as a different type of space, I have suggested that it possible to see the contours of this energy-oriented social contract in contrast to the broader normative arrangements in the United Kingdom. This can be a way to understand the contemporary dynamics as the United Kingdom begins a new round of creating heterotopias of green, affordable heat. This lens helps us raise questions about the shared responsibility to generate social value for the city, the socioeconomic ability to access these spaces, and which interests are licensed to generate value from its development.

Notes

1 Westminster City Council is the local authority for Westminster City, which is one of London's 32 boroughs. Pimlico is a neighborhood in Westminster City, London.

2 The first documented example of district heating was a system in Lockport, New York, in 1877, and European schemes in operation in the first decades of the twentieth century included one in Manchester in the United Kingdom, one in Dresden, and one in Warsaw (Heating and Ventilating Research Association 1967). The U.K. engineers discussing the Pimlico scheme for Churchill Gardens mention systems in Russia, Germany, and the United States as examples and

specifically acknowledge technical guidance offered by their American counterparts (Egerton 1943).

3 Information provided by CityWest Homes.

4 The advertisement appears on the website of CityWest Residential, the property-selling arm of the management organization running Churchill Gardens Estate for the Westminster City Council: http://www.cwhr.co.uk/property-for-sale/3-bedroom-apartment-for-sale/churchill-gardens-estate-sw1v/722.

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