

## **Chapter Nine**

### **District heating in Belgrade: the politics of provision**

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#### **Introduction**

The evolution of Milorad Branković<sup>1</sup>'s central heating system is a good place to start thinking about the politics that are created through urban energy infrastructure. In 2011, at the time of research, heating was an issue in Belgrade. The government had identified electric heating as a source of waste and pollution and aimed to switch people on to the city heating network, Milorad's neighbourhood had been identified as an area for new connection. Milorad is an entrepreneur in his late thirties who runs his business out of the relatively large Belgrade town house that his great grandfather built in 1928. At the time of construction, the area was on the edge of Belgrade and served by the electricity grid, but heating was an individual's affair. Milorad's house had been built with a wood-fuelled boiler in the basement, which provided the house with central heating. This system was no longer functioning. Milorad's great-grandmother had dismantled it in 1941 at the time of the German the occupation of Belgrade, as a tactic to make the house less attractive to the occupying forces. The strategy did not work, 'so we got our German officer who was living right here, in this room and that one', Milorad said, gesturing to the office in which we were sitting and the neighbouring room which housed the top-range printing machines that were the basis of his current successful business. The central heating system had never been restored, because, with the Communist Party taking power, his family's fortunes changed. '[A]fter the war, my great-grandfather was an enemy of the state and we didn't have money. It's as simple as that', explained Milorad. Despite the shift in fortunes of his bourgeois family, they had managed to keep ownership of their home and today, in addition to Milorad's printing firm, two branches

of his extended family were housed in apartments above. Now they heat the house with electricity and use individual radiators to heat the rooms as required.

Central heating can create a domestic environment that differentiates between social groups, as Milorad's great grandmother was aware. In the early 20<sup>th</sup> century, it signified membership of an affluent elite which did not have to stoke open fires to keep warm. By the middle of the century, with the rise of mass consumerism, this form of technology-enabled comfort was within the reach of a much wider population.

Shove's (2003) work on comfort has shown that managing heat in the home cannot be interpreted as purely a matter of individual taste and rising affluence. It is driven by much broader dynamics including medical understandings of human physiology and technical innovations in managing internal environments, both of which contribute to normative understandings of what conditions a home should provide. With optimum internal conditions defined, the market can both create and meet demand for these conditions. Shove points to the gradual international harmonisation of indoor living conditions around 22°C as evidence of how standardised needs are socially created and met.

Under the socialist system, the uptake of central heating was driven not by the market, but by the state. Central heating was recognised as a living standard that a modern industrial society should be able to provide for its urban citizens. In common with other socialist states, Yugoslavia<sup>2</sup> invested in large-scale district heating systems in its cities in order to optimise efficient resource distribution through centrally planned urban development and produce modern, healthy homes for the labour force (The Heating and Ventilating Research Association, 1967). These networks of pipes and pumps delivered heat generated at power plants into the central heating systems of the city's buildings. The networks were overtly political, as they were used to promote socialism's ability to provide comfortable living conditions, and to reward certain groups through allocation of the flats built on the system.

They have been described by critics as ‘implementation tool[s] for the political ideologies and development policies of communist states’ (Poputoaia and Bouzarovski, 2010: 3820). As the heating network extended through Belgrade, it created a territory in which specific roles and responsibilities were created, casting the city as provider and its residents as beneficiaries of the socialist political economy. Access to these standardised domestic environments was secured through people’s connections with the socialist state and their contribution to the socialist economy. Those falling foul of it, such as Milorad’s family, were less able to achieve these conditions. However, for those within the network, the municipal technology shaped social practices and created norms of sharing and of negotiating personal comfort within a wider social group.

These values and practises are being exposed today, as the district heating system is subject to upgrades and reforms. District heating is again being pursued as the optimal way to manage urban energy (Connolly et al., 2014), recognised as a low carbon way to heat city homes (Lund et al., 2014). Achieving this vision in Belgrade means retrofitting capitalist relations into the socialist designed systems, which challenges the previous political logics of distribution, changes the roles and responsibilities of actors within the system and unsettles the values and practices of residents.

The aim of this chapter is to understand these politics and to show how they affect the way heating happens in Belgrade today. To do this, I bring together two areas of research: science and technology studies’ (STS) critiques of neoliberal reform of infrastructure and practice theory approaches to energy and comfort. The first body of literature helps understand how urban infrastructures create institutional forms and social differentiation by analysing technical arrangements and the relationships of scale, ownership and power they create (Graham and Marvin, 2001; Gandy, 2004; Bouzarovski, 2010). The second body of literature focuses on the lived experiences of these infrastructural arrangements and in

particular how habits and social values form part of these systems (Lutzenhiser, 1993; Shove, 2003; Shove, Walker and Brown, 2014). In this chapter, I make use of both strategies to analyse how Belgrade's district heating network created a set of social values and institutional forms which continue to be experienced in the home. I then use this framework to show how the proposed technical upgrade and economic liberalisation of the heating infrastructure is creating new roles and social relations. I conclude that the proposed reform involves creating new scales of responsibility and new categories of financial risk, which undermine the ability to mobilise social and infrastructural relations to improve the efficiency of the system.

### **Shaping institutions and practices through territory and technology**

Belgrade's district heating system is intimately tied to the development of Yugoslav socialism and the city's fluctuating fortunes as the capital first of the Yugoslav federation of socialist states, and then of Serbia. In the early days of Yugoslav socialism, Belgrade's development served a number of key symbolic purposes from promoting socialist economic progress, to accommodating the different nations of the federation. Belgrade needed housing urgently after the war, and the mass housing projects of the 1960s and 1970s not only fulfilled this need, but were used to demonstrate the high standard of living that the socialist political economy provided for its citizens and the rewards it offered to loyal socialist citizens and workers who were allocated the right to use them (Blagojević, 2007; Kulić, 2014). Heating infrastructure was part of this demonstration, since central heating indicated a high standard of convenient and comfortable modern urban living (Johnson, 2018).

District heating was the modern and efficient way to provide such a standard at scale. On the tabula rasa sites of new socialist housing developments, heating plants were sized and built to pump heat into the planned homes. These homes were spaces that needed to be kept

above a certain temperature for certain times of the day and certain parts of the year. When temperatures fell, the heating was switched on and stayed on until spring. Heating pipes ran vertically through apartments linking bedroom to bedroom and sitting room to sitting room as they rose up through the building. Flats on these networks did not have individual controls and residents could not control the amount of heat from their radiators, nor when they came on or went off during the day or the year. There was no space for individual preferences. Instead, the occupant's notional role was to labour for the socialist economy by day and enjoy the cosy rewards of this economic development by night. The heating infrastructure created and reproduced standardised interpretations of health, comfort and modernity, materially linking residents to their neighbours, their city and their state in these terms.

At first, this style of living was provided in new neighbourhoods on the edge of the city, where district heating systems could be built to supply new housing. 1970 marked a conceptual reorganisation of Belgrade's heating with the foundation of a 'workers' heating utility, Beogradske Elektrane. This brought all shared heating systems including individual small-scale coal and heavy oil boilers used in older apartment blocks under the same management, conceptually linked, although physically separate systems and technologies. The city boundaries were changed to give the municipality control over a nearby coal field. Belgraders thus had their own fuel source and large scale networks could extend through the city channelling heat from thermal plants into both new and existing housing. Such re-organisation followed broader political reforms in Yugoslavia at the time, which increased state control over development and supported Yugoslavia's form of self-management by creating governance structures that could integrate local supply with local demand (Estrin, 1991: 189). Guided by a principal of self-management of resources, the municipal firm was responsible for delivering equal services to the people of Belgrade and for providing 'comfortable' conditions indoors regardless of such fluctuating externalities as the weather or

the price and availability of different types of fuel. Through the 1980s the network extended into older pre-socialist neighbourhoods, removing polluting oil boilers and coal fires from existing housing and integrating them into the network.

The 1990s marked another conceptual shift. With the end of socialist Yugoslavia, Beogradske Elektrane stopped being a workers' organisation and instead became a public utility company (*javno kumunalno preduzeće*). It now began to reconsider its service as something that needed to pay for itself, rather than something that was provided by the state as a universal standard of living. Nonetheless, the new firm's aim was 'not to maximise profits, but to deliver thermal energy to the city's population and economy' argues a book produced by the utility celebrating its 45 year history (JKP Beogradske Elektrane, 2010, p. 77)<sup>3</sup>. This decade of war and sanctions not only produced internal challenges to the logic of heating provision, but external ones, too. Coward (2009) has argued that the bombing of Belgrade explicitly targeted urban infrastructure in order to make life unliveable, disrupt the social contract and undermine the government's support. Making Belgrade go cold was a way of demonstrating military power.

The end of the Milošević regime in 2001 saw Serbia re-join international energy and finance markets, a move which has seen a new form of infrastructural politics of development loans and liberalisation. The system faces major problems with old pipework, outdated generating facilities, badly maintained pumping stations, and a lack of end-user controls. The firm is targeting these issues through a modernisation programme aided by loans and international consultants (JKP Beogradske Elektrane, 2010: 112).

The firm currently services 40% of the city's households, but is continuing to expand. Pipes are now being extended into the oldest parts of the city through neighbourhoods like Milorad's under a mandate to reduce the highly polluting electricity being used to heat homes. Milorad's household was offered the option to connect, but he has been emphatically

against it. The district heating utility is still owned by the city and he was sceptical of the company's role in maintaining socialist-era patronage and dependencies. Not only that, his house is above the maximum distance from the nearest substation and in order to connect he would have had to pay for a new one to be put in his basement. This was not something he would consider: 'I really can't understand why I should give 20,000 euros for a pipe this big. And to give one room in the basement for something that they need. ... Because by the contract that you are making with them, it's their room in your house! I don't want to do that. I really don't. It's my house.'

In his account, installing a heating substation seems an imposition almost like the billeting of an enemy officer. It allows a discredited municipal body to take up residence in his home and extort money. In his eyes, the network extension is simply the municipal firm's strategy to trap more and more residents into paying for a bloated and leaky state organ. For Milorad, the district heating system still connotes a socialist middle class which is 'well connected' and which earns these privileges by allowing the state into its private sphere. Others, who supported or directly benefitted from the socialist political economy, view the infrastructure differently.

### **Shared heating and shared practices**

In Belgrade, flats are advertised according to their radiator types and fuel sources. Those connected to the city's district heating system are currently able to earn a premium on the rental market. This suggests the system still appeals. Jana, a professional in her late forties, lives in a flat built in the mid 1970s that had been allocated to her husband's family. It's connected to the city heating which she likes because it removes the inconvenience of dealing with solid fuel boilers. She explained, 'it's much more satisfactory because there aren't stable

market conditions. One year it's better to heat with electricity and the next year wood and the third on coal, but you can't change your boiler every year to electricity, coal, wood.'

Her comment captures the difference between those whose homes fall within the 'heated territory' of the city and benefit from standardised provision and those who have to work harder to keep their own home warm and are more exposed market fluctuations. Such awareness also comes through in a conversation with Ognjen, a pensioner in his seventies, who lives in a 1930s building which predates the socialist era. Close to Milorad's neighbourhood, the building's residents also had the option to connect and Ognjen explained why opting in had been a good option for him. The new central heating replaced his electric storage heaters and now he no longer had to choose which parts of his flat to heat or wait for the cheaper electricity tariff. With the city heating, he said, 'we don't think at all about... whether it will heat there or not.' Being connected to the system is an acceptance of the state's role in managing resource distribution and in Ognjen's account suggests a continuation of a socialist vision of abundance; the completion of a work in progress that had been abandoned in the 1990s, leaving many on the waiting list for a lifestyle they had been contributing to through their role as socialist citizens. For both Jana and Ognjen, the standardised system mitigates market uncertainty and maintains consumer comfort. For others, this standardisation is problematic. It is an ideal type that is confounded in reality by things like pipes breaking down, conditions in apartments varying as they're exposed to northerly winds or south-facing warmth and the differences in people's tastes and perceptions of comfort.

In this context, a malfunctioning radiator symbolises different kinds of failure. For some, it represents an anachronistic remnant of the misplaced socialist faith in progress which has shackled the present administration to a legacy of unachievable ideals and unrecoverable expenses. For others, however, it is evidence of the state reneging on its



contract to provide the population with the basic standards of a 'normal' standard of living. The unreachable ideal of universal provision is such that diverse strategies are privately employed to alter the home environment. For example, larger radiators are added to the pipes to boost heat levels or additional technologies are used to extend heating beyond the prescribed periods. These additions turn the system into a site of ongoing negotiation organised around the goal of maintaining a reliably heated home. These are not just technical negotiations about how comfortable conditions might be achieved, they also involve conceptions of civic duties and responsibilities. The two pipe system means that individual flats cannot be cut off for non-payment and therefore the decision to pay reflects a household's evaluation of the service provided and of the wider state of the political economy. For example, when I asked one public sector employee whether she paid her bills regularly, she replied that when the state does not enable her to earn a living wage, she does not pay the state either.

The infrastructure also situates residents in relation to one another. Alterations made to the system can disrupt the supply to other residents' homes and such interventions are interpreted as being unfair and un-civic-minded. Conversations with residents who had altered parts of the network in their homes revealed this awareness. Irena, a journalist in her fifties, had recently added thermostatic valves to her radiators to adjust the heat they emitted. She found her flat too hot and as a sufferer of emphysema it was particularly problematic. She used defensive language about having altered the system in her home, aware that altering the system in one's own flat has a knock on effect for others connected to the system. She explained that a Beogradske Elektrane engineer had come to investigate a major problem with the whole building's supply pipe and while he had been working in the building, Irena had asked him for help:

'They sent someone really responsible from the service, who understood my problem and who wanted to help. He said, 'ok that is something that you have to

pay yourself. That is not included in our service.’ And I’m sure he didn’t lie to me. ... [H]e has put three valves in three radiators here. And I am very grateful for that. .... If it is too hot we turn it down. ...[H]e did it... and we paid for it.’

Irena felt the need to justify both his and her actions: ‘First of all it was strictly out of his working hours. Strictly, that’s something that he told me that I should be aware [of]. ... My logic was that he’s the guy that has been working at that place for thirty years. He’s responsible and he knows how to do things. Why should I go and look for some person I cannot trust at all instead of asking this guy to be kind enough to do me a favour?’

Irena’s account indicates the relationships created through the infrastructure that link her domestic space to the city and state; as described, this situation creates a tension between her role as citizen within a system and as occupant with individual tastes and requirements. She recognises the infrastructure in her private sphere as belonging to a broader system that requires both users and suppliers to play fair in order to make it work. In adding controls, she is going beyond the normal role of a citizen and feels that it is her responsibility to pay for the valves and the labour to install them. But she is also concerned that through this private investment, she does not damage the broader system: it is in these terms that she justifies her use of a moonlighting state employee to help create conditions that she will find comfortable within her own home. Because of his experience, he can be trusted to make sure that the wider system continues to distribute heat equally and to perpetuate the equality of the service.

Irena uses a framework of trustworthiness and responsibility to work within the system, distinguishing between those who do and don’t play fair. Earlier in our interview she had been sceptical about the previous socialist state and was very cynical about the subsequent administrations, which she felt continued to be corrupt and ineffective. Even so, she was committed to the universalist principle of the heating system and accepted that there was a collective need to manage resources and protect social equity. This is not unique: ethnographic studies of post-socialist life have shown how the social values of previous

regimes remain engrained in the habits and materialities of everyday life. Alexander (2007) and Humphrey (2007) have demonstrated the disconcerting experience people have as they negotiate their roles as citizens in a new political economy equipped with established infrastructure and its associated practices and values. Residents experienced a sense of ‘social upheaval’ or ‘moral loss’ at the removal of standardised provision when services were privatised or manipulated by political elites (Humphrey, 2003: 92). However, Irena’s experience brings a new aspect to this; she is intervening in the infrastructure to get the kind of service she wants, but in way that aligns with her interpretation of the values embedded in that system. Given the new technology that now exists to control heating in her home, she is investing her own resources to ‘upgrade’ the standardised equipment. By opting to put in thermostatic radiator valves rather than leave her windows open to let the heat out, she is not only acting according to her understanding of the moral economy of the heating system, but also in a way that aligns with policy recommendations to improve the efficiency of the system (see OECD/IEA, 2004).

Research into the problems of post-socialist cities’ district heating identify overheating and limited control over the amount of heat used in the home as two sources of system inefficiency. They also identify the difficulties of mobilising the capital needed to add controls and improve performance (Rezessy et al., 2006). Technical appraisals call for the utility to be liberalised, unbundled and privatised to overcome these difficulties. These calls follow the broader trend apparent in the management of urban infrastructure, which has seen a shift from social welfare models of service provision paid through rates to a liberal model of prices charged per unit consumed. This shift is accompanied by the ‘unbundling’ of publically-owned and vertically-integrated utilities into separate generation, distribution and customer-facing activities which can be privatised. Graham and Marvin (2001) describe this shift as replacing ‘the modern infrastructural ideal’ with a splintered urbanism which forgoes

the ideal of universal provision. This is key feature in post-socialist economic reforms, particularly in energy infrastructure (Bouzarovski, 2010). Reforms rework the social and material characteristics of the network and open up what Collier (2012) has called a ‘problem space’ in which explicit debates over technical and economic improvements contain implicit assumptions about the forms of social relationships and institutions that should exist. This ‘problem space’ is explored in the following section.

### **Liberalisation: creating autonomy and locating risk**

Arguments in favour of liberalising Belgrade’s district heating system and replacing state distribution with the market highlight problems with the present system. Firstly, Belgrade’s district heating system is extensive and loses large amounts of energy through its distribution network. Secondly, it relies on expensive imported natural gas or highly polluting heavy fuel oil and coal, raising environmental concerns about the carbon intensity of the heat supplied and economic concerns about the burden it places on state and municipal budgets (Karam and Palmreuther, 2012). Thirdly, high-quality fuels are used in heat-only boilers: a more efficient strategy would be to use these fuels for electricity production or other industrial processes and use the low-grade heat produced as by-product to heat homes (Karam and Palmreuther, 2012; UNDP, 2004). Finally, the present system sends heat out according to predetermined criteria such as the external temperature and floor space, charging a flat rate for this, rather than supplying the amount of heat wanted by the residents and charging them for what they consume (Kavgic et al., 2012). This flat rate is subsidised by the city and therefore perpetuates the inequality created through the socialist housing allocation system, which rewarded the middle class which continues to benefit from living in these higher quality and warmer buildings. The UNDP have argued that subsidised ‘district heating services and maintenance [can be interpreted as] rent on accumulated social capital’ (UNDP, 2004: 76).

Whereas under socialism the district heating system was a standard to which society was progressing, now it is seen by some as a mistargeted subsidy that has been hijacked by the middle class and an inefficient waste of resources which is indebting both the city and its citizens.

As a result of these problems, reforming the district heating system is a priority for the city (City of Belgrade, 2008). Although the difficulties listed above are located in different parts of the system, one over-riding theme is the need to liberalise the service and charge consumers the market cost of the thermal energy they consume. Just as the heating utility's history book described the consolidation of territory and technologies to provide a standardised service, these arguments for reform rest on the shared belief that this territory must be broken up through metering technology in order to expose the 'real' amount of energy being used in different parts of the system and identify who should take responsibility for the cost and efficient management of the heat.

The first step, as advised in the technical literature, is to split the heating system into two types of networks: a primary one which connects power stations, generating plants and substations through city pipes and secondary ones which run between substations and residential blocks or small groups of buildings (Euroheat and Power, 2011; OECD/IEA, 2004). This allows for two areas of improvements to be made: more efficient generation in the primary network from new, low carbon heat generating technologies and more efficient use of heat within homes.

These primary and secondary pipe networks exist, but heat has historically flowed unmonitored between them. Meters are therefore needed to create a boundary between these parts of the system by producing data on how much heat is being sent to and from substations. In creating this data, meters help delineate a jurisdiction in which residents can become active subjects of the new system and take control of their heat consumption at

home. To date, residents have been recipients of heat with a limited ability to influence the amount they use. The system needs to enable residents' agency to turn them into active heat consumers. This is done by replacing the rates system of billing with a two-tier tariff system composed of fixed and flexible costs. The fixed costs refer to the capital sunk into the network in the form of pipes, energy plants, control room technologies and staff who manage the production and distribution of the heat. The flexible costs relate to the energy used. These costs are flexible because the price of fuel fluctuates, but also because the amount of heating fluctuates in response to such unpredictable variables such as residents' preferences and the weather. These flexible costs are the ones that the residents notionally have the ability to control. This seemingly benign admission of the state of uncertainty within an energy network simultaneously situates the problem as one that is located in the secondary network. This means the financial challenge of managing fluctuating fuel prices and demand can be shifted down the pipes out of the city-utility's jurisdiction and into homes. The logic is that flexible costs can be passed on to the 'consumer', because this new subject has the power to alter them.

This image of the active consumer exists in energy efficiency policies, but actually achieving this subject position is technically problematic. Firstly, due to the lack of radiator valves, many residents do not have the ability to reduce the amount of heat that comes into their home. They would need to add the valves if they wanted to do this. Secondly, due to the pipe layout which links radiators vertically between flats rather than horizontally within them, it is not possible to know how much heat is being consumed within any one home. To find out how much heat an individual household is using, all residents need to fit heat cost allocators on each radiator to sense the amount of heat being emitted, then, the total amount of metered energy entering the building can be attributed proportionally to each radiator, giving an idea of how much each flat has used. Thirdly, it is hard to know exactly why

residents are consuming the amount of heat they are. If one building uses a lot of heat, this could be because the residents are keeping their flats at very high temperatures, or because the building is poorly insulated or the central heating systems are poorly installed or badly maintained. It is therefore not clear how residents can manage their energy consumption while maintaining a warm home. And there is a final difficulty which remains: for residents to turn their homes into these bounded sites of individual consumption within the network, they will have to invest collectively in the infrastructure itself, buying heat cost allocators to know how much of the substation's heat is being emitted by their own radiators. The investments needed to individualise consumption are framed as vehicles for releasing consumer sovereignty and the promise is that the costs involved will be recouped through reduced energy bills (Živković, Todorović and Vasiljević, 2006; Fankhauser and Tepic, 2007). If this is to happen, residents will have to work together to manage their shared thermal energy and invest in the infrastructure.

In addition to the technical issues that undermine this re-scaling and reallocation of responsibility, there is another reason why this is a problematic proposition. It is based on the idea that people's primary motivation will be financial. However, as we have seen above, what people do reflects different interpretations of comfort as well as of their responsibility towards the system as a whole and the impact of their actions on their family, their neighbours, the city or the state. In fact, a field trial of meters and radiators valves found that those who had the capacity to adjust their heating did so despite having no economic incentive. Monitored over two winters, Belgraders in two 'test' buildings used between 10.5% and 15% less heat, despite being charged the same flat rate (Živković, Todorović and Vasiljević, 2006: 81). Other studies have had similar results – for example, a study of communal energy use in the US found that 'even where lack of concern for energy use is endemic, cultural practice and collective restraint can produce both highly variegated and

lower-than-expected consumption levels among households who, by economic reasoning, might be considered likely to exploit common property resources' (Lutzenhiser, 1993: 258). However, an upgrading programme that relies on cultural practice and collective restraint defies the logic of the current infrastructural politics which only recognises privatisation and individualisation as the route to system upgrade.

The liberalisation of Belgrade's heating system depends on turning the home into a bounded site of energy consumption and financial responsibility. This involves positioning anxieties about rising fuel costs within the domestic sphere and at the same time supposing that households have the ability to control their consumption. It prioritises the ability of an individual to act on his/her own consumption, rather than attempting to achieve system level gains through a collective response. Although the plans for improving the efficiency of the heating system involve a reworking of relationships between citizen and municipality and reconceiving the processes through which heat is consumed, these plans clash with the material arrangements and values embedded in the existing system.

At the time of research (2010-11), Serbia's second largest city Novi Sad was progressing further towards the liberalisation of its heating firm. This generated press coverage of the new metering system being implemented. One article discussed the cost of installing meters, saying that it would amount to 50 euros per radiator. This provoked a flow of comments, two of which illustrate different perspectives on this topic. 'The meters need to be introduced urgently. Why do we pay for heating according to an apartment's floor space? Where else still has that?. ... I will switch off the radiator when I don't need it ... and I will not pay for heating I haven't used. ... Is there anything fairer than a man paying for what he's used? I don't think there is.' This reader's comment reveals his frustration with the wastefulness of the municipal system and his outrage at having to cover the cost of this wastefulness. However, another reader presents a different perspective: '[W]hy would I pay



50 euros for that meter and finance the heating firm? The ultimate hypocrisy is that the firm says that they will ‘meet the citizens halfway’ and the citizens can buy those devices on credit. That sounds like our public enterprise, i.e. the state, making loans... [t]o buy and install the meters, so that the firm can then be sold off more easily’ (Petrović, 2010). In this account, heating is a social asset which should be protected. Instead, the state is attempting to use the creditworthiness of its citizens to upgrade the network in preparation for privatisation. In this interpretation, heat generation and distribution assets are being separated from the home, which becomes a disconnected space of financial risk, rather than a reliably warm dwelling.

These comments exemplify some of the themes discussed in this chapter, including scepticism towards the motivations of those in power, anxiety about the market encroaching into areas that should be protected and a sense that daily life is affected as infrastructure and its managers reshape related roles and responsibilities. The debate suggests that people have a sense of the political value of warmth in the home. For some, a warm home ensures health benefits and the luxury of not engaging with the market; for others it means wasteful oversupply and limited consumer sovereignty. The reforms, driven by a different interpretation of the kinds of relationships that should be created, and of the infrastructural changes involved (more metering), do not capitalise on this sense of participation and responsibility towards the heating network.

## **Conclusion**

This analysis of Belgrade’s district heating has demonstrated how the system has shaped social norms and affected practices over time. It created a heated territory based on normative values about residents’ rights and responsibilities and the sort of conditions the state should provide. When framed in these terms, warmth in the home came to be associated with

politics, both the everyday politics of connections between neighbours and the formal politics of the state. The conversations I had with residents whose buildings were connected to the network revealed a range of responses to the politics surrounding and created through this infrastructure. They discussed private strategies employed to improve the warmth of the flat, using electric heaters to top up the heating or adding thermostatic valves to reduce the warmth. Some hankered for a more straightforward 'consumer' role and were frustrated by the wastefulness of the system. Others accepted the porosity of the border between their domestic sphere and the shared spaces and systems of the building, arguing neighbours had to collectively contribute to the upkeep of these shared systems in order to benefit from them.

Reforms have the potential to produce technical, financial and legal boundaries between residents and provide them with limited control over their domestic space, but these boundaries will also weaken residents' connection with broader issues that govern the price and reliability of home heating. I have suggested that concerns with these issues remain and that the political value of warmth is still attached to the design and operation of the technical system, and understood by residents. District heating connotes an idealised standard of living that the state should be able to provide, but the reality of living with these systems reveals the difficulty of achieving this ideal. In response, some argue for continued participation and for actively working towards this goal, others feel exposed to abuse and exploitation and would prefer a different way to achieve warmth in the home. Within these debates, the radiator valve has a central role: it is rhetorically constructed as the instrument through which to produce material and social arrangements of the kind that are in demand in Belgrade today. Residents are eager to be rid of political corruption and to sever links with neighbours who do not play fair, but despite its technical promise, the valve fails to produce these purified forms and is persistently undermined by an obdurate material network of pipes.

I have developed this argument by looking at how power relations flow through the socio-technical assemblage that makes up Belgrade's district heating system. I have also paid attention to how people respond to the technologies of home heating. This has helped me articulate the values that are inscribed in the system and describe how practices of keeping warm are interpreted. Bringing these two aspects together highlights the tension that appears when technical upgrades and economic reforms clash with existing social relationships supported by an established heating infrastructure. These tensions define the 'problem space' created by the liberalisation of the system. I have argued that assumptions associated with this project constrain opportunities for improving the system's efficiency by promoting individual agency over and against the collective action that is required to manage heat consumption and reduce demand. I have also noted that proposed solutions do not align with the materiality of the existing network nor with the social practices this materiality supports and that it is not obvious that new understandings of scale, individualism and agency can be retrofitted at will.

## Notes

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<sup>1</sup> Pseudonyms are used for all interlocutors.

<sup>2</sup> Belgrade was the capital of the socialist Federal Republic of Yugoslavia from 1945 and has been the capital of Serbia since the end of Yugoslavia in the 1990s.

<sup>3</sup> All translations are mine.

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Replace the first three sentences with:

Heating is an issue in Belgrade. In 2011, at the time of research, the government had identified electric heating as a source of waste and pollution and aimed to switch people on to the city heating network. This presented not just a technical issue, but also a political one, as the evolution of Milorad Branković's central heating system shows.