



TRAVELING TECHNOLOGIES: Infrastructure, Ethical Regimes, and the Materiality of Politics in South Africa

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In July 2011, in the midst of a particularly cold South African winter, a violent protest occurred in Chiawelo, a poor area of Soweto. For hours, hundreds of residents blocked one of Soweto's main thoroughfares and protested outside local government offices, in the process igniting a car and burning down the houses of two local councilors. Like the many so-called service delivery protests that have been making regular headline news in South Africa in recent years, the protest in Chiawelo bore an uncanny resemblance to the scenes of spectacular violence in the townships during the 1980s. In an apparent effort to dispel such uncomfortable associations, government and African National Congress (ANC) officials were quick to condemn the protests as "acts of anarchy" by "mobs" and "rogue elements." Meanwhile, the media, scrambling to understand what was going on, had identified the cause of the protest as a set of prepaid meters that had recently been installed by the electricity parastatal Eskom. The meters had automatically cut residents off from electricity service, leaving them cold and in the dark.

This was not the first time that prepaid meters emerged as protagonists in large-scale protests. Over the past 15 years, such protests have occurred at regular intervals. During my fieldwork in Soweto and Johannesburg, I had often seen the meters—pulled out from walls and backyards and dropped at the gates of local government offices—take center stage at demonstrations. A prepaid meter is a small technical device that, apart from measuring networked services such as electricity or water, automatically disconnects users in cases of nonpayment. In

order to access services, users have to purchase and load up credit tokens in advance either by entering a numerical code or by using a magnetic key or card. In the past two decades, and in a context of neoliberal reforms prescribing “cost recovery” on the one hand, and widespread nonpayment of service charges on the other, prepaid meters have become ubiquitous in South Africa. Simultaneously, South Africa has emerged as an industry leader in the development and innovation of prepayment technology and is also a primary exporter of the meters.¹ While prepaid meters have increasingly also been installed in middle-class homes, where they are often preferred to untrustworthy municipal bills, for now, the meters are primarily deployed in poorer, historically black townships and informal settlements. Beyond the now-standard prepaid cell phones, most residents in places like Soweto are now connected to electricity and water via prepayment devices. “Living prepaid” with an always-precarious connection to flows of water or electricity has thus become an increasingly normalized condition.

And yet, at the same time, many residents in Soweto and other urban areas have bypassed their meters, rendering the meters useless and giving residents de facto free water or electricity. As a result, there is an ongoing low-intensity battle between residents tinkering with the technology and utility officials trying to secure it. This article tracks this technical micro-politics involving residents, engineers, and utility officials in a seemingly perennial struggle over the enforcement and evasion of payment. I argue that this politics does not take conventional political forms of public demonstration, disagreement, or deliberation, but takes shape at the level and in the language of technology itself. Here, questions that were central to the liberation struggle—about the limits, entitlements, and obligations of citizenship—are transduced to novel forms, media, and idioms.² In this context, technologies and infrastructures are not merely *symbols* or *tools* for political expression; rather, technology itself becomes a *political terrain* for the negotiation of moral-political questions that were at the heart of the anti-apartheid struggle and that continue to animate the forms of life left in apartheid’s wake.

Building upon recent work in science studies, political theory, and anthropology, this article takes the contemporary conflicts surrounding prepayment as a starting point for a broader reflection on the relationship between ethics, politics, and technics. Through a genealogical exploration of the travels of the meter on the one hand, and an ethnographic account of the contemporary metering industry in South Africa on the other, I chart the political life of the meter as it is deployed within a diversity of ethical regimes and techno-political assemblages.

A TRAVELING TECHNO-POLITICS

In following the travels of a small technical device and the ethico-political worlds it is shaped by and that it in turn helps shape, I contribute to an emergent anthropological engagement with infrastructure. Rather than neutral means to more substantive ends, this scholarship has foregrounded infrastructures as central to the multiple constitutions of modernity—fashioning socialities, subjectivities, and affective capacities (Larkin 2008; see also Anand 2012; Chalfin 2010; Collier 2011; Elyachar 2012; Kockelman 2010; Mains 2012; von Schnitzler 2008). Specifically, my concern in what follows will be to trace how technical devices are assembled and re-assembled in relation to particular ethical regimes and political projects.³ I examine how in their very design, such technologies are scripted with, and come to reflect, specific ethico-political projects, targets, and expectations (Redfield 2012). If, as Brian Larkin (2008) suggests, technologies are always “unstable objects,” my focus in the following will be on understanding the semiotic-material *work* through which technologies come to inhabit new contexts. I combine what Susan Leigh Star (1999) termed the “ethnography of infrastructure” with a genealogical investigation of the “travels” of technologies across time and space. Such an approach, I suggest, opens up conceptual and methodological space for an exploration of *forms* of the political outside its conventional locations and mediations, whilst focusing our attention on the specific ways in which the technical is always already mobilized within specific ethico-political conjunctures.

While social studies of technology have opened up conceptual space for a rethinking of technology in less deterministic terms, particularly in the focus on the vernacular uses of technology, such approaches have often been less interested in extending these insights to theorizations of the political.⁴ Conversely, political theory has often paid little attention to the material, embodied, or affective grounds of political action; indeed, the political has often been defined by its location in a public realm unconstrained by the “urgency of the life process” (Arendt 1990:60).⁵ By contrast, recent scholarship has urged a rethinking of liberal-secular accounts of the political, exploring more affective, embodied forms of political subjectivity and focusing on new locations of ethical and political formations that are often below the threshold of visibility of normative conceptions of political action (Connolly 2002; Hirschkind 2001; Mahmood 2005). Similarly, scholars have pointed to the importance of materiality in the constitution of political actors and of political engagement (Barry 2001; Bennett 2010; Mitchell 2011; Whatmore and Braun 2009).

As Partha Chatterjee (2004, 2011) has suggested, such a rethinking of normative liberal accounts of the political is particularly important in postcolonial contexts in which formal political channels shaped by the colonial legacy are inaccessible to large sections of the population, such as slum dwellers, the informally employed, or the indigenous. Here, political questions are often contested via ostensibly apolitical *administrative* connections to the state, such as the provision of land, housing, or basic services. In such contexts, Chatterjee contends, the political is not located in what is conventionally thought of as the political sphere; rather, it is at the register of administration and population where “rules may be bent and stretched” (Chatterjee 2004:60) that political questions are often de facto negotiated and resolved.

While Chatterjee’s theorization of “political society” enables a rethinking of the *locations* of the political, in the following, I focus on the techno-political *forms* of political society and the multiplicity of its *terrains*. I explore a less visible, material micro-politics concerned with the shaping of subjectivities, ethical dispositions, and political agencies, what one might call a politics of non-publics taking shape at the register and in the language of technology. I investigate how infrastructure comes to mediate a diversity of competing ethical projects, political disagreements, and subterranean conflicts that often concern central political questions of civic virtue, basic needs, and the rights and obligations of citizenship. In the politics of meters, pipes, and wires, infrastructure itself becomes a *political terrain* on which such questions are negotiated and contested. Here, the political circulates and becomes manifest in different material *forms* (Gaonkar and Povinelli 2003).

In the following, I examine these forms via two linked inquiries. First, I trace a genealogy of the prepaid meter as a *techno-political device*. My aim is not to provide an exhaustive social history; rather, I focus on two historical conjunctures at which prepaid meters suddenly proliferated on a large scale and became enrolled within distinct ethico-political projects. First, late-19th-century Britain, when the meter was invented to provide gas to the working classes and became integral to the Victorian project of moral reform. Second, I track the conceptual and practical labor of translation as the meter moved to late-apartheid South Africa, when it came to be deployed as a device of counterinsurgency to end the anti-apartheid rent boycotts. In each moment, I argue, the meters became integral to the constitution of specific techno-political terrains.

In the second part, I ethnographically explore how this techno-political terrain is fashioned in contemporary South Africa. Drawing on my ethnography with engineers in the metering industry, I examine how prepaid meters come to be

re-scripted as they are deployed in the aftermath of apartheid and in a context of neoliberal reforms.⁶ In following engineers' seemingly perennial quest to develop ever more secure metering devices, I describe a technical war of position in which minute technical innovations become crucial tactical moves dependent on engineers' capacity to mobilize local knowledge and interpretive skill.

TRACKING THE LIFE OF THE PREPAID METER

Much of my fieldwork in Soweto was carried out in Phiri, a poorer section of Soweto next to Chiawelo, where I began this article. In 2003, Phiri had been chosen as the pilot site for Operation Gcin'amanzi ("Save Water"), a controversial multiyear infrastructure project that would convert all Soweto households from unmetered water connections to prepaid water meters. Thus, residents would no longer be charged a monthly flat fee, but a metered rate that needed to be paid in advance to avoid automatic self-disconnection. Over the years, the project has been at the center of much protest and media controversy, and it also became the subject of a high-profile, if ultimately unsuccessful, constitutional court case in which five Phiri residents challenged the legality of prepaid water meters.⁷ Partly because of this multifaceted opposition, the project is yet to be completed, though most Soweto households now access water via prepaid meters.

While less legally and morally fraught, prepaid electricity meters have been a concern since the 2000s when social movements like the Soweto Electricity Crisis Committee (SECC) protested their increasingly widespread deployment. During Operation Khanyisa ("Light Up"), SECC-affiliated "struggle electricians" reconnected residents to electricity supply if they had been manually disconnected and also bypassed or removed prepaid meters.⁸ Thus, they turned illicit reconnections and meter bypasses into a public spectacle and mobilization tool. In recent years, organized social movement action has declined and, most of the time, prepaid meters are an unremarkable part of life in Soweto. And yet, the bypassing or "bridging" of meters continues silently on a large scale often without any link to social movement organizing or a public, "political" language. Indeed, while the protests against Operation Gcin'amanzi eventually subsided and the utility argued that its surveys showed a 98 percent satisfaction rate, in 2011, utility officials told me that 30 to 40 percent of meters had been bypassed and needed to be retrofitted with new security features.

To have their meters bypassed, residents may individually pay a skilled person—often a utility employee earning a side income—a few hundred rand, or a skilled family member or SECC-affiliated technician might do it for free. The

decision to bypass is determined by multiple calculations—often both pragmatic and moral—and is also often subject to disagreement within households. While the social movements linked the meters to larger concerns about neoliberal reforms, residents often have a multiplicity of concerns that are frequently less clear cut and more ambivalent. On the one hand, prepaid meters often came with the promise to erase debts (which most Soweto households had accumulated over years of not paying for services) and to prevent the accumulation of new debts in the future. At the same time, the meters often raised larger worries about affordability especially in a context in which, for years, the vast majority of Soweto residents had not paid for basic services and thus money for water or electricity was often not part of household budgets. Electricity is particularly difficult to afford in poor areas of Soweto, where unemployment is high and many households rely on grants and pensions as primary income.⁹ A particularly cold winter, for example, can dramatically increase costs for topping-up credit and often multiplies cutoffs and blackouts. Importantly, the meter affords no room for negotiation should money to buy credits be in low supply. An unpaid monthly paper bill will not result in an immediate disconnection, and thus enables residents to delay payment until money has come in. The prepaid meter, on the other hand, automatically cuts the connection without regard for context or special circumstances.

But there are also less immediately apparent reasons for opposition to the meters. In South Africa, and in Soweto in particular, infrastructure has never been merely a neutral conduit for the provision of services, but has always been bound up with questions of belonging and citizenship (von Schnitzler 2008). Part of the promise of liberation was an end to the everyday violence of apartheid. Similar to other post-independence projects, the extension and improvement of basic services, from education or health to electricity and water, was seen as central to national reconstruction. Bound up in objections to prepaid meters are thus often larger concerns about the limits of this promise in the paradoxical context of post-apartheid neoliberal reforms, where services are often extended and restricted at the same time (cf. Mains 2012; Ferguson 2007). Prepayment technology in South Africa is thus coded in very specific terms that may differ widely from other places where the technology has been deployed more recently. Indeed, my point here is precisely that technologies are enrolled within ethical and political assemblages in historically specific ways that may or may not “travel” elsewhere and that may shift over time.

Toward the end of my first bout of research in Phiri, I attended South Africa’s fourth annual Prepayment Week, a large international industry conference and

the only one of its kind. Held as part of the African Utilities Week in Cape Town's imposing International Convention Center, it brought together nearly eight hundred delegates from five continents to exchange industry news, present innovations, and sell their products. The conference required a shift in perspective. In the exhibition hall, meters were no longer objects of anger and complaint, but rather displayed to promote the desire of their would-be buyers. Removed from dusty township grounds and unconnected to pipes or wires, the meters were neatly lined up according to functionality and level of sophistication—shiny, disentangled objects, next to and in competition with their peers. Here, the social life of prepaid meters was clearly in its commodity phase (Appadurai 1986). But what kind of commodity was being marketed here? What made the meters valuable in the eyes of manufacturers and prospective buyers?

I had come to the conference in part to learn more about the history of the meters, and to fill the gaps of my archival research. Many of the original developers, it turned out, were still in the business, though today mostly working for multinational companies. Many had been engineers during the apartheid era, sometimes with previous employment in military and security industries. During conversations with various delegates, I was repeatedly pointed to Peter Clark, who was described to me as the South African "pioneer of prepaid metering."¹⁰ A man in his early-sixties and an electrical engineer by training, he had developed the first meters in the mid-1980s and continued to be a central figure in the industry. As we sat on a bench outside overlooking the bustling convention center, Clark seemed happy to talk about the early trials—South African prepayment technology was an international success story in which he had played no small part.

Like many of the engineers I had talked to earlier in the day, Clark explained to me that the widespread anti-apartheid rent boycotts in the townships during the 1980s had increasingly become a fiscal problem and that engineers had begun to look for "technical solutions" to the crisis of nonpayment. Having first seen prepaid meters during travels in Britain, Clark had a meter shipped to South Africa. He described the meter as "a huge metal box" with "very rudimentary technology." It was coin-operated and thus easy to bypass. This, he maintained, had worked in the UK, since, as he put it, "people there are polite." In South Africa, where, he argued, "people get involved in energy theft, and things like this," this meter would not work and would have to be re-engineered from scratch.

Peter Clark's offhand comment about the character of South African and British users sheds some light on the labor of translation required for a technology to be made operational in new contexts, and I will return to this question in the

next section. More importantly, his association of prepayment technology and “politeness” encodes a key problematic that goes to the heart of the *kind* of techno-politics I will be concerned with in the rest of this article. While the concept techno-politics has been productively used in relation to large engineering projects (Hecht 2009; Mitchell 2002), in what follows, I track a techno-politics that operates on a more micro-political terrain and is centrally preoccupied with the relationship between subjectivity, ethical dispositions, and the technical.

THE “AGENCY OF THE PENNY-IN-THE-SLOT METER”: Tracking the Technics of 19th-Century Liberalism (London, 1888)

The prepaid meter began its career in Britain in 1888, at a time when the squalor of working-class life had become a matter of rising concern often expressed in the register of public health. During much of the century, working-class homes had remained excluded from networked grids and instead relied on candles, oil lamps, and coal for lighting and heating. The darkness of the working-class home was increasingly seen as a problem, in particular given the growing emphasis on public hygiene and concerns about the time spent by workers in better lit and warmer pubs (Daunton 1983). Infrastructures, and the circulation of water, electricity, and gas they enabled, were seen as central in the effort to produce the domestic conditions on which a new moral order could be founded (Joyce 2003).

It is in this context of the rise of biopolitics and its technics that the “penny-in-the-slot meter” was invented and dramatically changed the politics of infrastructure. Within ten years, over 60 percent of Londoners had domestic gas connections via the slot meter and the number of gas consumers increased from two to eight million. As one engineering report noted at the time, many dark working-class areas had thus “become illuminated through the agency of the penny-in-the-slot meter.”¹¹ While the slot meter enabled the integration of the whole city within a networked grid, it simultaneously divided its population into two sets. A first segment, mostly wealthier households, who could be trusted to pay monthly or quarterly bills and hence would have a contractual relationship to the utilities. And a second segment, mostly the working classes, who would have their connection to infrastructure regulated by a technical device, and were thus more precariously located outside of such contractual relations. Unactivated, the meter would automatically disconnect them from the city’s flows.

As with other practices of metrology and automation during the 19th century, prepayment technology became closely bound up with distinctly modern moral

anxieties about the blurring of human and machinic agency. On the one hand, the automated mechanism of the meters aroused suspicions about the morality of machinic agency. Numerous accounts of the time depict “automatic machines” as “immoral,” tempting users to cheat and in turn prone to cheating the users, laying bare the uneasy coincidence of an unprecedented exaltation of the autonomous human agent and her increasing, but surreptitious dependence on technical instruments.

On the other hand, much like the devices of scientific objectivity studied by Daston and Galison (2007), penny-in-the-slot meters were invested with human virtues such as patience, preciseness, and continuous alertness; virtues that ironically most humans were now believed to be lacking.¹² The meters—alongside other domestic measuring devices such as thermometers, scales, or clocks—were seen as capable of eliciting and shaping certain habits, subjectivities, and dispositions. Indeed, they became integrated within a set of larger moral-political concerns that defined the late-Victorian era. First, the slot meter, in its ability to extend gas services, was seen as aiding in the “moral upliftment” of the working classes by improving domestic sanitary practices and encouraging domesticity by simplifying the cooking of warm meals and thus discouraging men from frequenting pubs (Daunton 1983). A second concern was the constitution of the worker not only as a producer, but also as a judicious consumer, in particular in a context of the increasing centrality of credit and consumption to economic life. In many reports of the time, prepaid meters were described as devices that would aid in the production of a more rational attitude to spending and accustom the working classes to inhabit a contractual exchange relation.

While the benefits of the meters were widely touted in engineering journals of the time, the actual process of their introduction was beset by problems. Despite engineers’ insistence that the meters were accurate, this could never quite be established in the users’ mind—to “lie like a gas meter” soon became a popular metaphor to express habitual mendacity. A perhaps even greater challenge was to make the user respond to the new device in expected ways. Meters were broken into, coins were inserted on a string, and foreign coins would get stuck in the meter, leading one engineering report to soberly note that the meters could only be deployed in “localities where people were exceptionally honest.”¹³ In the initial stages of the invention, enormous trust had to be placed in the penny collector, who was also prone to help himself to coins from the piles he collected daily. But, in the end, for many engineers it was again technology that would solve these “human”

problems. As one report put it, “both the penny collector and the householder may be dishonest; but, unlike the human heart, the metallic mechanism of these automata cannot be demoralised.”¹⁴

In the early years, then, the problem of innovation in prepayment technology lay in gauging *how to distribute agencies*. Could measurement be left to the meter, or would the penny collector have to double-check? Could the collector be trusted not to serve himself? Would consumers be trustworthy or, as Clark might put it, “polite” enough not to tamper with the meter? The meter and the user thus needed to be co-constructed. Importantly, however, these co-constructions were inspired by and became allied with a liberal project. Indeed, it could be argued that the engineers’ worries spoke to a larger liberal conundrum of distributing agencies and responsibilities: how to avoid governing too much, which population groups to include as reasonable members of the social contract and which to designate as in need of tutelage. This continuous redistribution of agencies, or what one might call *agencement* (Callon 2007), took the shape of an ongoing techno-political battle in which the technology itself became the terrain on which such ethical and political questions were negotiated. The autonomous self-governing citizen, so central to the liberal imagination, here emerges as a precarious socio-technical achievement, a figure unthinkable without the work of tools, devices, and infrastructures.

What Clark identified as British politeness, then, was not a foregone conclusion, but had to be painstakingly manufactured and was always prone to failure. And yet, Clark was correct in assuming that the meters would not simply travel smoothly to South Africa. The transfer of expertise, as Richard Rottenburg (2009) has shown, is predicated on a labor of translation. How a technology moves from context to context, and what travels with it and what stays behind is thus an open question—once they leave their makers, technologies are “unstable objects” (Larkin 2008). And yet, as technologies move to new contexts, they also become restabilized: harnessed to new projects and anchored to new ethical regimes. It is this semiotic-material *work* that goes into making devices functional within specific ethico-political assemblages that I explore below.

DEVICES OF COUNTERINSURGENCY: “Budget Energy Controllers” in Late-Apartheid South Africa (Johannesburg, 1988)

As Clark himself was well aware, the context in which the prepaid meter came to be deployed in South Africa was quite different from late-19th-century Britain. South Africa in the 1980s, he suggested, was “in a mess” because of “that political thing.” For him, as for many other engineers I spoke to in the course of my

fieldwork, talking about “politics” was not part of their job description and usually accompanied by frowns or pained expressions. Many had been in the business since the apartheid period and were at best uncertain about how to incorporate the anti-apartheid struggle into the narration of their professional biographies.

While the anti-apartheid struggle became known to the world outside South Africa through its campaigns for political rights, which for the most part were articulated at a national scale, it often took the shape of localized struggles that involved the more tangible, if less visible administrative connections to the apartheid state. During the rent boycotts in the 1980s, township residents all over South Africa withheld payment for rents and service charges as part of the effort to make the townships “ungovernable.” Such acts of “fiscal disobedience” became both symbolic and material tools of insurgency with dramatic effects, disabling the running of township administrations and turning disconnections from services and evictions into sites of political struggle.¹⁵ It was in this increasingly militant and militarized context of the boycotts that engineers began the search for technical solutions to the problem of nonpayment.

At the same time, there were increasing moves toward the electrification of the townships by South Africa’s powerful electricity parastatal Eskom. Over the course of the 1970s and ’80s, it had become clear that “urban Africans” would not “return” to the Bantustans as grand apartheid ideologues had envisioned. This realization prompted an increasing interest in the black urban population as an untapped market and as potential consumers of electricity and electrical appliances. It was in this profoundly paradoxical context of planned large-scale electrification and simultaneous politicized nonpayment—of “reform” and counterinsurgency—that prepaid meters emerged.

As Peter Clark told me, in 1986 he developed the first South African prepaid meter. Much like in Britain, one of his primary tasks was to construct a functional assemblage of device, consumer, and utility. Clark transformed the original technology primarily in two ways. First, in order to “protect” it from South African users, he replaced the coins with a magnetic card and nontransferable “tokens.” Thus credit would be linked to a specific household and cash transaction would be limited to the local pay point. Second, the protective box around the meter needed to be made of cheaper, yet sturdy material to discourage residents from selling it as scrap metal. Apart from making changes in the technology, however, and similar to utilities in 19th-century England, Eskom needed to configure its users.¹⁶ One crucial issue, for example, was the creation of demand for electricity, a problem the utility sought to solve by providing residents with free basic

appliances, such as lamps or hotplates. And yet, as several engineers told me, when visiting individual households at the time, they would often find the prepaid meter box blackened from the smoke emitted by a fire burning from a wood stove beneath it, the electric hotplate not having been used at all.

By the late-1980s, prepaid meters commonly known at the time as “Budget Energy Controllers” were celebrated as “the next major technological breakthrough following the invention of the computer.”¹⁷ In many accounts, the political implications were stated bluntly. As one manufacturer suggested, prepayment “will help to depoliticise the supply of electricity such that energy does not become a pawn in the ideological struggles which the country is bound to face in the years ahead.”¹⁸

The political target and effects of the invention became clearest in Clark’s depiction of the early trials, during which engineers began simultaneous negotiations with the white municipalities and the rent boycotters in the adjacent black townships. In the late-1980s, Clark, by then employed by a meter manufacturer, started marketing the meters to individual municipalities *specifically* as devices that would enable breaking the boycotts and eliminate the need to access the townships directly to institute disconnections. Simultaneously, he marketed the meters to the boycott leaders, who desired electricity for the townships, but were unwilling to negotiate with the white municipalities. As Clark put it:

We realized that we needed to go straight to the community. We . . . approached [the civic organizations] and said: “Look, we understand that you have a war, but we know you want electricity. With [prepayment], you will have both—electricity and no contract with the government. Nobody will ever come in again to disconnect you.” There was a lot of psychology involved.

While Clark was eager to tell me about the successes, often such negotiations with the civics failed. Indeed, as one observer from the civics-aligned NGO Planact noted in 1992, prepaid meters were “fast becoming dangerously discredited” and had become “a source of real controversy in many townships, while some civics refuse to even discuss them” (Cobbett 1992:5f).

During the 1980s, prepaid meters were thus invested with the capacity to delink questions of payment and infrastructure from larger claims to citizenship and to reestablish and materially enforce the boundary between the administrative and the political. Here, the meters were harnessed to a late-apartheid technopolitics that combined piecemeal “reforms” with a fierce defense of minority rule.¹⁹ However, partly as a result of such contradictions and failures, many projects

remained at the trial phase and only relatively few prepaid meters were in fact deployed in the 1980s.

While the meters began their life as tools of moral improvement in the era of Victorian liberalism, in their move to late-apartheid South Africa they were thus re-assembled as devices of counterinsurgency. In both moments, specific ethical and political projects were delegated to technology, and technology itself became a terrain on which such questions were expressed and negotiated. What joined the two moments, and what “traveled” with the meter, is the ability to delegate protracted ethico-political questions—of belonging, civic virtue, and indeed the limits of citizenship—to a technical terrain. The meters, as technical *forms* of political society, thus produce what might be termed a graduated social contract by which citizenship is *de facto* mediated on an administrative terrain. And yet, even in a context of seemingly radical depoliticization, such technical devices are constitutive of a material politics in a variety of ways and open to a diverse set of ethical claims and affective investments.

In contemporary South Africa, this material politics has taken several, seemingly counterintuitive forms. In a context of continued widespread nonpayment in townships like Soweto and a neoliberal imperative for “cost recovery,” prepayment technology has become the default mode of connecting poorer township residents to services, in the process often cutting previously unmetered access to services. Here, this graduated social contract maps onto the racial legacies of apartheid and is often experienced as punitive. Thus, as I elaborate in the next section, prepayment metering becomes the terrain for an ongoing techno-political struggle over the limits of citizenship. At the same time, the meters are at times deployed to *extend* services to residents of informal settlements. The meters enable the connection of residents to the grid for the first time, whilst simultaneously rendering this connection precarious. Finally, there has also been an increasing *demand* for prepaid meters, often from wealthier residents who mistrust municipal accounting practices and see the meters as devices to wrest control from unaccountable city officials. Implicit in such demands for prepaid meters is often a desire to withdraw from the contractual relationship with a local state perceived as biased and untrustworthy. In an ironic reversal, this too produces a graduated social contract, if one initiated and demanded by residents themselves. Even in this context, the meter becomes object and terrain for ethical and political questions of trust, belonging, and civic obligation. As prepaid meters increasingly become the default means to connect all residents to infrastructure,²⁰ yet other ways of assembling ethics, politics, and technics may emerge.

BAD PAYERS, SMART METERS, AND THE MARKET IN ANTI-PROGRAMS: The Politics of “Technical” Innovation

After about an hour, my conversation with Peter Clark was interrupted by the Annual Prepayment Award ceremony that had been scheduled for that night. Sponsored by South Africa’s largest cell phone company, the award is given each year to the company with the most innovative prepayment concept. The invention that won the award this year was a device called the Information Link at Point of Delivery, short InfoPOD, developed by Peter Clark’s employer, the multinational company Actaris Metering Systems. The Minister of Minerals and Energy, Phumzile Mblambo-Ngcuka, had been invited to the ceremony to present the award. In her speech, she thanked Actaris for their tireless efforts for development and infrastructure in South Africa.

If at the award ceremony prepayment technology was presented as the transparent result of technological progress and South African ingenuity, throughout the conference this linear narrative had steadily unraveled. Earlier in the day, a group of protesters had gathered outside the convention center armed with placards reading “Down with Prepays!” This was not particularly surprising to the delegates who, after numerous demonstrations and a looming legal challenge, were well aware of the multiple objections to prepayment, especially for water. Meanwhile, inside the conference rooms, a less visible kind of politics emerged which involved the design of the technology itself. In the course of a host of PowerPoint presentations, what became apparent was an industry in constant struggle with “nontechnical” problems—government intrusions, legal hurdles, problems of standardization and financing, and centrally, a variety of noncompliant consumers, who emerged as the protagonists in a seemingly perennial conflict over payment for services.

For despite the end of apartheid in 1994, many township residents had never resumed payment for services. Campaigns urging residents to pay for services in the name of national reconstruction had failed spectacularly and in places like Soweto nonpayment had in fact increased. Manual cutoffs from services and illegal reconnections were widespread, often aided by residents’ organizations such as the Soweto Electricity Crisis Committee. At the same time, many municipalities began instituting neoliberal reforms and thus the pressure to institute “cost recovery” had grown dramatically. It was against this backdrop that prepayment technology came into wide use; this time, a technical solution to the failure of nationalist interpellation. In the ten years following the end of apartheid five-million households had thus been fitted with prepaid meters. Within a few years, however, many of these meters had been bypassed by residents rendering the meters useless and

giving residents illicit access to electricity. This in turn had left Eskom with the impossible task of manually checking and disconnecting each account. And it was *this* problem of the bypassed meters that preoccupied many presentations at the conference. I will focus here on two of the proposed solutions in order to illustrate this techno-politics of innovation.

As an arena of technology development, municipal engineering is in many respects unique in that it is addressed primarily at populations and not merely at individual users. Infrastructure developers are often centrally concerned with constructing and managing particular relations to utilities and the state, albeit relations usually conceived of as administrative rather than political. Indeed, in many of the presentations, what emerged most saliently were the relationships that could be established between the user and the technology and how these relationships would in turn mediate the population's relation to the utility or municipality. The *value* of the meters could only be established after an indication about how well it would fare in the establishment and durability of such relationships. This in turn required engineers to demonstrate not just knowledge of basic demographics, but also knowledge of a sociological kind, including a certain interpretive skill. For example, engineers needed to be aware of the history of payment practices in a particular area, which in turn was often bound up with the political histories of the townships. They needed to demonstrate how they had gone about testing the meters, which potential obstacles they had considered or what kinds of "social interventions" would be needed to ensure "user acceptability." Presentations thus often included the results of field trials or pilot projects that could demonstrate a certain *local* knowledge. The importance of this mobilization of local knowledge became most obvious in the disjuncture between international and local presenters.

The day started with a presentation by a French representative of a large global infrastructure technology company who introduced the concept of "Automatic Meter Management" (AMM), a combination of prepayment and "smart" metering technology that would enable remote communication between the meter and the utility. The novelty of this technology was its claim to universal usability, that is, as the engineer put it, its ability to flexibly respond to "*global* challenges." In outlining each of these challenges, he created a peculiar map of the world from the perspective of the global trade in infrastructure technology that divided the world according to distinct "customer bases" with a diversity of needs, various levels of trustworthiness and sophistication, and a range of more or less predictable behavior patterns. In the "first world," for example, the meters needed to be compatible with internet

services to enable online billing or to offer customers flexible tariffs. In “third world” contexts and in places like South Africa, he argued, AMM would enable the “constant monitoring” of consumption and thus help eradicate bad payment, illegal connections, and theft.

Standard metering, the engineer argued, was insecure and thus required constant auditing by utility employees. In a PowerPoint slide he summarized the resulting problems in the following way:

- “1000 Inspectors with 1000 dogs” can visit any account at least once a year . . .
- If they were to know where to go . . . without political biases
- If they are let in . . .
- If this does not create political repulsion against the Utility . . .
- Frauds can be reinstalled a day after the visit . . .
- Evidence about frauds may be insufficient to recover past losses
- . . . and why could not the readers execute this fraud eradication program before?
- . . . and would anyone replace a dumb old electromechanical meter with a new, still dumb, electromechanical meter bound to be tampered with soon?

Older, “dumb” meters require a municipal official to audit the meter. This in turn opens the door for all sorts of problems. As the engineer suggested, residents may decide not to let him in, he may become the target for “political repulsion,” or he may be unreliable himself. AMM would *delegate* the functions of auditing the meter from humans to technology.²¹ Measuring, meter reading, surveillance, and disconnections could now be performed by one technical device. Thus, the meter itself would “provide ways to bring [such] behaviors back to law and help dealing [sic] with the political issues of these customers.” The technology would not only eliminate the unreliability of the municipal official and the possibility of bypassing the meter, but also the space for negotiations or protests left open by the presence of an official. Thus, the technology would, the engineer argued, perform “political” operations. AMM then was *one way* in which disputes over payment could be delegated to technology.

The presentation seemed to garner limited interest from South African delegates. It was quite clearly a costly solution that did not speak to the financial constraints faced by South African utilities. More importantly, in the absence of evidence from a field trial, the engineer was unable to generate the *kind* of authority that would convince the other delegates. As one South African delegate argued,

“Consumers will for some reason accept a technology type in one country, but in the next they will not accept it all. This behavior is unpredictable and will ruin your venture and your investors’ trust in your solution.” What was required, in other words, were mechanisms that would limit the unpredictability of consumers’ responses. And this, in turn, required a more sociological kind of knowledge and, indeed, a *thicker* description of the relations between communities and the local state.

It is here that the award-winning InfoPOD raised the interest of the other participants and quickly cast aside “global” solutions. In his presentation, the InfoPOD’s developer, a local representative from Eskom, laid out the problem. Eskom could ill afford to replace its entire existing “dumb” prepaid meter base. On the other hand, many of the installed meters had been bypassed and had thus become useless. The InfoPOD, which had been piloted in the past year, would provide the solution. The InfoPOD—described by its developer as “a walk-by, nonintrusive, noncontact system to collect information from prepayment meters”—is a small radio device that can be attached to existing prepaid meters to enable officials to track tampering by accessing the meter remotely without needing physical access to residents’ premises. Retro-fitted with the InfoPOD, the old meters would, as it were, become “smarter.” Rather than having to enter the premises, utility employees could now drive or walk through the township with a radio receiver and automatically collect information from the meters at a distance.

Importantly, his presentation also included a discussion of the potential problems that could be expected during the introduction of the new devices. Asked how it would be possible to make people agree to such an installation, the engineer suggested: “When you come there, you don’t only tell them that [the InfoPOD] is there to detect tampering. You tell them about the nice benefits. You have to be strategic, if I can put it that way.” The success of such “technical” innovation thus relied centrally on engineers’ local knowledge and on their capacity for thick description and strategic intervention.

Viewed from this perspective, the InfoPOD was only the latest installment in a series of strategic measures to enforce payment—from appeals to civic virtue to the compulsions of a technical device—and thus to fashion a new relation between the local state and its citizens. It was an “anti-program,” to use Latour’s term.²² What made this device valuable, then, was its capacity to strategically intervene in an ongoing conflict over payment, albeit one that was now carried out

in the form of technology. It was just *one move* within an ongoing techno-political battle.

At the end of the conference, a delegate from Johannesburg told me epic stories about the various obstacles that had to be overcome by engineers throughout the history of prepayment technology in South Africa. Finally, he suggested, “you know the providers thought that people are uneducated, but in fact, a lot of innovation happens through them. If it wasn’t for people regularly subverting the meter, we all wouldn’t be here.” And indeed, while much of this essay has been concerned with the experts present at the conference, its absent protagonists were the “users,” the “cunning water thieves,” the “economic saboteurs,” the “bad payers,” “tamperers,” “electricity poachers,” and the residents with “political problems.” Prepayment metering in South Africa is an industry that *requires* constant innovation, because the latest technologies are quickly out of date, having been pulled out, bypassed, broken, or rewired. New anti-programs are thus required on a regular basis: “smarter meters,” “security seals,” tools that “audit,” “track,” “monitor,” and “enable remote disconnections.” Here, technical expertise is produced in constant conflict with what one might, with Callon, Lascoumes, and Barthe (2009), term “expertise in the wild.”²³

Importantly, my point is not to tell a story of small acts of resistance to rationalization, neoliberalism, or modernity; rather, my goal has been to map a techno-political terrain that often remains invisible in the common analytic focus on the public and on immaterial speech. Invested in the “technical” transformations I traced above are strategic scripts and counter-scripts—interventions in an ongoing series of low-intensity conflicts that have become materialized within the technology itself. Such a micro techno-politics concerns central moral-political questions about civic virtue and post-apartheid citizenship, albeit in a dramatically different *form*. In this context, infrastructure is not merely a tool or a symbol *for* the political, nor *merely* a conduit of power; infrastructure itself has become a political terrain. Indeed, this is a politics of nonpublics, inscribed within pipes, wires, and technical devices as much as in the more visible protests that continue to make headline news on a regular basis in South Africa.

CONCLUSIONS

The South African story of the prepaid meter is of course in many ways specific. As the meter travels on, many different stories can surely be told. And yet, we might discover a similar *kind* of techno-politics in a diversity of locations and

forms. There is today an unprecedented investment in developing sometimes highly sophisticated technologies for the poor and their presumed condition.²⁴ In much of the world, such technical devices increasingly mediate relationships between populations and the state or NGOs. Such technologies are often alternatively invested with a magical power to radically improve the lives of the poor or decried as tools of domination or surveillance. What I have suggested here is that seemingly neutral technical mediators come to do work within a diversity of ethico-political projects beyond their apparent pragmatism. Tracking the travels of such technical devices and ethnographically following the work of their inscription may thus enable us to “de-scribe” a politics in unfamiliar places and in unexpected forms. In turn, it might expand the conceptual and imaginative horizons of how we study and conceive of the political.

In a context in which the formal political sphere appears increasingly inaccessible, such material links often become the location at which political and ethical questions are negotiated and contested. Questions concerning citizenship, belonging, or civic virtue may here be expressed by flicking a switch, cutting off a wire, or by installing a “smarter” meter. This is a politics far removed from the modern political imaginaries of a transparent, unencumbered sphere of public deliberation. Of course, at certain times, as during the protests in Chiawelo with which I began, this material politics does become public, transforming technics into a “matter of concern” (Latour 2004). But even here, looking more closely, “public” protest is often intimately tied to the more invisible forms of techno-politics I have outlined in this article.

Returning to the protest in Chiawelo, it turned out later that the protest was spawned, at least in part, by a new technical counterscript. Residents of Chiawelo had already had prepaid meters for a long time, but, as in other areas of Soweto, many of the meters had been bypassed. The protests, it became apparent, were prompted by a pilot project begun a few years earlier to install a new type of “split meter,” an innovation that divides the meter in two parts: a touchpad to enter in the credit code located in the house and the actual meter now located outside on the pavements in unbreakable, “tamper-proof” green steel boxes—a new anti-program, one even more secure than the InfoPOD. And yet, three months after the protests, in October 2011, an audit by Eskom found that residents had opened the “unbreakable” green boxes with the help of grinders. Thus, the meters had been bypassed yet again, setting the stage for the development of new anti-programs in a seemingly endless cycle of innovation and subversion.

ABSTRACT

In this article, I explore the politics of infrastructure in South Africa by focusing on the “travels” of a small technical device. Since the end of apartheid, prepaid meters have been widely deployed in South Africa’s townships to curb the nonpayment of service charges. Yet many residents have bypassed their meters, enabling them to illicitly access electricity or water. I track the micro-political battle between residents tinkering with the technology and engineers trying to secure it, arguing that infrastructure itself becomes a political terrain for the negotiation of central ethical and political questions concerning civic virtue and the shape of citizenship. To investigate this techno-political terrain, I trace a genealogy of the meter from Victorian Britain, when it was invented as a tool of working-class “moral improvement,” to the late-apartheid period, when it was re-assembled as a device of counterinsurgency against the anti-apartheid “rent boycotts.” In each moment, I suggest, the meter was harnessed to distinct ethical regimes and political projects. Drawing on my ethnographic fieldwork with engineers in contemporary South Africa, I explore the semiotic-material work required to make the device functional in the post-apartheid moment. Tracing the travels of a small technical device across time and space, I argue, opens up conceptual space to rethink the relationship between ethics, politics, and technics. [infrastructure, technology, politics, ethics, citizenship, materiality, South Africa]

NOTES

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1. In 2007, out of ten million one-way prepaid meters deployed worldwide, eight million were located in South Africa. See J. S. Jones, “Prepayment Reaches 21,” *Metering International* 4 (1) January 2007.
2. See Stefan Helmreich’s (2007) discussion of the concept of transduction.
3. I am here inspired by Collier and Ong’s (2005) account of the constitution of “global assemblages.”
4. On the “user heuristic,” see, e.g., Fischer (1994), and Bijker, Hughes, and Pinch (1987). For compelling work on the technical and the political within science studies, see, e.g., Akkrich (1992), De Laet and Mol (2000), Hecht (2009, 2012), and Winner (1980). More recently, Callon, Lascoumes, and Barthe’s (2009) account of “technical democracy” convincingly makes the case for a symmetry of traditional research and lay people’s research. Yet, the *form* of political engagement they describe returns to more conventional notions of the political as located in a transparent, immaterial space of communication in which the rational, unencumbered individual human actor appears again as the protagonist.
5. This definition of the political as based on communication and the public is shared by a diverse array of theorists, from Arendt to Habermas and even more radical critics, such as Rancière.

6. See Madeleine Akrich's (1992) and Bruno Latour's (1992) work on this semiotic-material conception of inscription.
7. For an analysis of the case, see Bond and Dugard (2008).
8. There is a large literature on new social movements in South Africa (see, e.g., Naidoo 2007). Specifically on prepaid electricity see the edited volume *Electric Capitalism*, and especially the chapters by Ahmed Veriava and Prishani Naidoo, and by Peter van Heusden (MacDonald 2009). On the politics of the Treatment Action Campaign, see Robins (2008) and Comaroff (2007).
9. Despite the nationally mandated free provision of 50kWh per month, in 2004, poor Soweto households often spent 37 percent of their monthly income on basic services (Nefale 2004).
10. Following anthropological convention, I use pseudonyms for all individuals named in this article, apart from public figures.
11. Association of Gas Engineers and Managers. 1895. UK, *Report of Proceedings 1895*, p. 302.
12. On the moral economies of measurement, see Gooday (2001) and Wise (1995).
13. "Penny-in-the-slot gas meters," *Western Mail* (Cardiff, Wales), Tuesday, November 8, 1898; Issue 9191.
14. "Penny-in-the-slot meters," *Liverpool Mercury* (Liverpool, England), Monday, June 19, 1893; Issue 14183, p. 5.
15. I take the term "fiscal disobedience" from Janet Roitman (2005).
16. See Woolgar (1991) on the "configuration of the user."
17. George Malan, "Budget Energy Controllers Can Solve Non-Payment of Water Accounts," *Municipal Engineer*, October 1989.
18. M. A. Stevenson, "Development of Prepayment Electricity Metering Systems for Use in First and Third World Environments," in *Seventh International Conference on Metering Apparatus and Tariffs for Electricity Supply* (Glasgow: Power Division, Institution of Electrical Engineers, 1992).
19. Ironically, it is the legacy of apartheid techno-politics that in part accounts for South Africa's contemporary status as a "global" leader in prepayment technologies.
20. In April 2013, City Power, Johannesburg's electricity utility, announced plans to install prepaid meters for all of its users.
21. On the concept of "delegation" see Latour (1992).
22. In coining the terms "programs of action" and "anti-program," Latour (1992) suggests that actions may be inscribed or anticipated within technical artifacts. These may however in turn be obstructed by other programs of actions, or anti-programs. Thus, an artifact can be "de-scribed" according to its programs of action (or anti-programs).
23. Callon, Lascoumes, and Barthe (2009) use the term "research in the wild" to refer to research by lay people outside the laboratory setting that often comes to challenge the "secluded research" by professionals.
24. One might think here, for example, of food stamp cards in the United States, biometric ATMs for rural populations in South Africa, informal banking systems, or the biometric registration of refugees in UN camps (see, e.g., Breckenridge 2005; Elyachar 2012; Fassin 2011). See also Peter Redfield's (2012) work on humanitarian design.

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