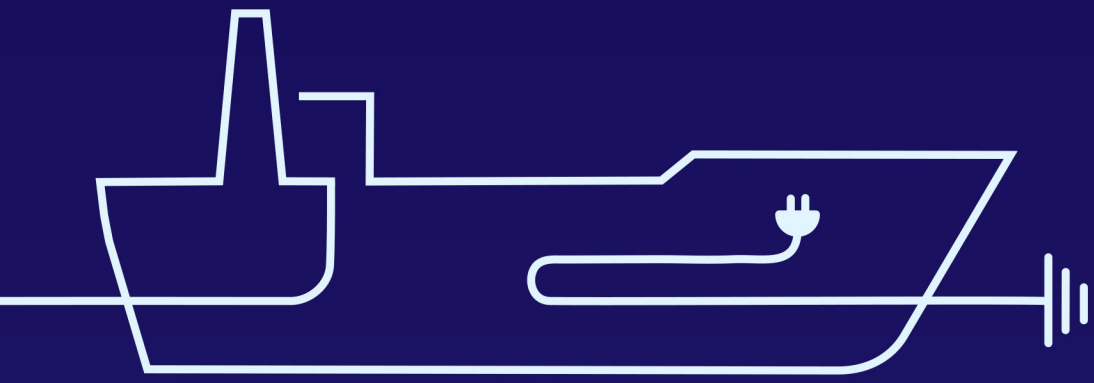
FLOATING POWER

Energy, Infrastructure, and South-South Relations



Gökçe Günel

Floating Power



EXPERIMENTAL FUTURES

Technological Lives, Scientific Arts, Anthropological Voices

A series edited by Michael M. J. Fischer and Joseph Dumit

Floating Power

Energy, Infrastructure, and South-South Relations

GÖKÇE GÜNEL

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Introduction: Technologies of Deferral

Serkan and I met in a Turkish restaurant in Accra's East Legon neighborhood in December 2016 and nibbled at some *pide* over a languid lunch. A meticulously dressed, compact man in his mid-thirties, Serkan had been the director of Karadeniz Holding's East Legon office for the past six months and managed relations between Karadeniz and the various energy-related institutions in Ghana with the help of eleven employees. There was an element of savviness about him. On Fridays, he wore dashikis to demonstrate his appreciation of local attire.

A day before, his driver had taken us to the fishing harbor in Tema to tour *Ayşegül Sultan*, the Turkish-built floating power plant Serkan's employer, Karadeniz Holding, had leased to the Ghanaian government. At a time when Ghana's electricity production was about 2,500 megawatts, the barge produced 235 megawatts of power or about 10 percent of Ghana's electricity.[1] The morning after our visit, the intense heat, loud reverberating noise, and endless vibrations that characterized the ship's hold lingered with me (see figure I.1). The crew members had suggested that it had taken them no time to adapt to the sensory environment of the floating power plant, given that many of them had backgrounds as ship engineers. But Serkan did not have to spend time on the ship very often and therefore partly shared my surprise at the harsh interior of the power plant amid the seeming calm of the ocean. Now he was enjoying

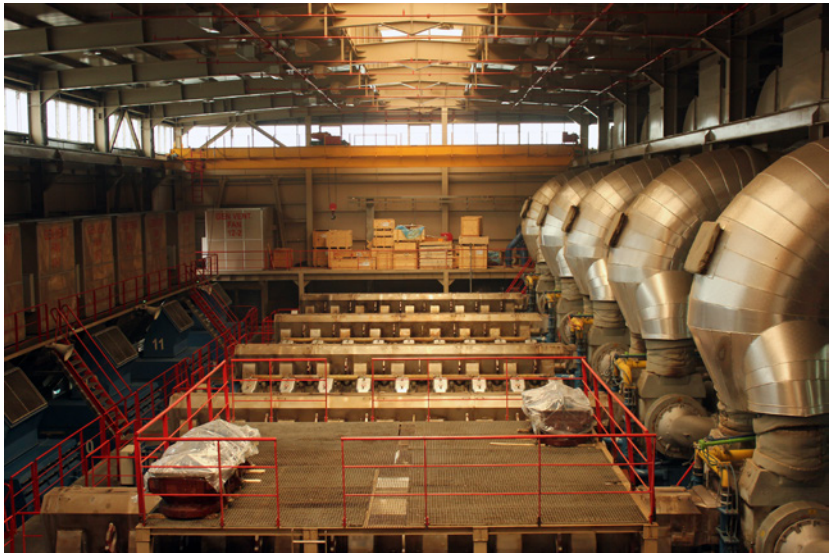


FIGURE 1.1. *Ayşegül Sultan*'s engine room, Tema, Ghana, 2016. Photo by the author.

lounging on the patio of the restaurant in East Legon, slowly picking at his food.

As we chatted about Serkan's expatriate experience in Accra, we could overhear some men assessing the latest updates in Turkish soccer and complaining about harmattan, dusty winds that blow from the Sahara to the Gulf of Guinea, leaving a beige haze hanging over the West African coast. Serkan identified the men eating at neighboring tables as employees of Aksa, another Turkish energy company, which had built a land-based power plant in Tema.[2] Karadeniz Holding and Aksa were two of the independent power producers operating in the Ghanaian electricity market. Relying on investments mainly from Turkey, China, and the United Arab Emirates, independent power producers in Ghana produced electricity from imported heavy fuel oil and from domestic and imported natural gas. Karadeniz Holding's *Ayşegül Sultan* stood out among these power production facilities mainly because, unlike them, it was not land-based. It was also larger than most of its competitors.

"Karadeniz could have built a land-based power plant here, but they did not," Serkan said. "Instead they built the plant on a barge. If Ghanaians gave us a concrete slab and allowed us to place a plant on that slab, Karadeniz could have done that, but we did not." He picked up a clean white napkin

off the table and then folded it four times until it was the size of a stick of gum. "This is how much space our barge takes," he said. "This is how much more effective it is when compared to a land-based power plant. And if the authorities do not pay, or if there is a war, then we take our barge and leave."

By folding the napkin, Serkan was taking a seemingly two-dimensional land-based power plant that was flat and spread out, and rendering it three-dimensional. Unlike a regular power plant, the floating power plant was thick and densely packed. The act of folding represented a transformation from a horizontal organization to one that was layered and vertical, a space where everything was stacked up. With scrubber towers on the top, workers in the middle, and engines at the bottom level, the ship constituted an enclosed world for power production, attached to the Ghanaian grid with high-voltage transmission lines stretching over the harbor. According to Serkan, the innovative barge had many advantages both for the company and for the Ghanaian authorities.

In addressing urgent electricity demands, many countries look toward quick power generation systems. One emergent system is powerships: floating power plants that anchor at a harbor, plug into a national grid, and generate electricity using heavy fuel oil or natural gas. The Turkish company Karadeniz Holding—or Karpower, as it is known to its many clients—has become an increasingly popular producer of powerships in the past decade.[3] A family-owned business, Karpower builds the ships on spec in various shipyards in Istanbul and leases them to places with unmet energy demands. Their barge *Ayşegül Sultan* (figure I.2) produced power for Ghana's grid between December 2015 and September 2017, initiating the company's operations in Africa. The larger powership *Osman Khan* replaced *Ayşegül Sultan* in late 2017 and now provides 470 megawatts, almost doubling Karpower's production volume. In late 2019, the Liberia-flagged *Osman Khan* switched its fuel source from heavy fuel oil to natural gas, a less expensive and more environmentally friendly fuel, by moving its operations from Tema to Takoradi, a port much closer to the country's own natural gas reservoirs.[4]

At the time of my first visit to *Ayşegül Sultan* in December 2016, Karpower had experience with projects in Iraq, Lebanon, Pakistan, and Indonesia. Their presence in Ghana also precipitated the company's expansion into Zambia, Sierra Leone, Mozambique, and Gambia, among other countries. As of March 2018, the company owned forty-three vessels operating worldwide (table I.1). More than twenty of these were powerships, while



FIGURE 1.2. *Ayşegül Sultan,* Tema, Ghana, 2016. Photo by the author.

others were service ships that delivered fuel or provided housing to crews in locations where it was difficult to accommodate them. In South Africa, the powership encountered concerns and criticism, mainly due to the high costs associated with the proposed twenty-year contracts (see Cirolia et al. 2025). Critics also pointed to the lack of transparency in the tendering process and underlined how, given its financial footprint, working with Karpower for twenty years would defer the arrival of renewable energy power stations in the country. Such criticism has had little impact on the company's presence worldwide. In late 2024, news agencies announced that Karpower would provide electricity to Syria, contributing to the country's postconflict reconstruction efforts. Karpower used the slogan "The power of friendship" to promote their project, presenting it as a broad and cordial campaign to bring quick and cheap electric power to those in need.

Powerships represent a move from what power companies have called permanent power to temporary power. Across the industry, permanent power denotes installations designed for long-term, continuous operation, integral to urban and regional networks, and delivering more reliable and affordable electricity without a preordained end date. In contrast, temporary power is short term, installed during events, construction, or emergencies, and often less stable and more expensive. This distinction shapes electrical codes and safety standards worldwide. Yet, as floating power

TABLE 1.1. Karpower's Forty-Three Ships

No.	KPS ID	*Name of the Vessel*	*Ex Name*
1	KPS 1	Karadeniz Powership *Ali Can Bey*	X-*Kim Heng 301*
2	KPS 2	Karadeniz Powership *Iraq*	X-*Karadeniz Powership Iraq*
3	KPS 2	Karadeniz Powership *Yurdanur Sultan*	X-*GTO 396*
4	KPS 3	Karadeniz Powership *Doğan Bey*	X-*Melpomeni*
5	KPS 4	Karadeniz Powership *Rauf Bey*	X-*A Raphael*
6	KPS 5	Karadeniz Powership *Kaya Bey*	X-*Kamari*
7	KPS 6	Karadeniz Powership *Irem Sultan*	X-*Enterprise*
8	KPS 7	Karadeniz Powership *Orhan Bey*	X-*Atlas 1*
9	KPS 8	Karadeniz Powership *Osman Bey**	X-*DN143*
10	KPS 9	Karadeniz Powership *Fatmagül Sultan*	X-*Sainty No 9*
11	KPS 10	Karadeniz Powership *Ayşegül Sultan*	X-*Sainty No 10*
12	KPS 11	Karadeniz Powership *Zeynep Sultan*	X-*Explorer*
13	KPS 12	Karadeniz Powership *Osman Khan*	X-*Pacific Triangle*
14	KPS 14	Karadeniz Powership *Onur Sultan*	X-*Abyo Four*
15	KPS 15	Karadeniz Powership *Orka Sultan*	X-*Kohyohsan*
16	KPS 16	Karadeniz Powership *Orhan Ali Khan*	X-*Nisshin Trader*
17	KPS 22	Karadeniz Powership *Gökhan Bey*	X-*HR Indication*
18	KPS 23	Karadeniz Powership *Yasin Bey*	X-*HR Intonation*
19	KPS 24	Karadeniz Powership *Ibrahim Bey*	X-*Transpine*
20	KPS 25	Karadeniz Powership *Mehmet Bey*	X-*Transwood*
21	KPS 32	Karadeniz Powership *Ela Sultan*	X-*SKS Trent*
22	KPS 33	Karadeniz Powership *Deniz Sultan*	X-*SKS Tweed*
23	KPS 35	Karadeniz Powership *Suat Bey*	X-*Stolt Egret*
24	KPS 36	Karadeniz Powership *Enis Bey*	X-*Fryken*
25	KPS 40	Karadeniz Powership *Gültekin Bey*	X-*Sea Power*
26	KPS 41	Karadeniz *One*	X-*Normand Skarven*
27	KPS 42	Karadeniz Powership *Refakat Sultan*	X-*Pacific Warrior*
28	KPS 43	Karadeniz Powership *Remzi Bey*	X-*Pearl*
29	KPS 44	Karadeniz Powership *Ragıp Bey*	X-*Seacor Valor*
30	KPS 45	Karadeniz Powership *Faruk Bey*	X-*Maersk Puncher*
31	KPS 46	Karadeniz Powership *Asım Bey*	X-*Maersk Provider*
32	KPS 50	Karadeniz Powership *Koray Bey*	UT 745, X-*Maersk Finder*
33	KPS 51	Karadeniz Powership *Metin Bey*	UT 745, X-*Maersk Fighter*
34	KPS 52	Karadeniz Powership *Nezih Bey*	UT 745, X-*Maersk Forwarder*
35	KPS 53	Karadeniz Powership *Göktay Bey*	UT 745, X-*Maersk Feeder*
36	KPS 54	Karadeniz Powership *Barış Bey*	UT 745, X-*Normand Vester*
37	KPS 55	Karadeniz Powership *Göksel Bey*	VS 483, X-*Siem Carrier*
38	KPS 60	Karadeniz Powership *Ebru Sultan*	X-*Lamnalco1*
39	KPS 61	Karadeniz Powership *Filiz Sultan*	X-*Lamnalco2*
40	KPS 62	Karadeniz Powership *Selma Sultan*	X-*Lamnalco3*

(*continued*)

TABLE I.1. (*continued*)

No.	KPS ID	*Name of the Vessel*	*Ex Name*
41	KPS 100	OWK	X-*Stena Explorer*
42	KPS 101	OK	X-*Super Servant 3*
43	KPS 102	Karadeniz Powership *ISTANBUL*	X-*Cable 1*

Source: The table reproduces a photograph of Karpower's inventory, taken by the author in March 2018, Istanbul, Turkey.
Note: KPS stands for Karpowership.

plants evidence, this conventional industry binary does not always reflect the complexities of electricity infrastructure. For instance, a 2014 article in *POWER*, the go-to trade publication that has been published in North America since 1882, asks, "When 'temporary power' supplies nearly a quarter of a grid's demand, is it still temporary power? How about when a project lasts 10 years?" The article continues, "Calling power service temporary doesn't quite capture all of its distinguishing attributes. It's temporary rather than permanent, rented rather than owned, and mobile rather than fixed. It's also modular and easily scalable" (*POWER* 2014). The article foregrounds how temporary power increasingly satisfies electricity demand for longer durations worldwide, especially when electricity utilities face financial constraints, rendering investments in permanent infrastructure more difficult. Others from the industry also argue that rapid installation and low up-front capital requirements are a compelling case for temporary power stations.[5]

Temporary power infrastructures such as powerships have capitalized on the potential for long-term development and linear progress in the places where they have been put to use. Karpower representatives present their ships as provisional systems whose eventual demise will spawn post–fossil fuel modernization. The formal qualities of the floating power plants serve as evidence of such a possibility: Since their only connection to the land is through high-voltage transmission lines, powerships seem a less permanent infrastructure than land-based plants, as they can leave at any time, especially if and when their presence in lessee countries no longer makes financial or political sense. Electricity producers have been financially and politically invested in prolonging such provisional periods as far into the future as possible, absorbing the lessee country's resources and delaying the arrival of an age beyond their obsolescence. In this sense, temporary power structures have constituted what I call *technologies of deferral*, which satisfy present needs while postponing fossil fuel phaseout to a future date.

How, then, did floating power plants become a mechanism for forestalling progress? More importantly, what does the proliferation of such technologies of deferral mean for the global future of energy and climate change?

All of the Above: The Fossil Fuel Industry Promotes Energy Justice

A West African delegate I met during the United Nations Framework Convention on Climate Change (UNFCCC) COP 17 meeting in Durban, South Africa, in December 2011, insisted on the necessity of fossil fuels as a tool for development: "We can't improve our industry on solar power. We need to uplift our people, and we will need fossil fuels to do that. Germany has educated its people, and now it's time for it to clean up."[6] The delegate stressed a common opinion among energy industry professionals, reiterating that it was time for Global North countries to relinquish fossil fuels, even as the Global South needs them longer to create industrial infrastructures that match those of countries such as Germany. This perspective follows the arguments propagated by the Kyoto Protocol, an international agreement signed in 1997 acknowledging that developed countries have been liable for the high levels of carbon emissions that put the planet's future at risk and therefore have a heavier responsibility to mitigate climate change. Broadly, the delegates supported technologies that enable the proliferation of fossil fuels in the Global South, linking their propagation to the advent of industrialization and development.

Perhaps the West African delegate's emphasis is not surprising—some would even describe it as a cliché. Across convention centers worldwide, policymakers repeat the significance of energy justice, often referring to the necessity of carbon-based fuels as a tool for development. In rendering energy justice achievable as a goal, they point to developing fossil fuel infrastructure in the Global South, which would help countries industrialize and, therefore, prosper.[7] Even though such imaginations of the future are often ambiguous, they create a dominant discourse in the industry when they coalesce.

Over a decade after the COP 17 in South Africa, this perspective on energy justice continues to structure how representatives of the global fossil fuel industry frame climate change. At CERAWeek 2024, the world's largest energy conference, which takes place in Houston, Texas, every March and attracts about ten thousand industry representatives, one US-based executive suggested that "oil is intrinsic to the world economy," stressing how

the world has had to embrace an "all of the above" approach to fossil fuels and renewable energy infrastructures.[8] An autobiographical detail helped support this point: The executive's parents' move from India to the United States had allowed him to enjoy a range of goods provided by the fossil fuel economy, and this incentivized him to make such goods available to those in India who could not yet access them. In this framework, calling for fossil fuels to be phased out—a perspective stressing the gradual elimination of fossil fuel production and use that has gained prominence among climate change activists in the past decade—is a call to promote global inequality, to deprive these abstract populations in India of the opportunities that this executive had accessed as a child growing up in the United States. "Did you know that Heathrow Airport uses more energy than Sierra Leone?" he reminded the audience when introducing his main point. According to the presenter, questioning the all-of-the-above scenario meant setting unfair goals for all the African ministers who wanted to "decarbonize after they carbonized." "No one deserves to be poor," the executive concluded.

Yet it is important to return to the West African representative I quote and recall his emphasis on the responsibilities that Global North countries have in upholding energy justice and allowing for African countries "to decarbonize after they carbonized." Other decision-makers shared his perspective. For instance, at CERAWeek 2025, a panelist who directs one of the leading environmental nonprofits in India told the audience that the Global North countries needed to abide by various emission reduction mechanisms to allow for fossil fuel–based development to continue in the Global South. Most often, however, energy professionals missed this critical layer, evading responsibility regarding emission reduction protocols in the Global North and instead stressing the significance of expanding fossil fuel infrastructure in the Global South.

In the early 2010s, representatives of the fossil fuel industry often claimed that climate change was not anthropogenic, citing historical transformations in the planet's climate such as the Little Ice Age and obfuscating the role that fossil fuel production and consumption have played in instigating climate change.[9] However, in the 2020s, this discourse has given way to a perspective that emphasizes energy justice, coupling the emergence of equity and development with the consumption of fossil fuels. Adopting an energy justice framework has given the fossil fuel industry a new moral valence.

This emphasis on all-of-the-above solutions, meaning using all energy sources, including fossil fuels and renewables, to ensure a stable and secure energy supply worldwide, defers the implementation of impactful climate

change mitigation strategies. In this context, insisting on the necessity of fossil fuels illustrates how providing energy and petrochemical products to the world's population for the longest extended period is more important than reducing the disproportionate impacts of climate change worldwide, prioritizing energy justice over climate justice. For instance, at the CERA-Week meeting in March 2024, a prominent energy economist, who held a PhD from the University of Chicago and had written a dissertation on the US petroleum market in the 1990s, suggested that oil and gas demand will keep growing until the world experiences what he called a "Lake Erie moment," referring to a crisis of overpollution in the lake in the 1960s that prompted the Nixon administration to impose environmental regulations across the United States, including the Clean Water Act.[10] Even though climate scientists stress that it is already too late to mitigate climate change, this projection of the future posits that it is actually too early for policymakers to intervene and that fossil fuel–sponsored development can continue until a moment of significant rupture, such as a Lake Erie moment (see Hulme 2019).

In this book, I investigate how this all-of-the-above approach makes itself known in the Global South by focusing on the emergence of Karpower's floating power plant in Ghana alongside solar power stations and electric vehicles. This perspective relies on technologies of deferral, such as the powership described earlier, which allow for the fossil fuel economy to be extended while keeping the horizon of transformation intact.[11] Even though some, including the delegate from West Africa, may value this approach, a close investigation of the dynamics between energy professionals in Ghana, Turkey, and beyond demonstrates that subscription to all of the above does not actually generate a level playing field for these diverse actors. As I set out in this book, geopolitical and geoeconomic differences between countries, meaning countries' varying capacities to use geographic resources or economic investments to expand their global influence, scaffold the terms of engagement between actors from Turkey and Ghana, further entrenching inequality. Even when technologies of arrival associated with post-oil modernity, such as solar power stations and electric vehicles, are put to use, the dynamics of social, political, and economic inequality persist.

Despite the global context I have described, many contemporary accounts of energy transition portray a shift from fossil fuels to renewable energy sources, document how the politics of renewable energy vary in distinct social contexts, and investigate how governmental and corporate intervention impacts energy technologies. Many proponents of this shift

imagine that the transition will take time and occur in response to price incentives and profit motives (Malm 2016). But rarely does the scholarship on energy and climate change acknowledge how humans have consistently added new energy sources to the mix and subscribed to the all-of-the-above approach (Wenzel 2022; Barak 2020; Fressoz 2024). For the past two centuries, the consumption of all energy sources has grown extensively. In spite of the conventional narratives around energy transition today, older sources of energy are rarely completely abandoned or replaced. Instead, such sources support the production of other fuels—consider, for instance, how much petroleum is necessary for manufacturing and installing solar and wind power stations. While some scholars criticize the energy transition narrative (Kuzemko 2016; High and Smith 2019), there is a general agreement in the literature that an expected transition from fossil fuels to renewable resources is and should be around the corner. The linear thinking associated with energy transition assumes a substitutive logic, where energy infrastructures may be replaced in a progressive modernizing trajectory, whereby certain items become obsolete while others emerge. Instead, this book shows that the various fuels and associated energy infrastructures expand and grow symbiotically and suggests that energy infrastructures have changed in cumulative ways. I call this transformation *energy accumulation*.

Energy Accumulates

"If you're in trouble, you don't think straight," said Ibrahim, an electrical engineer with the Electricity Company of Ghana (ECG), describing Ghana's power crises. In a meeting room on the fifth floor of the Electro Volta House building, our windows looked out onto Accra's Black Star Square, a modernist public square built in 1961 by the country's first president and pan-African statesman, Kwame Nkrumah, in celebration of Ghana's independence from colonial rule. On the wall a monthly calendar featured newly completed electrical substations nationwide. A promotional sign hanging from the ceiling celebrated the company's fiftieth anniversary, suggesting that the company had been powering Ghana's socioeconomic growth and development for half a century. Like many other employees I met there in late 2019, Ibrahim wore a button-down shirt featuring the ECG logo, tailored for him with fabric printed in recognition of the company's fiftieth anniversary.

Ibrahim took time to explain to me what he meant by "trouble." Originally from northern Ghana and the recipient of a scholarship from the

Islamic Development Bank, he had earned his undergraduate degree from a top engineering school in Istanbul. He was exactly my age. Considering how close his university campus had been to my apartment in Istanbul, we could have met each other in Turkey between 2000 and 2004. Ibrahim peppered his comments with Turkish words and sentences here and there, and he grew somewhat nostalgic about his years in Beşiktaş, where his university campus had been located and where I had lived before emigrating to the United States in 2007. He had not been back to Istanbul since his graduation and asked me to describe in detail how the neighborhood had changed. Then he gave me a lengthy account of Ghana's recent struggles with electricity provision as he understood it, foregrounding the contemporary condition of electricity excess.

Until 1997, state-owned hydroelectric power plants produced all of Ghana's electricity (Awopone et al. 2017). In the words of historian Stephan Miescher, the opening of Ghana's Akosombo Dam in 1966 and the creation of Lake Volta—the world's largest human-made lake by surface area and the fourth largest reservoir by volume—"produced different temporalities of an industrialized future that would transform the country's rural past and create new cities, factories, and infrastructures" (2014, 341). In 1961, only four years after the country's independence from colonial rule, the government of Ghana also embarked on the Ghana Nuclear Reactor Project with the aims of integrating nuclear science and technology into the nation's agenda, cultivating expertise, and paving the way for potentially incorporating atomic power into electricity generation (Osseo-Asare 2019). The process that historian Elizabeth Chatterjee (2020, 14), in the context of postcolonial India, labels "fossil developmentalism" placed an explicit emphasis on state power and large megaprojects. In the inauguration ceremony of Lake Volta, Kwame Nkrumah announced, "It is in this spirit of fruitful collaboration for a better world for all that I . . . inaugurate the Volta River Project. Let us dedicate it to Africa's progress and prosperity. Only in this way will Africa play its full part in the achievement of world peace and for the advancement of the happiness of mankind" (quoted in Ayensu 2013, 19). Nkrumah was overthrown by a military coup a few months after this ceremony. "The future envisioned by Nkrumah, in which each would give according to his ability and receive according to his needs," as the literary scholar and cultural historian Saidiya Hartman (2007, 177) observed, "had been eclipsed."

Inadequate rainfall and rising temperatures have negatively impacted the hydroelectric power station at Lake Volta, at times completely incapacitating it (Silver 2015; see also Yarrow 2017). As Chatterjee (2020, 19)

writes, "Under fossil developmentalism, electricity could no longer be kept confined as an abstract, profit-making commodity that served only elite interests. Increasingly large sections of the population gained access, albeit unevenly." Electricity production symbolized the era of independence, standing in opposition to the period marked by British colonialism (Diouf 2005). The process of fossil developmentalism also meant that electricity emerged as a right, leading to novel modes of claim-making. In the early 2000s, however, when power demand was increasing across the country, the dams could no longer satisfy national electricity needs. Most of the new power producers that started operating in Ghana in the early 2000s were thermal stations that rely on natural gas, stockpile light crude oil, and burn heavy fuel oil. Unlike Nkrumah opening the Akosombo Dam, these power producers have not claimed to fulfill the teleological narratives about progress but have instead offered quick stopgap solutions that bring immediate relief to Ghanaian consumers, bridging electricity shortages until a time when the renewable energy infrastructure starts producing electricity for the country.

Between 2012 and 2015, an electricity crisis resulted in unprecedented levels of load shedding, where grid operators interrupted the electricity supply to avoid an excessive load on generating plants throughout Ghana. Power for industries and homes was turned off for twenty-four hours at a time and turned back on for only twelve-hour periods. *Dumsor*, the name given to the crisis, meaning "off and on" in Twi, was brought about by low water levels in hydroelectric dams, disruptions to natural gas flow from Nigeria, and alleged mismanagement of the grid infrastructure. *Dumsor* impacted all areas of life in Ghana. Newspapers reported on the buzzing sound of generators that now characterized Accra's central neighborhoods, yet another stopgap measure that was affordable only to a select few.[12] The reliance on these backup options not only resulted in additional expense for households and industries but also increased fuel consumption, leading to higher energy costs and contributing to environmental concerns. According to the Ghana Employers' Association, about thirteen thousand people lost their jobs. Businesses collapsed. The uncertainty surrounding power availability also deterred foreign investors. Power outages resulted in limited access to essential services, such as health care, education, and communication. Sparking political unrest and demonstrations against the incumbent National Democratic Congress government, the electricity crisis earned Ghana's then president John Mahama the nickname "Mr. *Dumsor*."

Publicized widely in major media outlets worldwide, the crisis jeopardized Ghana's newfound position as a lower-middle-income country.

In response, Ghanaian decision-makers such as Ibrahim saw a further expansion and diversification of the country's energy portfolio as a potential solution to the crisis, shifting the nation's energy production portfolio further away from hydropower and toward fossil fuels. In seeking to resolve *dumsor*, ECG, the sole electricity distributor servicing the south of Ghana, signed forty-three new power purchase agreements with different vendors.[13] "Prices were so high during the emergency," Ibrahim said. "And many of the contracts we signed stated that we would pay whatever we agreed, which was double or more what we would usually pay, say, for instance, eighteen cents per kilowatt-hour for energy that should cost perhaps nine cents, for the next decade. After paying double for a decade, you renegotiate." Critics of these agreements from within and outside Ghana argued that government representatives had aggregated more electrical capacity than necessary in a nontransparent manner. In agreeing to these measures, decision-makers at ECG, such as Ibrahim, found themselves participating in processes that exacerbated the electricity crisis (Mbembe and Roitman 1995, 325).

Regardless of popular narratives on energy transitions and leapfrogging, the future did not always hold the promise of stability for energy professionals in Ghana. Instead, many energy professionals anticipated regular power outages and looked for creative ways to maintain and repair existing systems. Joseph, a senior engineer at the Ghana Grid Company (GridCo), who had been working with the organization for more than a decade, told me that he lived very close to the headquarters of the grid company in Tema because he wanted to arrive at the control room as quickly as possible when a blackout occurred. He prioritized proximity to the control room above all else. A devoted member of one of the most popular charismatic churches in West Africa, Joseph often referred to the teachings of his evangelist-pastor when describing Ghana's energy issues. During our conversation in December 2019, he summarized *dumsor* with an analogy: "Can you kill the devil? The world would be a very beautiful place if you could kill the devil. . . . But you can't kill it. You have to stay away from its control." According to Joseph, unstable flows and increasing electricity costs will continue to characterize the Ghanaian grid for years to come. Despite countless complications, Joseph hoped the new electricity generation contracts would keep the devil away temporarily.

In an insightful article, literary critic Jennifer Wenzel points out that the two terms *transition* and *impasse* characterize contemporary understandings of energy. For her, "Transition refers to the social, cultural, economic, political, and technological processes involved in a society transitioning from one predominant fuel source to another—say, the shift from wood and whale oil to coal and kerosene in nineteenth-century United States or the planetary imperative to shift from energy systems built around fossil fuels to renewables and greener energy sources today" (Wenzel 2022, 155). Where certain fuels and infrastructures acquire social, political, and financial centrality at a particular time but do not necessarily replace former fuels, the moment is one of a transition from fossil fuels to renewable energies. Impasse, however, is "the immobilizing sociopolitical predicaments of the present: that is, everything in petromodernity that stands in the way of energy transition" (Wenzel 2022, 155; also see Simpson and Szeman 2021).

Yet the transformation in energy infrastructure in Ghana followed neither of these trends, appearing out of sync with the imagination of energy in the early twenty-first century. Instead, Ghana experienced an accumulation of various kinds of energy infrastructure with varying and changing degrees of importance to its economy. Each project constituted diverse political rationalities, mobilizing various geopolitical and geoeconomic goals in the process. What has taken place in Ghana since the turn of the twenty-first century, and accelerated as a result of the final episode of *dumsor*, is therefore best understood not as an energy transition or impasse but as energy accumulation (also see Günel 2020).

Paul, an energy specialist I met in Accra in January 2020, recognized the linearity of the dominant energy transition narrative. "Maybe we are transitioning in reverse," he said. Indeed, many of Ghana's generating plants, powered by natural gas and heavy fuel oil, had previously been used in countries like China and Turkey and had been broken down into pieces and transported in cargo ships to serve the Ghanaian grid. For instance, the country's first and largest independent power plant, Sunon Asogli, had been used in China between 1991 and 2007 (figure I.3) The natural gas–fired plant started selling electricity to the Ghanaian grid in 2009 after its value had already depreciated. During a conversation in March 2023, one of the engineers at the Turkish-built Aksa power plant in Tema described their plant as a "museum," referring to how they had collected used Wärtsilä engines from disused power production facilities in Turkey, Sri Lanka, and India and transported them in cargo ships to serve the Ghanaian grid.



FIGURE 1.3. Sunon Asogli turbines, Tema, Ghana, 2019. Photo by the author.

Stranded assets of the energy industry, unwanted elsewhere, found their way to the Aksa plant in Tema's Heavy Industrial Area, only a few miles away from the GridCo office where Joseph worked. These plants may have been replaced with newer, perhaps more efficient plants in their places of origin, but they continued to produce electricity for Ghana and were part and parcel of the global expansion of energy sources described earlier. The infrastructures that were obsolete in other parts of the world became the basis of Ghana's transition in reverse. In some ways, Paul had accepted the linear narrative of a transition and expected a move from fossil fuels to renewable energy resources to take place in Ghana.[14] Yet, given how the energy landscape he had observed closely did not correspond to the expected timeline of energy transition, Paul wondered if Ghana as a country was actually moving backward when it should be moving forward. By arguing that Ghana was transitioning in reverse, he made sense of his environment while keeping his attachment to the seemingly one-dimensional terms of the energy debate. Paul's comment demonstrated how he maintained his investment in energy transition even when the concept of energy transition did not match everyday realities.

But Paul's comment is not only a reflection on Ghana. It also offers an essential corrective to the global debate on energy transitions, demonstrating how such apolitical, seamless, and unidirectional development

is a reconstitution ex post facto of a messy process that rarely finds empirical support. The emphasis on energy transition also obfuscates the empirical transformations that are taking place, obscuring the all-of-the-above approach that fossil fuel company representatives, such as those I quoted earlier in this introduction, advocate and implement. Finally, energy transition narratives prevent the realization of what environmental historian Jean-Baptiste Fressoz (2024, 13) describes as "energy amputation," the challenge of eliminating three-quarters of the world's total energy consumption by stopping fossil fuel use.

While the imagined transition to renewable energy sources is tempting, as it allows humans to extend existing social, political, and economic relations into the future while eliminating carbon emissions from fossil fuels, the evidence suggests that the development of renewable energy infrastructure only minimally displaces fossil fuels (Thombs 2018; see also York 2012). As sociologists Richard York and Shannon Elizabeth Bell (2019) contend, "historically, no established energy source has undergone a sustained decline with the addition of a new energy source. Rather, consumption of all energy sources has typically grown, a trend that has been maintained for over two centuries." York and Bell make a second important point, suggesting that "adding new energy sources may, in some circumstances, actually accelerate consumption of other resources, even in areas outside the energy sector" (2019, 42). Using whales as an example, they overturn a standard narrative regarding how the use of fossil fuels in the last decades of the nineteenth century might have helped whale populations: "the discovery of petroleum did not suppress whale oil consumption, helping to save the whales; rather, it actually spurred a dramatic increase in whaling. This increase occurred because fossil-fuel-powered ships could catch more and larger whales more rapidly than could sail ships and rowboats, and new uses were developed for whale oil (e.g., for margarine after the development of hydrogenation)" (2019, 42). In this context, new fuels such as petroleum contributed to the growth and development of former resources, such as whales, for new purposes. The whaling industry peaked in the 1960s, a century after the advent of fossil fuels, with about eighty thousand whales being killed every year, and only came to an end in the 1980s through the adoption of a moratorium on commercial whaling due to the significant decline in whale populations (Fressoz 2024). Others have echoed York and Bell's critique of the energy transition narrative, suggesting that the term *transition* should be reevaluated, as "the advent of new sources of energy does not lead to the abandonment of earlier sources"

(Gellert and Ciccantell 2020, 216). Instead, energy accumulates, rendering the Ghanaian case emblematic of energy dynamics globally.

An examination of the Ghanaian case also reveals the specific mechanisms that lead to such energy accumulation, adding a critical layer to historical arguments regarding infrastructure and illustrating how all of the above is enacted when it takes place between South-South partners such as Turkey and Ghana. On the one hand, Turkish representatives vouched for fossil fuel–based development perhaps as a necessary evil to allow Ghana to move along a modernization timeline in the way that Turkey had done over the past century and finally catch up. At the same time, Ghanaian representatives perceived Turkish decision-makers as having a more equitable and friendly approach than Global North countries, which have exploited resources across Africa for centuries. This imagination of Turkey's difference from other international actors supported the proliferation of powerships as technologies of deferral, keeping the geopolitics of linear progress alive. In this context, the relationship between Turkey and Ghana ensured an all-of-the-above approach, maintaining fossil fuel–based forms of progress as tools for safeguarding development. In short, the emergence of the Turkish powership demonstrated what liminality without transition might denote.

Why is energy transition such a popular notion? The promise of energy transition acts more as a myth than as an empirically viable explanation. However, the literature on energy and climate change is laden with this perspective and even features a subdiscipline called transition management (see, for example, Loorbach 2007). Much of the scholarship in this field stresses how the world is decarbonizing thanks to advances in renewable energy power stations. According to York and Bell (2019, 41), this labeling is mainly due to a "common mistake made in analyses documenting so-called energy transitions," where scholars focus on "the proportion of the energy supply that is generated from various sources."[15] At the same time, the discourse on energy transition depoliticizes and obscures a wide variety of social, political, and ethical transformations (Kuzemko 2016) and "has narrowed the scope of how anthropologists understand and engage with the ethical dilemmas posed by energy" (High and Smith 2019, 11). Despite its force as an ambition for the future, the idea of energy transition also cloaks how the fossil fuel industry makes claims for its staying power while deferring the phaseout of fossil fuels and seeking to reinvent itself.

Beyond the issues of miscalculation, it is important to remember that the narrative on energy transitions mirrors modernization theories, where

progression through stages of national economic development ensures technological innovation and overall social and political welfare. Modernization theory emerged primarily in the 1950s and '60s to explain how agrarian societies might become urban and industrialized and gained prominence during the Cold War era as a response to the challenges of economic precarity in newly independent countries, such as Ghana. Despite its many limitations, such as its emphasis on Eurocentric and unidirectional transformations, this theoretical framework has had a significant influence on development studies and international development policies around the world. As I argue in this book, it continues to shape global energy politics today.

Perhaps the most well-known theory of modernization, Walt Rostow's (1990) *Stages of Economic Development: A Non-Communist Manifesto* argues that economic development also results in innovative energy systems. Theories of progress such as Rostow's reproduce the assumption that innovation stems from the Global North and only slowly spreads to the Global South, ensuring "takeoff" and "sustained consumption" in these regions.[16] While Rostow did not initially acknowledge the environmental footprint of such stages of development, he points out in the preface to the third edition of his classic work the "strains on the physical environment that global industrialization and urbanization may impose," suggesting how "existing strains on the forests, arable land, and species as well as increasing pollution of air and bodies of water make it difficult to contemplate complacently a more than doubling of global population, with the increase overwhelmingly concentrated in countries likely to be experiencing dramatic increases in those technologies that now carry with them the greatest threats of pollution" (Rostow 1990, xx). All in all, modernization projects categorize people and places in terms of whether they belong to the past or the future (Fabian 1983; Barnes and Matthews 2016). The authors of these theories investigate what the future should hold and provide instructions on how to achieve it.

The narrative on energy transitions reproduces the familiar tropes of these theories, relying mainly on national-scale analyses, seeking technological breakthroughs in the Global North, and hoping that they will be appropriately applied in the Global South. Given the historical context in which the term *energy transition* developed, this alignment is perhaps inevitable. In his book *More and More and More,* environmental historian Jean-Baptiste Fressoz (2024, 142–59) explains how energy transition as an idea did not grow out of empirical analyses of the past but rather projections

regarding the future. Coined by Caltech geochemist Harrison Brown in November 1967, the term *energy transition* emulated the postwar ideal of demographic transition, a theory that mapped demographic stages onto stages of development, propagating the assumption that progressing societies should transition from high birth and death rates to lower ones. If demographic transition offered a toolkit for calculating and managing population growth worldwide by promoting birth control (Davis 1945), energy transition attempted to estimate future energy use and, accordingly, build nuclear capacity (Brown 1967). In its contemporary usage, the idea of energy transition also adds an existential significance to this telos: If countries do not transition to renewable energy, the world loses its chance to mitigate climate change.

Yet it is essential to underline that the definition of energy transition is not static among the representatives of the energy industry. Instead, it derives its force from its malleability and ambiguity. At CERAWeek 2023, one speaker suggested that energy transition now has a different meaning for every context and should not be universalized as a movement from fossil fuels to renewable energy power stations. "In Africa, it might mean moving from burning wood to burning gas," he summarized, placing the African continent in a premodern position on the modernization ladder, "but in other places, it might mean moving to net zero."[17] During the same conference, the current ExxonMobil chief executive officer Darren Woods announced, "Our strategy is to basically do both; as I said, we believe it's an 'and equation,' so we are going to continue to invest in traditional sources of energy and the critical products society needs, but we have also built our business to be flexible where we can invest in emissions reductions" (CNBC Television 2023). At times, the ambiguous definitions of the energy transition narrative also encapsulated the all-of-the-above approach. When I saw Paul again later that month in Accra, he ended our conversation by saying that the transformations in Ghana's electricity infrastructure no longer appeared anachronistic to him.

This does not mean that people in Ghana or elsewhere worldwide are no longer building renewable energy and clean technology infrastructure. In a context where the energy transition narrative remains mainstream, many decision-makers in Ghana hope that the country will leapfrog to renewables and imagine that new business models, technological innovations, and design solutions will support this leap. "Have you seen the solar map of Ghana?" Raymond, then a legal adviser to GridCo, asked me enthusiastically during a meeting in July 2018. An alumnus of the prestigious

Achimota School, where Kwame Nkrumah himself had once been a student (Ahlman 2021), Raymond had earned law degrees in both Accra and Cambridge, Massachusetts, and had written a thesis and later a book about the impacts of *dumsor* in Ghana. My younger sister was Raymond's classmate in Cambridge, and we met for the first time at their graduation in May 2017. During the ceremony, Raymond wore a custom stole marking his Ghanaian heritage in red, yellow, and green. His reputation within the energy industry in Accra is impeccable, and, given his interest in politics, many energy professionals firmly believe that Raymond has the potential to become a future president of Ghana. He summarized, "We are missing opportunities by not building solar here."

By evoking the idea of leapfrogging, Raymond attempted to challenge modernization theory's basic assumptions and to argue against the notion that the countries of the Global South must fulfill specific stages of progress. Yet the prospect of leapfrogging maintains the teleological horizons of modernization theory, offering those who are left behind the seeming opportunity to spring forward while maintaining their roles as disadvantaged participants in a modernization rat race. The preordained path of development remains unchanged by their forward spring. Inspired by novel paradigms of development, Raymond referred to the most commonly used examples of technological leapfrogging, pointing out that people in Africa have adopted cell phones, mobile payment systems, and digital banking applications. Renewable energy infrastructures may constitute the next stage-skipping technology, allowing Ghana to avoid fossil fuels.[18] Like many of his colleagues in Ghana's electricity sector, Raymond celebrated the green financing programs recently offered by some Ghanaian banks, which provide funding for domestic and institutional consumers to build rooftop solar panels. "Once you prove that your project is lowering emissions, your interest rates fall. There are incentives for building solar," representatives at Ghana's CalBank confirmed. Dressed in polo shirts advertising their green financing programs, four CalBank men told me that they offer three- to five-year loans for rooftop solar projects but have had trouble attracting individuals with stable enough jobs for these loans (see chapter 3).

While seemingly contradictory, the emphasis on leapfrogging complements energy industry representatives' insistence that carbon-based fuels will ensure development in the Global South. Both future projections draw on ideas of linear progress, where countries skip from one energy stage to the next, depending on where they are situated on the modernization ladder. Yet financial incentives and technological innovation do not create the

conditions for transitioning from one fuel to another; instead, they result in energy accumulation. How, then, have energy infrastructures historically transformed? The University of Chicago–trained energy economist I referred to previously, in fact, answers this question by invoking the Lake Erie moment—when dire environmental problems spurred popular protest and significant policy transformations—and underlines how policy mechanisms could bring the end of fossil fuels if and when a crisis erupts.

Energy industry representatives concur that the countries of the Global South will drive the future of energy infrastructure in the coming decades. Therefore, it has become ever more important to describe and analyze the social, political, technological, and financial conditions under which corporations and governments deprived of ample resources invest in new energy infrastructures, how decision-makers and users envision their energy futures, what services they are able to afford under existing circumstances, and which infrastructure providers they are able to approach. By answering these questions from an ethnographic perspective, this book seeks to critique liberal assumptions regarding linear progress and demonstrate how South-South relations structure the future of energy and climate change.

Patchwork Ethnography

During my first meeting with Karadeniz executives at their Istanbul headquarters in May 2016, I asked whether I could visit their ships *Orhan Bey* and *Fatmagül Sultan* in Lebanon to learn more about their floating power plants. Although they did not explicitly say no, many people I met in their office that day encouraged me to travel to see their ship in Tema, Ghana, instead because it had played a unique role in the company's expansion. One employee of the company told me how inspiring it was to start working in an African country because the company was "bringing light to places that were dark." Taken aback by their racially charged language and their faith in this developmental mission but encouraged by their openness in guiding me through their projects, I told company representatives that I would visit Ghana in December 2016 and looked forward to meeting their staff there.[19] I had never been to Ghana before. Given various professional and familial obligations in the United States and Turkey, I also knew that long-term fieldwork in Ghana would not be possible. In 2016, I had started a tenure-track position at the University of Arizona and was completing my first book, *Spaceship in the Desert* (Günel 2019), to be eligible for tenure there. Visa and permanent residency applications in the United

States came with travel restrictions that prevented spending extended periods abroad. A long-distance relationship with another academic, known as the "two-body problem," also shaped my professional and personal life. Whenever I could, I traveled to Turkey to visit my family, and I was able to stop by the Karadeniz Holding headquarters in Istanbul in May 2016 and introduce myself to staff and board members there during one such visit. Overall, these conditions were not unique, but they informed my conceptual questions regarding how a researcher's personal life shapes the processes of knowledge production (Günel and Watanabe 2024, 2026). By the time these restrictions were alleviated in 2020, we had entered a new era of COVID-19 shutdowns. In sum, I could not conduct research in Ghana as I had done in the United Arab Emirates, where I had spent several summers and then a whole year documenting and analyzing energy infrastructure when writing my first book. Still, I followed this initial offer to visit the plant and took a three-week trip to Accra. Despite having no experience of doing research in West Africa, I saw this new research site not as a radically unknown place but rather as an extension of the energy, climate change, and infrastructure networks I had examined and cultivated for more than a decade (Howell 2017, 18).

This book draws on ethnographic work on electricity production in Ghana between 2016 and 2023. It also relies on research in Turkey during the same period, working with businesspeople and government representatives who specialize in building or sustaining geopolitical or geoeconomic relations with African countries. In carrying out this project, I have benefited from speaking to energy experts employed at Ghanaian institutions, including the Energy Commission, the Electricity Company of Ghana, and GridCo, as well as to engineers who work with independent power producers such as Beijing Fuxing Xiaocheng Electronic, Meinergy, Sunon Asogli, Aksa, and Karpower to generate electricity for the Ghanaian grid. In some ways, the grid itself (figure I.4) has offered me a map of the people who should be involved in the research, guiding me to spend time with electricity generators, distributors, and users. In the following pages, I examine some critical transformations to the Ghanaian grid in the 2010s and 2020s. The book historicizes the presence of Karpower's ships in Tema Fishing Harbour by documenting their emergence in Iraq (chapter 1). It also charts the powership operators' emphasis on the temporariness of their connection to the grid (chapter 2), looks at the uneven development of solar power stations during a period of electricity excess (chapter 3), and explores how developers of electric vehicle infrastructure

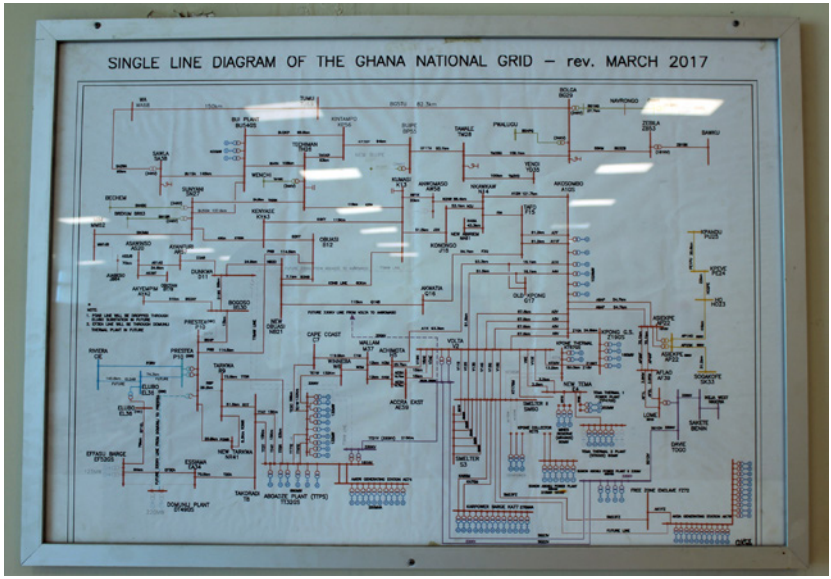


FIGURE 1.4. Single-line diagram of the Ghana national grid as drawn in March 2017, Tema, Ghana. Photo by the author, 2019.

tended to the grid by trying to curb the problem of electricity excess (chapter 4). As I will show, many of the connections I established with actors in these industries stemmed from personal and professional networks outside Ghana and Turkey. One such example is the relationship I developed with Raymond through my sister's graduate program in the United States.

Between 2016 and 2023, I spent about six months in Accra, mainly during the winter and summer breaks. During that initial visit in December 2016, my husband and I stayed with Joe Addo, a Ghanaian architect I had met at an infrastructure- and climate-change-focused event hosted by the Lafarge Holcim Foundation in Detroit in April 2016. Joe had recently opened a coffee shop and gallery called Jamestown Café in Jamestown, Accra. Even though I did not stay at Joe's house on subsequent visits to Accra, I stopped by Jamestown Café regularly throughout my research trips to Ghana. In addition to following Karpower executives in Tema and Accra, meeting people through a diverse array of energy-related institutions and companies in Ghana, and exploring other networks of Turkish expatriates, I saw Jamestown Café as a hub where I could encounter people informally outside these three main groups.

My relationships with Karpower staff had been crucial in facilitating visits to the floating power plant, especially on my first two trips to Ghana in 2016 and 2017. However, my research also benefited considerably from my friendship with Doris Edem Agbevivi, a staff member at the Energy Commission.[20] A colleague I met during an energy-focused event at the European University Institute in Florence, Italy, introduced me to Doris in November 2019. After meeting in person in December 2019 and January 2020, Doris and I continued to chat on WhatsApp several times a week. In April 2022, after we had both been vaccinated against COVID-19, I invited Doris to Houston for a ten-day stay. We also spent time together investigating transport electrification projects in Ghana in March 2023 and shared a hotel room while attending the United Nations Climate Change Conference, COP28, in Dubai in December 2023 (see conclusion). The fact that we navigated a male-dominated industry perhaps strengthened our friendship. Doris and I could interact casually in Accra, Houston, and Dubai and remained in touch with each other regularly. Throughout my research for this project, I rarely joined groups of male energy professionals in such informal activities.

In Turkey, I spent about eight months over seven years researching this project. Having grown up in Istanbul, I had access to an extensive network of people through family and friends. I knew my way around the city and had an apartment in Beşiktaş, a convenient and central neighborhood on the European side. I visited Karadeniz Holding's office in Kağıthane and met with several employees outside office hours. I also toured the Sedef Shipyard in Tuzla, where the company did much of its retrofitting work. Participating in large industry-specific events had been a valuable strategy during my fieldwork on renewable energy and clean technology development in the United Arab Emirates. In extending my research in Turkey, I joined Economic Community of West African States (ECOWAS) summits and Turkey-Africa business gatherings, events that I perceived not only as ethnographically significant sites but also as places where I could meet new research collaborators, such as Turkish businesspeople who had investments in African countries. Beyond these business networks, I met journalists and academics who explored the relationship between Turkey and Africa. One of my journalist friends, Cem, introduced me to press relations experts at Turkey's Foreign Economic Relations Board (Dış Ekonomik İlişkiler Kurulu; DEIK), the organization that manages Turkish foreign business relations and that organized a diplomatic trip I attended in February and March 2018. Most of my research occurred in office towers in Levent,

an established central business district in the European side of Istanbul. Beyond visiting offices, I met some interlocutors for coffee and lunches at malls in and around Levent, such as Kanyon and MetroCity. Some of the businesspeople I came to know had offices in Ümraniye, a growing business center on the Anatolian side that I had never visited before my fieldwork for this project but that was now easily accessible through subway lines. Given the increasing number of residential gated communities in the area, many people in these business communities either lived in or were moving to Ümraniye. Since emigrating to the United States to start my PhD in 2007, I had not spent this much time in Turkey. By carrying out research there between 2016 and 2020, I became refamiliarized with Istanbul's new and ever-changing social, political, and spatial dynamics.

In February and March 2018, I participated in a diplomatic trip to Algeria, Senegal, and Mauritania with the Turkish president, Recep Tayyip Erdoğan, and his entourage, a trip that also informed this book (see Günel 2022a). My participation in the diplomatic trip was made possible thanks to a press relations representative from DEIK, a friend of my journalist friend Cem, who enjoyed having a female US-based Turkish scholar analyze the work that went into solidifying geopolitical and geoeconomic relations between Turkey and Africa. In this context, the press relations representative practiced what political scientists call "street-level discretion," offering an invitation that stemmed from her own political and professional convictions and moral dispositions rather than DEIK's (see Zacka 2017). Because I was the only woman in the business delegation of 120 members, my presence attracted attention and led to the assumption that I was an administrative assistant at DEIK. Still, the diplomatic trip offered opportunities to discuss the geopolitics of floating power plants with businesspeople and government representatives over four intensive days (see Günel [2022a] for a more extensive analysis of this trip), complementing my research in Turkey and Ghana.

While researching this project, I collaborated with anthropologists Saiba Varma and Chika Watanabe on ethnographic research methodologies formulated mainly around what we labeled *patchwork ethnography*. In a manifesto published in June 2020, we defined patchwork ethnography as "ethnographic processes and protocols designed around short-term field visits, using fragmentary yet rigorous data, and other innovations that resist the fixity, holism, and certainty demanded in the publication process" (Günel et al. 2020). Work on research methodologies tends to focus on the changing lives of research subjects, but what if we looked at

how researchers' own lives shape ethnographic practices? Ultimately, we conceptualized patchwork ethnography as a feminist intervention that recognizes researchers' intersecting personal and professional responsibilities and draws on fragmentary yet rigorous data to foster a more inclusive research community. With patchwork ethnography, we wished to reimagine "what counts as knowledge and what does not, what counts as research and what does not, and how we can transform realities that have been described to us as 'limitations' and 'constraints' into openings for new insights" (Günel et al. 2020).

This book seeks to extend this question by drawing on a patchwork of research experiences between 2016 and 2023. These research experiences are supplemented by my daily life in Houston, Texas, where I have been observing the transformations of the energy industry regularly through both private and public events at Rice University's Baker Institute for Public Policy, where I have been a fellow, and attending key energy industry conferences, such as CERAWeek (discussed earlier). In this sense, since I became a faculty member at Rice University in 2019, my home has doubled as a field site, endowing me with unique ways of thinking about energy infrastructure. This book would have looked very different if it had been written elsewhere.

As the following chapters will show, conducting patchwork ethnography allowed me to traverse various vantage points over several years of fieldwork. Broadly, this book is a critique of the idea of linear progress. As I have explained, such illusions situate Ghana behind Turkey and Turkey behind the United States. They place heavy fuel oil infrastructure in the past and solar power stations and electric cars in the future. By conducting research in Ghana, Turkey, and the United States simultaneously and examining fossil fuel infrastructure, solar power stations, and electric vehicles within the same time frame, I could highlight the copresence of these spaces and observe how energy infrastructures transform in a cumulative manner, often in symbiosis with each other. Overall, my research praxis facilitated and reinforced this critique of linear progress, letting me represent various infrastructure projects as interconnected nodes and networks that complement each other rather than existing sequentially. In many ways, patchwork ethnography enabled me to bring all these contexts into a shared present by swiftly moving between them.

Patchwork ethnography has given me the tools to conduct multi-sited research across Ghana, Turkey, and the United States while at the same time

allowing me to analyze the gaps and interruptions that characterize the research process, thereby instilling ethnographic research with humility. This "seam-full" engagement with knowledge production—that is, an engagement that foregrounds the seams in ethnographic research—differentiates patchwork ethnography from multi-sited research, foregrounding how all research happens amid other personal and professional responsibilities. In this book, I seek to show that such fragmentary but rigorous data can and does foster theoretically ambitious claim-making.

I learned about the differences in electricity production by visiting various power stations and, as a US-based Turkish scholar with expertise in energy and climate change issues in diverse contexts, I could communicate with decision-makers using their professional vocabularies. I have mainly asked how new energy infrastructures emerge and tracked the actors who make these emergent infrastructures possible. While much of the scholarship on new energy infrastructure focuses on the Global North, prioritizing European countries (see, for instance, Dracklé and Krauss 2011; Henning 2008; Knight 2017; Krauss 2010), my inquiry concentrated principally on Turkish-built electricity generation infrastructure in Ghana and spotlighted South-South collaboration between Turkish and Ghanaian engineers and policymakers (chapters 1 and 2) as well as Chinese energy professionals in Ghana (chapters 3 and 4). Overall, I am drawn to examining how conceptions of temporality impact energy infrastructure and, therefore, humanity's ability to mitigate climate change.

Chapter Summaries

This book investigates how the all-of-the-above approach finds a footing in Ghana. I show that this approach relies on technologies of deferral, such as the powership at the center of the first two chapters, as well as technologies of arrival, such as solar power stations and electric cars, which form the basis of post-oil modernity and which I discuss in the last two chapters. Yet the proliferation of narratives regarding energy transition obfuscates the empirical realities of the approach, offering modernization timelines that promise to achieve both energy justice and climate justice by replacing dirty fossil fuel–powered technologies with clean ones. Such transformations in energy infrastructure uphold the inequalities between actors from Turkey, Ghana, and elsewhere. Each chapter of this book offers discrete but complementary illustrations of the broad context, bringing together

people and places not always thought of in combination. My priority is to deliver a concise account of energy infrastructure while explaining global patterns in a transformative manner.

I start by delving into Karpower's origin story, exploring the intricate processes involved in creating and sustaining this infrastructure. Many people in the Turkish business community described Karpower's ships as *cin fikir*, a quirky, effortless, but genius idea that circumvents expectations. Chapter 1 documents and analyzes how this *cin fikir* materialized, studying the emergence of Karpower's floating power plants in the early 2000s and tracking how they were integrated into the Ghanaian grid in the 2010s. I suggest that Karpower's powerships took shape as a *cin fikir* intervention, responding initially to military incursions in Iraq and later to power outages in Ghana and beyond, perpetuating a hegemonic global energy order that positions infrastructure in the Global South as requiring ongoing remodernization to remain on a linear developmental path. Within this framework, Karadeniz Holding's *cin fikir* unfolded through two interrelated processes operating across distinct scales, simultaneously mobilizing and transforming geopolitical and geoeconomic relations as well as quotidian labor practices. As a result, fossil fuel–powered infrastructure continued to generate electricity for countries in the Global South, such as Iraq and Ghana, enabling ongoing energy accumulation.

The infrastructural liminality of powerships positioned Karpower as a provider of short-term help that is necessary only until Ghana moves along the imagined telos of energy transitions, thus differentiating Karpower from Global North imperialist actors and imbuing the company with an ethical function. However, installing powerships required long-term, multiscalar connections between Ghana and Turkey, which established Turkey as a soft power in the region and ultimately deferred the promised transition to renewable energy, resulting instead in energy accumulation. These longer-term thick relationships supported and maintained the geopolitical and geoeconomic dynamics associated with a linear timeline of progress—that is, some countries, such as Turkey, are slightly ahead on this trajectory and therefore assist in developing others, such as Ghana. Chapter 2 analyzes how much work goes into maintaining this trajectory, even if it does not fully reflect empirical transformations, especially regarding energy infrastructure.

Chapter 3 segues into Ghana's clean energy future. I document and analyze the emergence of utility-scale solar power stations and rooftop solar panels in various parts of the country and investigate what leapfrogging

looks like materially. I suggest that attempts to leapfrog toward solar energy showcase Ghana's potential to enter the next phase of an emergent modernity, simultaneously reaffirming a linear narrative of progress and representing a "clean" future where cleanliness conveys environmental as well as social and political accountability. In practice, however, the effects of renewable energy power stations have followed the logic of energy accumulation, as these infrastructures are unevenly experienced and ultimately perpetuate and reinforce global and domestic disparities. On the one hand, large-scale solar power projects reproduce global inequities, extending relationships with Chinese investors. On the other hand, small-scale rooftop solar panels create what energy professionals call a "utility death spiral," a spiraling decrease in revenue and increase in costs for the government-owned utility company ECG that reinforces class status and income inequalities, shifting Ghana's solar-powered future from a technological to a financial operation.

In chapter 4, I document the aftermath of excess electricity. A diverse network of actors, including government agencies, established companies, emergent start-ups, and interested individuals with widely varying political and social ideals, reformulated the definition of excess as an opportunity to generate space for the emergence of electric vehicle infrastructure, which could consume the excess electricity on the grid and offer some financial relief to the Electricity Company of Ghana. Despite their different political and social ideals, these decision-makers share specific goals and methods. Most importantly, together they imagine creating a space for electric vehicles and charting new futures that will prevent Ghana from being the dumping ground for old technology, namely secondhand gas-powered cars. In doing so, they push back against the dominant timeline of development, opting instead for new affordable vehicles, such as the Chinese Ora Black Cat, further intensifying Ghana's geopolitical and geoeconomic connections with Chinese companies and looking for a new timeline they can help produce and follow. In certain respects, the campaign to advance electric vehicle infrastructure undermines the established flow of goods associated with the linear energy transition timeline—where Global South countries such as Ghana become sites for the disposal of the Global North's aging gas-powered cars—and unsettles assumptions about the appropriate conditions in which electric vehicle infrastructure can and should emerge. Overall, transport electrification in Ghana has shifted the Global North's sequencing of energy infrastructure development, creating alternative material pathways.

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Cin Fikir

On an exceptionally warm morning in March 2018, I visited the Sedef Shipyard in Tuzla, Istanbul, where *Ayşegül Sultan* had been retrofitted, and met up with Fikri, who had been an employee of the company for more than a decade. A mechanical engineer in his late forties with a strong interest in nautical design, Fikri had collaborated with a small team to plan and build the initial floating power plants in 2008 and 2009. The Sedef Shipyard is the largest private shipyard in Turkey, situated among forty other shipyards of various sizes in the Tuzla neighborhood of Istanbul. At the time of my visit in 2018, it was the only shipyard that housed a 300-ton crane, strong enough to lift the machines that made up the floating power plants. "Between 2000 and 2005, everyone was building ships here in Tuzla; there was such a boom that design units couldn't handle production," Fikri recalled, "but then the 2008 crisis hit, and the shipping industry still hasn't recovered from that shock."

As he guided me through the shipyard, Fikri warned me to beware of the various machines and wires that, for now, were strewn across this vast space and would eventually help assemble their powerships (figure 1.1). Each powership requires about six thousand different types of materials. Some of these materials, such as the scrubbers that capture sulfur from exhaust gas, were easily noticeable in the shipyard. Other crucial components were less detectable by an untrained eye. The parts necessary for building the floating power plants are rarely produced domestically in Turkey. The company



FIGURE 1.1. Sedef Shipyard, Tuzla, Istanbul, 2018. Photo by the author.

either imports them directly from producers around the world or purchases them from distributors who import the products for them and sell them in Turkey. Fikri experienced on a daily basis how capitalist production has become dependent on just-in-time delivery and understood that this was the primary reason maritime transport had acquired its central role in the world today. A just-in-time approach means that products are no longer kept in warehouses but are delivered whenever necessary (see Harvey 1990). In this case, all the products Fikri and his team had acquired were eventually placed on the shipyard floor, enabling the workforce to control their inventory directly. The other shipyards where they retrofitted secondhand ships to transform them into floating power plants all looked pretty much like this, Fikri explained, with parts spread around because the ships accumulated so many more parts on their hulls than regular ships. The most straightforward comparison would be the engine, he said. Instead of one main engine, these ships sometimes had up to fifty engines, mostly imported from Germany and Finland, and had to be equipped with supplementary material needed to support these fundamental units.

Complete with tall, orderly exhaust stacks whose gleam could be seen far away, powerships combine elements of thermal power plants with those of large ships. Many from the business community in Turkey told me in interviews or informal conversations that the floating power plants were a

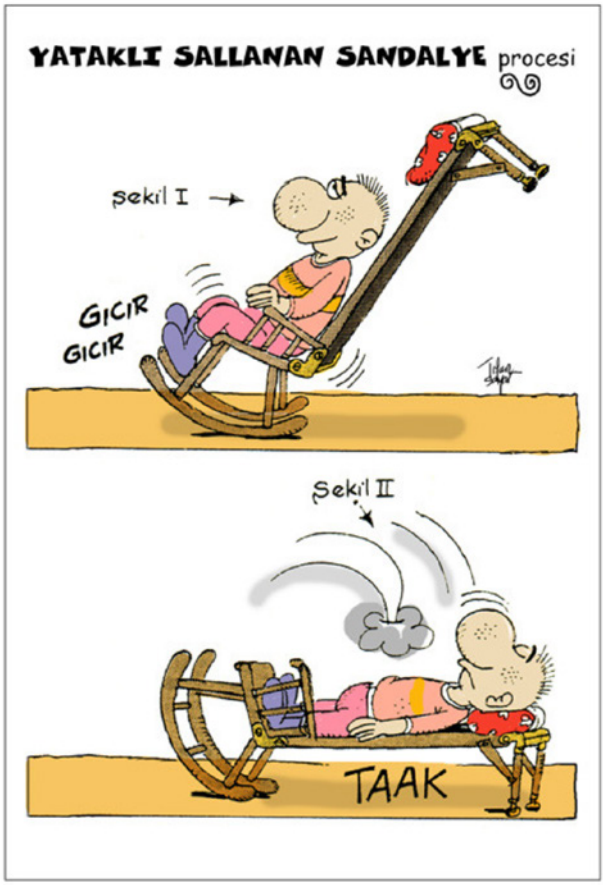


FIGURE 1.2. İrfan Sayar, *Rocking Chair as a Bed*. Cartoon drawings from *Zihni Sinir Proceler Külliyatı*, 2019 © Md Basım.

cin fikir. A rather difficult term to translate, *cin fikir* signifies a quirky, effortless, but genius idea that circumvents expectations and aims to provide a shortcut or to fool others. In trying to define *cin fikir* more clearly, several people referred to a well-known cartoon character in Turkey called Porof Zihni Sinir, created in 1977 for the popular left-leaning *Gırgır* magazine (similar to *Mad* magazine in the United States) by caricature artist İrfan Sayar. A cunning and imaginative professor whose humorous inventions question the relationship between people and objects, Sinir's many projects offered unconventional responses to everyday chores. For instance, in one cartoon Sinir lays out the designs for a rocking chair that doubles as a bed (figure 1.2). In another, a rail car offers services as a construction vehicle (figure 1.3). In these examples, everyday objects serve two rarely combined services at once, echoing how powerships incorporate the capacities

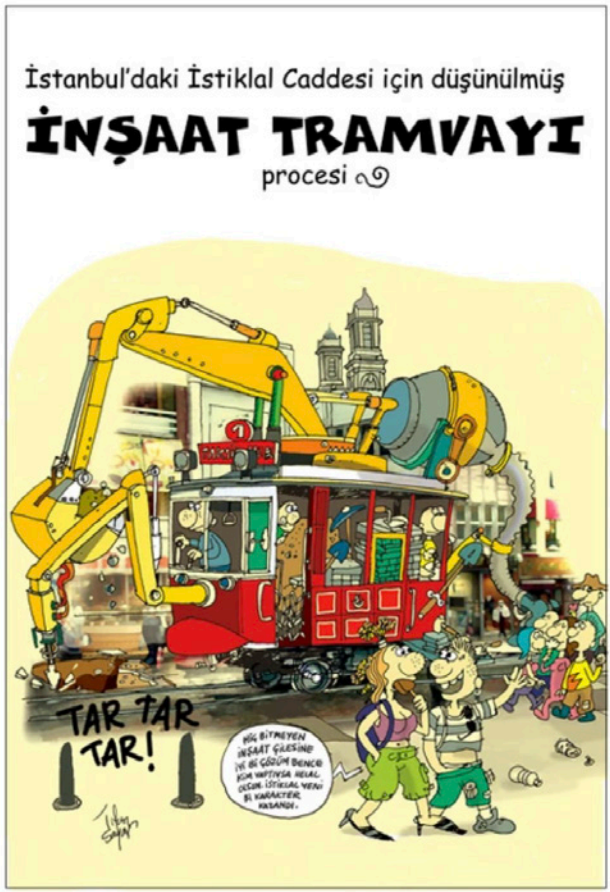


FIGURE 1.3. İrfan Sayar, *Railcar as a Construction Vehicle for Istanbul's Istiklal Street*. The caption reads, "Whoever did this—well done—it's a good solution to the ordeal of never-ending construction. Istiklal has gained a new character." Cartoon drawings from *Zihni Sinir Proceler Külliyatı*, 2019 © Md Basım.

of both ships and thermal power plants.[1] People from the business world in Turkey believe that *cin fikir* in the Karpower case had been somewhat risky but was well timed and eventually successful.

This chapter documents and analyzes how this *cin fikir* materialized, studying the emergence of Karpower's floating power plants in the early 2000s and tracking how they were integrated into the Ghanaian grid in the 2010s. I argue that Karpower's powerships emerged as a *cin fikir* solution, first to a series of military interventions in Iraq and eventually to power cuts in Ghana (among other countries), reinforcing the dominant global energy order, where the energy infrastructures of Global South countries require remodernization to maintain their trajectory on a presumed linear timeline. In this context, Karadeniz Holding's *cin fikir* materialized through two complementary processes operating at different scales, relying on and altering

global geopolitical and geoeconomic relations as well as everyday habits of work. Through such interventions aimed at remodernization, fossil fuel–powered infrastructures continued to produce electricity for Global South countries such as Iraq and Ghana, facilitating energy accumulation (see introduction).

Yet this *cin fikir* was not an end but a means for floating power plant producers. As I will show, Karpower's floating power plants emerged through a series of crises, specifically the Gulf War in 1991, the US occupation of Iraq in 2003, and the Great Recession of 2008. One of my goals in this book is to analyze how the development of energy infrastructure, including floating power plants, has been used to support specific geopolitical and geoeconomic objectives, as social relations are constituted in uneven and exploitative ways across such networks. Scholars have illustrated how such political and financial fluctuations shape infrastructure (Cowen 2014; Khalili 2020), in particular the entanglements between military and civilian projects, and how war produces infrastructure (Guarasci and Kim 2022). In this context, the development and growth of Karpower's floating power plants show how the US military's logistical operations were made possible thanks to corporate support from companies such as Karpower and how these operations in turn empowered select corporate actors. In the process, Karadeniz Holding implemented what many in the energy industry call "plug and play." The company could participate in remodernizing Iraq without building a plant in the country because their plug-and-play features allowed them to maintain their flexibility to remain attached to the grid or to depart if necessary. Karadeniz's public relations efforts also cultivated an affect of attachment, underlining how they were a stabilizing, peaceful, and friendly force, positioning Turkish companies such as Karadeniz as supporters in remodernizing Iraq without participating in the politically contentious invasion. By providing such support and acting independently of the US occupation that decimated Iraq's infrastructure, Turkey also solidified its position as a modern country. The powerships embodied a tension between being flexible and attached, drawing on the opportunities both of these conditions offered in extending their remodernization projects. In the years that followed, as infrastructures of war became common agents in the everyday supply of services, perhaps the planet itself was construed as a space of crisis.

While geopolitical and geoeconomic objectives may seem vast and formidable, they come to life through people's mundane choices. Sometimes these people are formally appointed policymakers, but often they are not. In this case, *cin fikir* was made possible through the everyday habits

that company executives and staff adopted and cultivated in their work, foregrounding archetypal post-Fordist characteristics such as flexibility, agility, and speed as markers of their success. Not only were staff members instilled with the need to be quick and opportunistic, but they also drew on explicit affective relations with the infrastructures at hand (Hoffman 2011; Bear 2014). Such affective attachments to the ships rendered people such as Fikri infrastructural (Simone 2004b; Degani 2022). A mechanical engineer, Fikri dedicated years to project management in shipyards in Istanbul, enacting the principles of just-in-time manufacturing. His decade-long career in the company led to a powership being named after him, rendering his contributions somewhat indelible. That Karpower was a family-owned business created an opening for Fikri whereby he could imagine himself as part of a kinship network that materialized in the form of floating power plants. The ship engineer Mehmet and his crew readied themselves to move on short notice and crafted social events where they tried to efface the differences and to strengthen bonds between various floating power stations. The forms of personhood and labor on and around the floating power plant diverged from those of other ships, such as pirate ships (Dua 2019), fishing boats (Ben-Yehoyada 2017), and container ships (Markkula 2022). In adapting to such processes, the people producing floating power plants also transformed to reflect the physical qualities of the ships themselves. Overall, staff members experienced a productive tension between being flexible and feeling attached, a condition that constituted the basis of their labor practice. I do not view flexibility and attachment as opposite ontological conditions but rather as two separate sets of "internal relations" (Strathern 2018), meaning relations to ships and shipyards that change staff members themselves. This productive tension between flexibility and attachment was pivotal in shaping larger-scale geopolitical and geoeconomic relations, including those between Turkey and its counterparts, such as the United States, Iraq, and Ghana.

In some ways, what I present here is an origin story for this *cin fikir*, which focuses on the ideas and experiences of the people who built and managed powerships, and describes the efforts at producing and maintaining such Sinir-style infrastructure. In doing so, I trace the kinds of relations that the builders and operators of floating power plants leveraged. By following the emergence of floating power plants, I seek to show what *cin fikir* means when espoused by a family-owned business in Turkey and to track how it is implemented. The chapter illustrates how *cin fikir* was made feasible through two complementary processes operating at different scales.

These processes not only drew on and molded global geopolitical and geoeconomic relations but also found resonance in the everyday work habits and affective attachments of individuals involved in the project, which made them infrastructural. All in all, the emergence of floating power plants rendered infrastructure and people both flexible and attached.

These processes underscore the prevailing narrative on global energy hierarchies, where the energy infrastructure of countries in the Global South needs to undergo remodernization to sustain their presumed linear developmental path. As I show in other parts of this book, Karadeniz's temporary flexible infrastructure helped to uphold a linear understanding of energy transition, serving as a liminal infrastructure whose obsolescence was expected to allow for the emergence of a renewable energy and clean technology future (see chapter 2). More broadly, this linear timeline was part and parcel of maintaining the global political order, placing Global North countries at the winning end of a trajectory, with Global South countries continually trailing behind. An investigation into the origin of *cin fikir* reveals one of the many ways of sustaining and strengthening this imagination of progress.

Powerships' Origins in the Crisis of Demodernization

The 1991 Gulf War, the 2003 invasion of Iraq, and the 2008 Great Recession successively created opportunities for Karadeniz Holding to expand its presence in electricity markets, leading to the production of its floating power plants. Originally a company trading heavy industrial machinery, Karadeniz had built its first heavy fuel oil–powered thermal plant in 1999 in Silopi, Şırnak, a Kurdish-majority town on the Turkish border with Iraq and Syria, near the border post of Habur Gate (also known as Ibrahim Khalil border crossing). This small 35-megawatt plant provided electricity to northern Iraq over twelve years through transmission lines that crossed the border, rendering Karadeniz the first private company to export electricity from Turkey.

In 1999, Karadeniz Holding's small 35-megawatt addition was noteworthy for the Iraqi grid. In his thesis "Strategic Attack of National Electrical Systems," Thomas E. Griffith Jr. (1994), then a major with the US Air Force, shows how the Gulf War in 1991 decimated Iraq's electricity production capacity, reducing the grid's 9,500-megawatt volume to less than 300 megawatts, and criticizes US military attacks on national electrical power systems. Unlike other goods, electricity cannot be stockpiled and set aside for

emergency use and had therefore become the primary target of US aerial attacks (see also chapter 2). A report dated October 1991 documents how some of the destroyed infrastructure was repaired using salvaged parts and improvised methods, and how this led to a wide range of safety risks and severely negative impacts on water purification, wastewater treatment, and broader public-health infrastructure (Doleh et al. 1991).[2] In his book *Cities Under Siege*, geographer Stephen Graham (2010, 280–81) makes similar observations: "It has become clear that the wholesale demodernization of metropolitan life in Iraq, a profoundly urbanized nation, in 1991—followed by the sanctions imposed between 1991 and 2003, making it impossible to reconstruct life-sustaining infrastructures—created one of the largest engineered public-health catastrophes of the late twentieth century. Even USAF papers admit that the public-health disaster created by the bombing of Iraq's electricity infrastructure killed at least thirty times as many civilians as did the actual fighting." The effects of US aerial bombings on Iraq's electricity infrastructure in 1991 were so devastating for the Iraqi population that the Gulf War became a notable example, even among representatives of the US military, against aerial bombardment of critical national infrastructure (see, for instance, Crawford 1997). Critics and perpetrators alike agreed that the war had "demodernized" Iraq. In 2002, Karadeniz Holding's subsidiary Kartet, benefiting from the Turkish energy industry's liberalization and unbundling efforts, acquired additional export and wholesale licenses for exporting electricity to Iraq.[3] The military interventions and the remodernization efforts in Iraq that followed facilitated the growth and development of Turkish corporations such as Karadeniz Holding.[4]

The US occupation of Iraq started in March 2003. By then, the Turkish parliament had already voted against assisting the United States in the invasion of Iraq and prevented US troops from being deployed on Turkish territories. As a nineteen-year-old university student, I participated in antiwar demonstrations in Istanbul in the fall of 2002 and spring of 2003, and two years later, I volunteered at the World Tribunal on Iraq, where an international group of activists and scholars came together in Istanbul's Sultanahmet neighborhood to document and discuss the recent history of the war (see Çubukçu 2018). Many in Turkey and around the world interpreted the 2003 invasion of Iraq as an "oil war," although the meaning of the term remained ambiguous for the most part. In analyzing US violence in Iraq, political scientist Timothy Mitchell (2011, 229–30) suggests that the oil industry's persistent goal of manufacturing and preserving the scarcity of oil, and thereby maintaining its high profit margins, could be achieved

only if the oil industry collaborated with particular political forces in oil-producing countries such as Iraq. He underlines that these entanglements indicate not the oil industry's power to manipulate local politics but its powerlessness. In other words, given that the oil industry did not have the political coherence to uphold such scarcity on its own, it had to cooperate with other domestic political forces to help it achieve its goals.[5] This desire to manage an oil supply to global markets and to achieve the necessary levels of scarcity to ensure profitability led to a material context where Iraq had no access to the benefits of its own oil production. Instead, it had to buy modest volumes of electricity from a heavy fuel oil–burning facility in Silopi. In occupying Iraq, the United States attempted simultaneously to manage oil supplies to maintain global capital flows and to position the United States and its allies as the remodernizing force, bringing Iraq back along an imaginary linear development timeline.

In September 2003, six months into the occupation, then energy and natural resources minister of Turkey Hilmi Güler attended the opening of Karadeniz Holding's new larger power plant in Silopi: "This is also foreign policy service. Our country will serve as an island of stability and confidence to this region [northern Iraq]. We see the first steps toward this goal here." In a video recording of the event, he dances *ikiayak* with a troupe of folklore dancers from Şırnak and chats cordially with US General David H. Petraeus, the army commander who had led US troops into battle in March 2003 and who was responsible for the Nineveh Governorate in northern Iraq at the time.[6] Apart from the dancers, all the attendees were men. Echoing the emphasis on peace building, the director of the Karadeniz Holding board, Rauf Osman Karadeniz, suggested, "The energy we transmit will carry with it the love and friendship in our hearts to every house it will light up." He labeled their work "friendship energy" (*dostluk enerjisi*), a slogan that would later evolve into their now well-known motto "The power of friendship."[7] The video recording of the ceremony closes with the governor of the Iraqi province Nineveh and the Turkish energy minister shaking hands on stage while the song "Victory" by the Australian/British classical crossover band Bond plays in the background (Karadeniz Holding 2015). By promoting stability, love, friendship, and victory in a festive atmosphere, these performances created an affect of attachment between corporate actors and the regions they serviced, a sensibility that continued to enliven Karadeniz Holding's future projects. In the meantime, representatives of Karadeniz Holding took on significant roles as foreign policy actors, mediating relations between Turkey, Iraq, and the United

States.[8] As demand in Iraq increased, Karadeniz augmented its thermal production capacity by purchasing electricity from the Turkish grid and continued providing power to the Duhok and Zakho regions immediately across the border in northern Iraq.[9]

In the early years of the invasion, Karadeniz Holding emerged as one of the many contractors the US military supported in rebuilding Iraq, even though the relationship between these actors was indirect (see also Khalili 2020, 243–65). Entanglements between corporations and militaries not only require militaries to create opportunities for corporate actors to provide goods and services but also necessitate active support from these corporations (Cowen 2014). The opening of the Karadeniz Holding facility in Silopi demonstrated how such entanglements extended beyond the border, shaping not only US operations in Iraq but also relations between Iraq and Turkey and, finally, backing particular governmental and corporate actors over others and facilitating their growth.[10] In the process of creating this network, corporations transformed. Ideas of war and security also shifted, allowing the US military to pull loosely associated allies into their process of invading and remodernizing Iraq (Cowen 2014). "In two-and-a-half years, the Iraqi people have made amazing progress. They've gone from living under the boot of a brutal tyrant, to liberation, to free elections, to a democratic constitution," then US president George W. Bush told the Council on Foreign Relations at the Omni Shoreham Hotel in Washington, DC, in December 2005 (Bush 2005).

Across Turkey, public opinion on Karadeniz's projects in Iraq began to take a different turn. In June 2007, an article underlined how Turkish citizens overpaid for electricity to facilitate Karadeniz's exports to Iraq (*Radikal* 2007). In July 2007, a representative of the Chamber of Electrical Engineers of Turkey from Bursa published an editorial claiming that the thermal power stations in Silopi sold underpriced electricity to the Kurdish guerrilla organization and the Turkish government's long-held enemy, the Kurdistan Workers' Party (PKK; Aktuğ 2007). It is possible that the problems these critics identified stemmed from the unbundling and deregulation of the electricity industry in Turkey. Yet nationalist political parties in Turkey often try to take advantage of anti-Kurdish sentiments for electoral gain, especially when they are under threat of losing seats in parliament. The 2005 Constitution had defined Iraq as a federalist state, including an article that recognized Kurdistan as a federal region (see Dodge 2019). This further alarmed Turkish politicians and citizens who feared possible Kurdish independence in the context of Turkey. Soon representatives of the

Turkish opposition party, the Republican People's Party (CHP), echoed the engineer's perspective, pointing out that PKK had bases in northern Iraq. In October 2007, tensions mounted when twelve Turkish soldiers died in an ambush near the Iraqi border. In easing this conflict, Turkish government representatives from the governing Justice and Development Party (AKP) stood by the Karadeniz family. For instance, at the Sixth Turkish Energy Symposium in Ankara in October 2007, energy and natural resources minister Güler responded to these claims by explaining how their contacts in the electricity sector held positions of authority in the central administration of Iraq (as opposed to the Kurdistan Regional Government) and added that they had the upper hand: They could cut Iraq's power supply whenever they wished.[11] The US Embassy in Ankara also helped solidify Karadeniz's position, which it framed as a competent power producer navigating a challenging political context. Electricity production in Silopi continued uninterrupted.[12] Regardless of domestic and regional tensions, the invasion and occupation of Iraq presented a singular opening for Karadeniz Holding, rapidly expanding the company's presence in regional electricity markets. In this context, Karadeniz held a unique position in stabilizing and maintaining Iraq's developmental trajectory—a position reinforced by the Turkish government and the US Embassy. However, these domestic political difficulties evinced a need for formal innovations that would endow them with greater mobility and flexibility as power producers.

As the occupation of Iraq deepened and changed character, the Karadeniz family came up with a new method for selling electricity to the country, finally making claims to their *cin fikir*. The Great Recession of 2008 adversely affected various markets, but the shipping industry was particularly hard hit (Sibilia 2019). The dry bulk freight market, in particular, faced significant challenges as a result of a decline in demand for maritime transport coinciding with an increase in the number of large dry bulk carriers designed to carry vast amounts of unpackaged cargo. According to data from *Lloyd's Shipping Economist* (2009), a monthly trade publication for the shipping industry, the idling rate of the world's dry bulk fleet reached almost 3.7 percent in June 2009, with 354 ships sitting idle while the number of ships sent for demolition and shipbreaking skyrocketed.[13] As more dry bulk carriers became available on the secondhand ship market, prices decreased. Under these dire market conditions, Karadeniz Holding started looking for a ship that could carry their dual-fuel engines.

In early 2009, Karadeniz Holding acquired the freighter ship *Melpomeni* from the Greek maritime company Vulcanus Technical Maritime

Enterprises. Geographer Elizabeth Sibilia (2019, 470) asks, "Ships, as part of the transportation sector, are only part of the production process when they are on the move. How do ships, as forms of fixed capital in the transport sector, produce value and surplus value, and what are the implications when ships slow down or even stop moving?" She describes the processes of shipbreaking in Bangladesh and of laying up ships in Singapore, both of which were widespread strategies adopted by shipowners during periods of downturn in the industry.[14] Karadeniz Holding executives responded to this question in a way that did not correspond to either of these more apparent pathways. Instead, they created a *cin fikir* solution that would service their goal of staying both flexible and attached and allow them to pursue development opportunities in Iraq in the wake of the 2008 financial crisis. By bridging the land-sea distinction, they put together "terraqueous infrastructure" that would enable them to transcend the geophysical difference "between firm land and fluid sea" (Campling and Colás 2021, 27). The tension between mobility and immobility led to the unique spatial conditions of the floating power plants, rendering it a *cin fikir*. In some ways, the ships experienced the same tension that the company employees embodied: remaining flexible and feeling attached.

Originally built in 1984 by the Japanese shipyard Mitsui Engineering and Shipbuilding in Ichihara, Chiba, the 617-foot-long *Melpomeni* changed names and owners several times in its twenty-five-year life. Before arriving in Tuzla, Istanbul, it had belonged to Misr Shipping Company in Egypt, then Bright Star Marine in Malta, and finally Vulcanus. During the Great Recession, when commercial banks significantly reduced the volume of loans to the shipping industry, Karadeniz Holding managed to receive a $130 million loan from the Turkish commercial bank Yapı Kredi and began retrofitting the bulk carrier in the Sedef Shipyard. With twelve German-made MAN Diesel dual-fuel engines in its four holds, the ship acquired a classification as a "special service floating power plant" from the international certification agency Bureau Veritas and promised to shape the future of electricity production (Maritime Directory 2010). Sharon A. Wiener, the US consul general to Turkey, wrote in February 2010, "The mobile sea-based power plant tracks with Karadeniz's stated desire for now to not actually build anything within Iraq (too complicated) but rather to continue the company's profitable relationship with the Iraqi Ministry of Electricity (the Iraqi Minister of Electricity, Karim Wahid al-Aboudi, was the Commissioner of Electricity under the Coalition Provisional Authority and

Karadeniz's relationship with him extends back to that time)" (Wikileaks 2010).[15] As the US Embassy cable demonstrated, the *cin fikir*'s temporary and flexible status allowed the company to stay out of Iraq while continuing a profitable relationship with the Iraqi foreign ministry and helping the United States reinforce a remodernization trajectory in the occupied country.

The company's first floating power plant, *Doğan Bey*, arrived at Umm Qasr Port in Basra, Iraq, in May 2010 and began producing 126 megawatts of electricity for the Iraqi grid. In 2010, Umm Qasr was not just Iraq's only deepwater port and its one maritime connection to the Arabian Gulf but also, as the former site of Camp Bucca, the largest US military detention facility in occupied Iraq until its closure in January 2011, the planned location for Basra Logistics City (Cowen 2014, 167–70). In their new form as floating power plants, electricity production facilities had become appendages that could expedite the construction of logistics cities, such as the one proposed in Basra.[16] As infrastructural spaces, they constituted pillars of what architect Keller Easterling (2014) labels "extrastatecraft," serving the interests of both the US and Turkish governments simultaneously. In August 2010, *Rauf Bey*, a second floating power plant with a 179-megawatt generation capacity and, like *Doğan Bey*, sailing under a Liberian flag (see Khalili 2020, 238; Appel 2019), arrived in Basra, offering electricity to about one million people in and around the Al Zubair district and bridging shortages. The floating power plants stayed in Iraq for five years, departing only in 2015 as the Islamic State (ISIS) claimed political control of the country.[17] Perhaps there is an irony in how such remodernization campaigns came to an end with the emergence of a force such as ISIS, deemed the opposite of modern by many.[18]

By 2010, Karadeniz Holding's energy infrastructure had reached its *cin fikir* form, escaping territorial confinement and seeking to transcend the distinction between land and sea. Keep in mind that the capacity and desire to ship oil across the oceans by the boatload had created the war-torn Iraqi ports in which the powership materialized. In other words, powerships were created to solve crises that were ultimately born from the capacity and desire to control oil shipments. The floating power plants soon started operating in various countries across the Global South, including Ghana, burning fossil fuels. Iraq offered a test bed for such infrastructure, allowing the company to experiment with this spatial arrangement. Next, their staff, some of whom moved from Iraq to Ghana, had to adopt and cultivate the necessary habits.

The Tension Between Flexibility and Attachment

Despite the overall perception of their work as *cin fikir*, Karpower executives did not think that floating power plants were particularly novel. In a Facebook message to me in 2017, Fatma, a third-generation board member who usually represented the company's stakes abroad and in the media emphasized that powerships were not high technology: "It is not rocket science." According to Fatma, powerships were composed of multiple engines that burned heavy fuel oil or natural gas. The ships incorporated a variety of power generation equipment, such as gas turbines, diesel engines, and steam turbines. These turbines were then connected to generators to convert the mechanical energy they produced into usable electrical energy. To operate these turbines, powerships required a consistent fuel supply, such as natural gas or heavy fuel oil, which was stored on board and replenished through pipeline connections or periodic deliveries by tanker ships. Designed to attach themselves seamlessly to domestic electrical grids in the countries they serviced, powerships contained the necessary infrastructure, including transformers and transmission lines, to transfer the electricity generated from the ship. Moored in ports deeper than five meters, the vessels look sturdy, substantial, and functional. Fatma reiterated that this was old technology that had not changed much in the past one hundred years. Rather than building these power stations on land, Karpower chose to place them on secondhand bulk carriers. This made them safer, more mobile, and easier to manufacture, and finally produced flexible infrastructure. Other employees of the company, including Fikri, agreed with Fatma's perspective. Another top executive argued that powerships have actually been around since the mid-twentieth century, when the US military took up the technology.

A good example was the USS *General S. D. Sturgis*, which was launched in 1943 as a navy transport ship and was repurposed in the 1960s with the installation of a nuclear reactor in its hull. Dubbed the MH-1A (short for mobile high power, first of its kind), the floating power plant was towed to the Panama Canal Zone in 1967, where it provided electricity until 1975. Compared to the Karpower ships in Ghana, such as *Ayşegül Sultan* or subsequently *Osman Khan*, MH-1A generated a very small supply of electricity, only 10 megawatts. Between 2014 and 2019, the ship was decommissioned and dismantled in Galveston, Texas, and its remaining parts were broken apart and recycled as scrap in Brownsville.[19] Perhaps the continuity between US military operations and Karpower ships is not a coincidence.

In the previous section, I demonstrated the links between the US military and Karpower's emergence, tracking how the Gulf War and the invasion of Iraq had presented opportunities to the company. Karpower executives emulated the MH-1A prototype, but rather than building nuclear ships from scratch—a model that would have been too expensive, too dangerous, and too slow for both the company and its lessees—they retrofitted old ships, mainly bulk carriers that were sitting idle after the Great Recession, to serve as platforms for heavy fuel oil—or natural gas–based power generation. Analyzing what late capitalism looks like from the perspective of its participants, anthropologist Daniel J. Hoffman (2011, 46) argues that its processes require people "to seize opportunities as they present themselves, to quickly react to the unexpected and to make the most of what chances go flashing by. To innovate, experiment, and bluff. . . . The opportunist profits when he can make these judgments quickly, a skill that most learn on the job but with which a lucky few are born." It is difficult to assess whether the people who built powerships learned how to take advantage of wars and financial collapse on the job or were born with the skill. However, the company crafted solutions by using the resources at hand. Overall, Karadeniz Holding benefited from the crises of demodernization in Iraq, which resulted from US wars, and took inspiration from US military infrastructure in doing so.

At the time of our tour in March 2018, the Sedef Shipyard housed five floating power plants of different sizes at various stages of construction (figure 1.4). Their production methods allowed a variety of ships to be built simultaneously. According to Fikri, the powership industry had kept the ship designers and shipyards alive since 2008. Besides some prized military vessels contracted by the Turkish government, the Hat-San, Gemak, and Sedef Shipyards had been relying on the production of powerships for their sustenance over the previous ten years.[20] As their workload grew, Karpower had also begun working with multiple ship design companies, including Artı, SEFT, and Navis, all headquartered in the Tuzla neighborhood of Istanbul. In addition to keeping shipyards and ship designers busy, the company hired ship engineers and crew to work at various intervals on floating power plants worldwide. The projects had also allowed Karpower to open its own shipyard in Yalova, Turkey, about forty minutes southeast of the Sedef Shipyard by car. Perhaps not surprisingly, the Karpower personnel worked in a floating office in Yalova.

While he walked with me and described in detail the history of their operations and the functions of what we saw, Fikri was also continually



FIGURE 1.4. Sedef Shipyard, Tuzla, Istanbul, 2018. The bright-yellow crane used in the building process reads "Sedef: Önce Emniyet," meaning "Sedef: Safety First" in Turkish. Photo by the author.

pulling tags from the materials assembled there and complaining to those he encountered on-site that these items had been mislabeled. Whenever there were leftovers from projects they had completed, he would transfer the materials from one project to another on his computer and ask on-site workers to retag them accordingly to give him a more accurate sense of what he would need to order for their next project. For instance, the tag KP-50 referred to *Deniz Bey*, a floating power plant that had already been completed and sent to Gambia to start producing electricity, but there were still materials lying around the shipyard with this label. According to his digital organization, the materials now belonged to KP-19, the largest of the five floating power plant projects under construction in the shipyard. Fikri used our tour as an opportunity to ensure that the contents of the shipyard matched his digital inventory.

By tinkering with the shipyard, Fikri demonstrated not only his careful management of the site but also the flexibility of the operation. Sometimes, even SAP, the project management software he had been using for some time, could not keep up with the speed at which decisions were made and at which large quantities of materials were moved from one place to another. This is why Fikri often monitored the four shipyards in person. His

strategies resembled what anthropologist Michael Degani (2022) describes as "modal reasoning," that is, actively investigating and evaluating claims about what is possible, impossible, necessary, and contingent, and making self-correcting decisions based on such contextual and embodied experiences. In the context of the shipyard, Fikri's modal reasoning made up for the missing links in post-Fordist calculations, correcting project management software such as SAP, and eventually assisting with the geopolitical and geoeconomic project of exporting electricity. Although his family lived in Bostancı, a more central neighborhood in Istanbul, a forty-minute drive from Tuzla when there is little traffic, he rented another apartment closer to the four shipyards and spent most of his week there. Staying close to Tuzla allowed him to refine his modal reasoning by always being close to the shipyard and hence able to respond to potential problems more quickly. Tuzla becomes crowded over the summer, as many Istanbul families keep second homes in the seaside neighborhood. During the time he spent in and around the shipyards, Fikri had seen many cafés and restaurants open in malls. As we had lunch in one of these restaurants, he admitted how he disliked Istanbul and all the Istanbul-style places that Tuzla now had on offer. He found the spaces of production, where he had a predesignated role, much more comforting.[21] His affective and professional attachment to the ships helped ensure that their operations remained fast and agile.

At the end of our lunch that day, I asked Fikri if he had a favorite ship. He had worked on all forty-three ships and knew them intimately, so I wondered whether he had a preference.[22] As if he had been waiting for this question all along, Fikri proudly confided in me that the company had named one of its service vessels after him—and, sure enough, that was his favorite ship. Many of the ships were named after family members (Fatma, Şahin, and Kartal), some of whom had prominent roles in the company. A few were named after dedicated employees. Through his commitment to the machines and decade-long wanderings around shipyards, Fikri himself had transformed into a floating power plant, subsumed by these generator ships. Perhaps his affective attachment to the vessels extended the kinds of affective attachments his bosses had started cultivating when they opened the electricity generation plant in Silopi years ago.

Pacing around the shipyard, Fikri demonstrated the how and why of just-in-time management. Instead of placing the various elements that constitute a powership in a warehouse, Fikri followed a model of production that relies on and reproduces the seamless movement of goods across space. Analyzing just-in-time production in West Africa, anthropologist

Daniel J. Hoffman (2011, 52–53) explains how it does not rely on disciplinary regimes or discrete institutions but rather requires subjects that are able to adapt and move between spaces seamlessly. Fikri's flexibility was essential for the development of the floating power plant, evidencing the significance of his movements alongside the movements of other Karadeniz executives and staff. His ability to be present in Tuzla with his team, to make sure that the digital space of the computers matched that of the shipyards, enabled the six thousand materials strewn around the shipyards to be documented and appropriately organized. This style of producing temporary power stations also differentiated them from their competitors: It allowed them to have all their materials on one site and to easily transfer them from one project to another without physically changing their location. In producing floating power plants, Fikri relied on and reproduced various logistical networks and trade relations, trafficking six thousand different materials through Turkish customs for each vessel. Overall, the tension between flexibility and attachment that Fikri embodied enabled a *cin fikir* response to the crises of modernization discussed in the previous section, thus maintaining the idea of linear progress and the global order associated with it.

Beyond his flexibility, Fikri's affective dedication to the ships allowed him to perform as effectively as well-regarded project management software. Not only did he mimic and, in his opinion, improve the software, but he also prided himself on having a ship named after him. The naming of the ship symbolized his company's appreciation of his work and somehow signified his inclusion in the Karadeniz family. Having a ship named after him further bolstered his affective attachments while rendering him infrastructural (Simone 2004b; Degani 2022). His excitement about the ship's name was perhaps an indicator of his desire to become a technological object that travels around the world producing instant power. By giving a powership his name, Fikri became a bit like a powership.

Aboard the Flexible Yet Attached Powership

In December 2016, as the electricity crisis in Ghana was coming to an end, Fatma put me in touch with Karpower's crew in Tema and asked them to guide me through their projects during my upcoming trip to Accra.

I had met executives, including Fatma, from Karpower for the first time in their company headquarters in Kağıthane, Istanbul, earlier that year. A nondescript modern building with a glass facade, the company headquarters was

walled off from the uneven urban development that characterized Kağıthane. The building reminds visitors of the Koç Museum, a private museum in Istanbul inspired by the Henry Ford Museum in Detroit and dedicated to the history of transportation. Like the Koç Museum, the Karadeniz headquarters features an array of classic cars in its ground-floor lobby. Perhaps the Karadeniz family had looked to the Koç family as a model. The only Turkish company featured in the Fortune 500 index in 2020, Koç Holding had grown drastically in the 1980s, during Turkey's first wave of neoliberal transformation. In terms of specific geopolitical and geoeconomic interests, Turkey constituted a bridge between the slowly collapsing Soviet Union and capitalist Europe and North America, and large family-owned holding companies such as Koç Holding managed to establish themselves as the pylons supporting that bridge. Karadeniz Holding extended this geopolitical and geoeconomic project in a new direction.

By 2016, Karadeniz Holding had a history of servicing countries such as Iraq by participating in building energy infrastructure in places that needed to be brought back into the timeline of linear development. In Iraq, military interventions had led to the so-called demodernization of the country, which created an opportunity for Karadeniz to intervene. In Ghana, the reasons for such demodernization were perhaps more ambiguous, but, regardless, there were opportunities for Karadeniz to help remodernize Ghana, by putting an end to the persistent power cuts that had characterized the country in the early 2010s.

Fatma had a degree in economics and philosophy from a college in upstate New York, and we had initially met online through a friend who had studied with her there. Her maternal grandfather had started Karadeniz Holding in the late 1940s, and the company had done well over the years, but it had never before garnered the attention it was receiving today, thanks mainly to its powerships. A magnetic executive, Fatma had been a college student in the United States during the initial years of the project, when *Doğan Bey* and *Rauf Bey* were retrofitted in the Sedef Shipyard in Tuzla. As a promising young woman, she stood out among global male energy professionals. By the time I visited her office in May 2016, she had acquired extensive experience in the energy sector. She regularly gave interviews to newspapers about powerships, appeared in international media, and knew how to talk about floating power plants with different stakeholders. Since 2009, Karadeniz Holding has been building and leasing floating power plants to various countries, including Iraq, Lebanon, Pakistan, and Indonesia. But, from Fatma's perspective, *Ayşegül Sultan*'s arrival in

Ghana's Tema Fishing Harbour in December 2015 marked a turning point in the company's growth and development, signaling Karpower's entry into the energy-hungry African market. This move facilitated an expansion to Zambia, Sierra Leone, Mozambique, and Gambia, among other countries. Fatma suggested that I schedule meetings with Serkan, who had been hired as their country director in June 2016, and take a tour of *Ayşegül Sultan* with the guidance of the ship's trusted chief engineer, Mehmet.

Once the ship was ready, Karadeniz Holding representatives explored staffing options. *Ayşegül Sultan*'s first chief engineer, Mehmet, had worked on ships all his life, operating and maintaining propulsion plants and support systems on maritime vessels. After receiving a degree in maritime engineering, he had taken up positions on oil tankers and other high-risk ships for about fifteen years. When one of his contacts from the shipping industry joined Karadeniz Holding, he forwarded Mehmet's résumé to the company and facilitated his employment as chief engineer for the initial barge in Basra. When the Iraq operation ended in 2015, at a time when ISIS had control of significant portions of the country, the company asked him to move to Tema and run their then-largest ship, *Ayşegül Sultan* (Wilson Center 2019). Like the ships themselves, Karpower staff had to be mobile and flexible. Mehmet was given short notice but was willing to go wherever the company sent him, complying with the demands of just-in-time production.

Named for a member of the Karadeniz family, *Ayşegül Sultan* had formerly been called *Sainty No 10* and had been used for transporting parts of bridges and offshore plants in the Netherlands. In 2015, Karadeniz Holding engineers retrofitted the 459-foot-long vessel in the Sedef Shipyard, the same shipyard where they had retrofitted *Doğan Bey* and *Rauf Bey*. The new *Ayşegül Sultan* would be fitted with twenty-four dual-fuel engines purchased directly from the Finnish manufacturer Wärtsilä and would produce 235 megawatts for the Ghanaian grid. Although the ship itself was secondhand, it was important that the engines were brand-new. Given the volume of secondhand commodities flowing into the country, Karpower executives did not want Ghanaian authorities to think that they regarded their country as a dumping ground for unwanted goods (Beisel and Schneider 2012; see chapter 4).

Ayşegül Sultan's arrival in Tema marked its removal from standard maritime transportation networks, but it did not mean that the barge no longer served logistical purposes. On the contrary, it had acquired a very specific function as a floating infrastructure for electricity generation in Ghana and

would later serve the Senegalese grid. By offering electricity to national grids, *Ayşegül Sultan* was creating new spaces, structures, and infrastructures alongside various hierarchies of labor.

Yet Mehmet's choice to travel from Basra to Tema reflected a certain kind of pragmatism. In her work on river pilots in the Hooghly River, anthropologist Laura Bear (2014) argues against "large-scale temporal fixes," demonstrating how time management is piecemeal and is defined by heterogeneity across spaces of capitalist production. Instead, Bear foregrounds the ethical and affect-driven practices that shape labor. Such affect-driven practices also characterized Mehmet's career path: He was happy to leave war-torn Basra, where he had had minimal independence and mobility, and excited to arrive in Ghana. Fikri had given me a similar explanation of why he spent more time in Tuzla each day—that he found the spaces of production more comforting. Despite being given short notice, Karpower employees such as Mehmet and Fikri were able to satisfy these expectations while improving their lives. These employees embodied a productive tension where they remained both flexible and attached.

"After Basra, Tema is like heaven," Mehmet said, offering me Turkish coffee in the ship's cafeteria. Tema was, famously, planned as an urban backdrop to the emerging port in the 1960s by the Greek architect and urban planner Constantinos Doxiadis, who was known for designing cities such as Baghdad, Riyadh, and Islamabad (see Chalfin 2023; Menoret 2014). But from the ship, all Mehmet saw was the heavy industrial area that stretched beyond the fishing harbor, a set of refineries, aluminum smelters, and power plants. Ghanaians I met often complained about the heavy traffic and the deteriorating road network there. In contrast to the impervious gray industrial zone seen through the window, the room where Mehmet and I sat was decorated with images of divers in tropical waters and sandy beaches. The cafeteria was named the Turquoise Room, reflecting the room's oceanic decor and referring to its origins in Turkey. Other walls were adorned with a flat-screen television, which the staff regularly used for videoconferencing; an image of Mustafa Kemal Atatürk, founder of the Turkish Republic; and photographs of other powerships that operated around the world. "When I landed here, I called my wife and told her I landed in heaven," Mehmet told me. His wife had remained in Istanbul throughout the years he worked on ships, maintaining their home and raising their children. This was an arrangement he shared with many of his coworkers. Such kinship and gender relations, which rely on floating husbands

and homebound wives, enable the development and maintenance of the kind of infrastructure that had carried Mehmet from Basra to his heaven in Tema.

"In Basra, the yellow of the desert extended as far as the eye could see, and we occasionally came across toppled tanks; we couldn't distinguish the barracks where we lived from the rest of the landscape," Mehmet continued. Given mounting safety concerns, Mehmet rarely left the ship and the compound in Basra. On those rare occasions, such as when he had to travel to the airport to fly home to Istanbul, a convoy of security vehicles accompanied him. "Everything was covered with the yellow of the desert," he recalled. In Tema, by contrast, the powership was located in the fishing harbor, surrounded by active fishermen operating ships that mostly belonged to Chinese-owned companies such as Shandong Zhonglu Oceanic Fisheries. Given his position as chief engineer, Mehmet did not live on the ship but had an apartment in Tema, which the company leased and managed. When they had free time, ship engineers and technicians like Mehmet enjoyed listening to live music and having drinks at popular venues such as Afrikiko in central Accra, only about an hour and a half from where the ship was docked. Ghana felt relaxing to Mehmet. Ghanaians were friendly. "There is no road rage here, for instance," he said, exemplifying what he meant by friendliness and comparing Accra and Tema to Istanbul. Soon his wife would join him there. They would be hiring more people in the next few months after the 470-megawatt *Osman Khan* arrived in Ghana, doubling the floating power plant's capacity and Mehmet's responsibilities.

Mehmet agreed with Serkan that the ship's compact organization was its most significant feature (see introduction). "We do everything here on the barge," he said. "The maintenance man comes here. We cook our own food. We only receive raw materials from the outside" (figure 1.5). While Mehmet worked on specific aspects of power generation, such as ensuring fuel quality, with Ghanaian mechanics and chemists who had no background in shipping, most of his crew—about 120 of the 180 people on the ship—consisted of engineers from Turkey. Mehmet outlined what had attracted Turkish ship engineers to this career shift to energy: "First, they are paid energy-industry salaries and make more money than ship workers." At a time when the US dollar was gaining significantly in value against the Turkish lira, engineers on the floating power plant benefited from receiving their salaries in US dollars, which gave them an added advantage in supporting their families back home in Turkey. "Second, they are not actually on the sea," Mehmet continued. "Some of them have the luxury to leave in



FIGURE 1.5. Workers carry Bel-Aqua brand drinking water into the powership, Tema, Ghana, 2016. Photo by the author.

the evening and sleep in a house." There was an element of satisfaction in Mehmet: He understood his work to be both innovative and impactful. He wiped his mouth with the back of his hand to brush off any Turkish coffee grounds.

The sixty Ghanaian employees followed a relatively different rhythm from those who lived on the ship, however. Managers at power stations often reminded me of how their Ghanaian employees were members of the Industrial and Commercial Workers' Union, the largest union in Ghana, and whose work was therefore governed by different regulations, which did not apply to the staff from Turkey. For instance, Ghanaian employees were harder to lay off, and their hours of work were monitored and dictated by the union. But when I asked a manager at the Turkish energy company, Aksa, whether the Ghanaian employees ate together with the staff from Turkey in their thermal power plant in Tema, he grew impatient with my question: "Of course, they eat together—we do not have apartheid here!" Then he pointed out how two kinds of food were available in the cafeteria, reflecting Ghanaian and Turkish cuisines (figure 1.6). Karpower's cafeteria also followed the general principle of serving food from two distinct national cuisines with little overlap.[23] Over the years, I found the opportunity to try and enjoy the Ghanaian and Turkish food at both Aksa and



FIGURE 1.6. *Ayşegül Sultan*'s cafeteria, Tema, Ghana, 2016. Photo by the author.

Karpower cafeterias. Aside from the time spent together at social occasions, the employees' national origins determined their employment experiences on the ships. While Turkish engineers like Mehmet were mobile in their employment, at times relocating from one floating power plant to another, I did not hear about any Ghanaian staff moving to Karpower jobs in other countries.

Sailor discipline and hierarchy helped organize the ship, which meant that everyone was always on standby, ready to attend to a maintenance issue or any type of emergency. The physical characteristics of the powership, which prioritized flexibility and attachment, required such just-in-time labor forms. All the Turkish employees spent ninety days aboard the ship and had twenty-three days to go home for holidays. They did not have weekends. One of the ship engineers told me in July 2018 that he enjoyed this dedication to a single ship, as it allowed him to get to know the machine closely. "As a sailor, I was never allowed to spend more than six months on one vessel," he explained. "I signed up for the longest journeys so that I could have more time on one ship." His experience in Tema allowed him to cultivate an intimacy with the ship that he had been forbidden to develop as a sailor. Despite a career that often rendered him mobile, this intimacy made him feel moored. Like Fikri, who found comfort in the shipyard, this sailor harbored strong affective attachments for the vessels

he inhabited. During their time in Tema, the ship engineers always worked in the same way they would have done on a regular ship. "But this is a ship without a captain," Mehmet said. "As the chief engineer, I am the highest-ranking officer on board." As the crew's leader, Mehmet helped sustain what Appel (2019) describes as "internal self-containment," assembling reusable, mobile, and impermanent parts and people that can be implemented in various contexts.

Mehmet's duties were not without joy. He told me that they would soon be hosting an international party for New Year's Eve, celebrating the arrival of 2017 alongside the global staff for powerships despite significant time differences. They planned on serving alcohol at the upcoming party, which was a departure from the norm, as the ship's staff were typically prohibited from consuming alcohol on board. Serkan, the director of Karpower's Ghana office, added, "The party won't be held at a conventional dinner hour; it will resemble a late brunch." Staff members were to select the band and decorations that would transform the Turquoise Room, the main cafeteria on the barge, into a suitable party venue. Instead of hiring a catering company, the existing Turkish chefs, who were responsible for the ship's daily meals, would also prepare the party food, which meant that they had some busy days ahead. Additionally, they needed to acquire permits for the live band to ensure their smooth entry into the harbor. Given all the work that went into preparations, some of the staff in Tema saw this work as *angarya*, meaning burden or drudgery in Turkish. (In 2016, a celebration over teleconferencing had seemed onerous to those who were able to spend time with friends and family in person. At the time we did not know that we were to engage in such long-distance communication throughout the COVID-19 pandemic in 2020, 2021, and beyond, attending birthday parties and dinners over such video calls.) But others were excited about the party. Many of the people on the ship had very few occasions to socialize.

Across the floating power plants, standardization of equipment, tasks, and personnel did not necessarily denote homogeneity. Not only did the ships differ formally and have different histories from each other, as exemplified by the varying trajectories of *Ayşegül Sultan* and *Doğan Bey*, but the contexts in which they operated also led to variations in the way they were integrated into the Karpower network. While *Ayşegül Sultan* would start the party at 2:30 p.m., the five barges in Indonesia—*Zeynep Sultan*, *Nezih Bey*, *Onur Sultan*, *Gökhan Bey*, and *Yasin Bey*—would be joining the teleconference at 9:30 p.m. These five powerships had begun producing electricity in Amurang, Medan, Kupang, and Ambon across Indonesia in

2016 and comprised an essential part of the Karpower fleet.[24] Leading the party arrangements and overseeing interactions between different branch offices, the head office in Istanbul would be starting the reception at the more acceptable time of 5:30 p.m. Overall, the party created a space to demonstrate how flexible movement across the ships, and therefore across the world, could be achieved while maintaining an attachment to the staff and infrastructures that constituted Karpower. By embodying this tension between flexibility and attachment, Karpower could participate in modernizing Ghana according to geopolitical and geoeconomic norms and expectations.

The floating power plant offered the Turkish ship engineers a lifeworld, forcing them to retool their existing expertise as ship engineers and requiring them to adapt to new social arrangements such as the teleconference party. Having been trained initially to work on oil tankers and high-risk ships, engineers like Mehmet now managed power facilities. As ships transformed into generators, ship workers became power plant operators, bringing with them specific modes of professional practice. Some engineers also signed up for online degree programs at US universities, using their time on the ships to equip themselves with additional skills. In some ways, the transition from ship engineer to power plant operator had been seamless for engineers such as Mehmet. The ships he had worked on before had also operated on Wärtsilä engines from Finland or MAN engines from Germany. He knew how to maintain and repair them. He also knew how to organize and manage a team of ship engineers. Mehmet proudly told me that if they organized their crew, machinery, and maintenance facilities properly, they could run and manage their plants without disruption for a very long time. Staff members' activities became infrastructural, enabling power generation, because they produced and sustained a lifeworld that depended on their everyday habits, and that in turn generated a specific kind of personhood associated with these ship-cum-generators.[25] These engineers' everyday habits created openings that sustained the imagination of linear progress, allowing them to insert themselves into the so-called remodernization practices of Iraq and Ghana, among other places, and eventually extending energy accumulation.

Despite its rapidly mobilized organization, *Ayşegül Sultan* was dependent on fuel deliveries from third parties, using about 1,000 tons of low-sulfur heavy fuel oil per day. Given that the ship could hold only 4,300 tons of fuel, it needed to be refueled every three to four days by a shuttle barge called *Suat Bey*. In a trip that took sixteen hours, this barge brought heavy fuel oil from a mothership located off the coast of Lomé in Togo (figure 1.7). It took about



FIGURE 1.7. *Suat Bey* sails toward the powership, carrying heavy fuel oil, Tema, Ghana, 2016. Photo by the author.

fourteen hours for *Suat Bey* to unload the heavy fuel oil, which meant that it needed to move continually between the mothership and the floating power plant. Mehmet noted how fortunate I was to be aboard *Ayşegül Sultan* on this particular day in December 2016, when *Suat Bey* would be delivering heavy fuel oil to the barge, and I could watch the seemingly straightforward procedure with him. Like Mehmet himself, the ship remained both flexible in its movement and attached to heavy fuel oil supply chains.

As we stood on the side of the ship and observed heavy fuel oil moving from *Suat Bey* to *Ayşegül Sultan*, Mehmet and I witnessed the materiality of electricity in a rather unexpected way. Since the 1960s, heavy fuel oil has been the dominant marine fuel and, given its affordability, it has facilitated the growth of international shipping worldwide. Critics describe heavy fuel oil as the bottom-of-the-barrel leftovers from the oil-refining process, adding that the sulfur content of heavy fuel oil is usually high, which makes it viscous and gummy (with a consistency similar to peanut butter) and quite dirty. Despite commonly discussed plans to move to other fuels, such as liquefied natural gas or hydrogen, heavy fuel oil still dominates the commercial marine industry, powering ships from cruise ships to container vessels. Electricity is sometimes considered invisible but, while watching the heavy fuel oil delivery, Mehmet and I saw Ghana's

electricity contained within a barge and regularly made visible to the crew working on the ship.

Karpower executives told me that they had become the world's largest consumer of low-sulfur heavy fuel oil because of their growing fleet of powerships. Yet they regularly explained to their clients that they intended to use natural gas for their operations instead, an aspiration widely shared by other temporary power producers, and looked for ways to easily access domestic natural gas. Eventually, they bought the heavy fuel oil mothership located off the coast of Lomé and moved it closer to the Tema Fishing Harbour to simplify their operations. This meant that it would take less time to load the larger powership *Osman Khan*, which replaced *Ayşegül Sultan* in late 2017. In late 2019, Karpower finally transferred its powership from Tema to Takoradi, a port city in western Ghana, where it has direct access to the country's Sankofa natural gas reservoir, and managed to stop using heavy fuel oil.

Karpower's powerships initially materialized as an imaginative solution to address a string of military interventions in Iraq and later extended to tackle power shortages in Ghana and elsewhere. As I suggested earlier, the ships helped preserve the prevailing global energy hierarchy whereby the energy infrastructure of countries in the Global South necessitates modernization to uphold their presumed linear developmental path from fossil fuel use to renewable energy consumption. Karpower employees played a significant part in facilitating this global order. Even though experiences in Iraq and Ghana differed for the workers, they embodied the tension between flexibility and attachment in both contexts. The workers' affective attachments to the ships and shipyards facilitated the implementation of such inventive energy futures.

Layers of Imperial Power

Karadeniz Holding executives viewed the 2008 financial crisis as an opportunity and started purchasing large secondhand ships at low prices from around the world. The company already had a variety of investments in the energy sector, a flourishing industry during the privatization of electricity markets in Turkey in the early 2000s. They had also been providing electricity to Iraq through a land-based plant for some time. After the financial crisis, executives wondered if they could place their electricity production facilities on a ship that would anchor at Basra harbor in Iraq. Refurbishing low-priced ships as floating power plants was seen as a good solution for

countries with affordable fuel, crumbling infrastructure, and coastal access to rivers or the ocean. A US Embassy cable about the floating power plants from February 2010 suggested, "Karadeniz Holding's target customers for the powerships are developing countries facing electricity shortages which could fuel social unrest. The powerships can become operational quickly and are intended to be rapidly mobilized short- to medium-term solutions. While the end-user electricity costs will be higher than costs from an existing combined-cycle power plant, they could be 25 to 30 percent cheaper than some countries' current electrical generation alternatives" (Wikileaks 2010). If the countries where they worked stopped compensating them for their services, the ships could simply leave rather than remain hostage to their clients. The business plan would work especially well in places where it was difficult to receive financing for permanent large-scale energy projects.[26]

Such distributed infrastructures have emerged worldwide because of deregulation and privatization, increasing infrastructural demand, and the many disruptions caused by wars and related emergencies. Extensions to power grids are the deliberate product of various layers of imperial power and careful planning among multiple international partners. Despite offering temporary relief, such extensions do not facilitate the production of self-sustaining infrastructures; instead, they deepen and extend geopolitical hierarchies and dependencies globally.

By tracing the history of powerships, this chapter shows how a series of global crises such as the Gulf War in 1991, the invasion of Iraq in 2003, and the Great Recession in 2008 played a crucial role in facilitating the emergence of this particular energy infrastructure. With powerships now operational in various parts of the world, it is important to explore the foreign policy goals they enable. Since such energy infrastructures involve multiple government and private entities and populations with different expectations and interests, they are critical for revealing whose imaginaries of the future become prioritized. Chapter 2 delves into how floating power plants serve as tangible manifestations of Turkey's soft-power strategy across African countries, specifically in Ghana. It will show how this link between Turkey and African countries has shaped energy infrastructure, leading company representatives from Karpower to differentiate their work from that of extractive energy companies in the Global North by developing a focus on short-term time frames.

Liminal Devices

"A hungry man does not need a table full of rice," Joseph, a senior electrical engineer and executive from Ghana's grid company GridCo, said during an interview in his Tema office in December 2019, referring to the contradictions of electricity excess in Ghana. Between 2015 and 2019, the country's electricity supply had gone from 2,800 megawatts—which had been sized to the demand placed on the grid—to over 5,000 megawatts. In response to persistent power cuts across the country, the Electricity Company of Ghana had entered into agreements with independent power producers that resulted in overcapacity, or what Joseph described as a "table full of rice." Private fossil fuel–powered thermal plants produced about two-thirds of this total electricity supply. Unlike the Electricity Company of Ghana office, which offers panoramic views of the ocean and the city of Accra, the nondescript GridCo building where Joseph worked was situated between industrial facilities in Tema. When it rained heavily, the muddy roads surrounding the site made the GridCo headquarters difficult to reach. Joseph had been working with GridCo for over a decade and had seen Ghana's electricity infrastructure transform drastically through its deregulation and unbundling process. In responding to the condition of electricity excess, he asked plainly, "Why build 5,000 megawatts when you can't consume it?"

As I explained in the previous chapters, Karpower had been one of the independent power producers that entered the Ghanaian market in 2015. Its powerships promised temporary power, constituting contingent networks



FIGURE 2.1. High-voltage transmission lines connect the powership to the closest substation in Tema Fishing Harbour, Tema, Ghana, 2018. Photo by the author.

that delivered the basic electricity needs of a society for a predetermined length of time. In a context where various forms of temporary power have gained popularity, powerships differentiated themselves from competitors through their formal qualities, namely by being ships that can move from sites of production to sites of consumption, utilizing waterways that are relatively independent of logistics networks. Unlike other systems of power generation, the construction of powerships was undertaken in a completely different environment than the one in which the floating plant would function. By centralizing production in shipyards in Istanbul, the company controlled its operations efficiently. Powerships did not require large swaths of land, and this made the projects more desirable for lessees.[1] The only supplement necessary for a powership once it arrived at a harbor was high-voltage transmission lines to connect it to the nearest substation (figure 2.1). In Tema, Ghana, for instance, this substation was 9 kilometers away. Finally, since their only connection to the land was through the cables, powerships also seemed a more tenuous power source than land-based plants, as they could leave at any time, especially if and when their presence in lessee countries no longer made financial or political sense. Yet the powership in Ghana had stayed on despite there being an excess of electricity—what Joseph referred to as "a table full of rice."

In deploying its power plants, Karpower relied on and reproduced long-term, multiscalar relations between Turkey and the leasing countries, fostering Turkey's soft power in the places where it operated. These relationships often reinforced a narrative of linear development—one in which Turkey is positioned as being slightly ahead along a universal path of progress and therefore capable of helping Ghana catch up, reproducing geopolitical and geoeconomic hierarchies accordingly. This condition of being only slightly ahead enabled the language of friendship and the possibility of a more equal relationship, differentiating Turkey from Euro-American countries. However, importantly, the liminality of the infrastructure remained in the space of the promise: It instilled a belief in transitioning to post–fossil fuel modernity without allowing that shift to happen.

In this chapter, I analyze how liminal devices are crucial to maintaining this trajectory, even if the trajectory does not fully reflect empirical transformations, specifically regarding energy infrastructure. As I show below, the arrival of the powership in Ghana shifted energy infrastructure in the country, opening up the space for a promissory period without guaranteeing the arrival of order in its aftermath. Here, liminality emphasizes a form of deferral that breaks the past without ushering in the future.

I present this larger argument regarding the geopolitics of progress in three sections. The first section argues that temporary power structures such as the powership capitalize on the potential for long-term development and linear progress in the places where they are put to use. Their producers frame them as liminal devices that disrupt the existing order, demarcating a phase of planning and incubation, and whose eventual demise will engender a new era of modernization. In Ghana, the provisional status of the powership denoted a period of transition to be followed by various kinds of renewable energy infrastructure. Decision-makers in Ghana—such as members of the Energy Commission, executives at solar power companies such as Beijing Xiaocheng Company and Meinergy, and green finance professionals at banks such as CalBank and Stanbic Bank—employed a range of technological models and business solutions to precipitate that new era (Günel 2021). In this sense, powerships arrived in Ghana with the promise of their own obsolescence.

While the producers of floating power plants position powerships as liminal devices whose appearance will serve to meet immediate demand and whose obsolescence will facilitate renewable energy and clean technology futures, the broader point I make in this book is that representatives of Karpower prioritized developing systematized connections with their

clients as well as with government representatives from Turkey, investing additional time and labor into maintaining and developing such thick relationships (see also chapter 1). The floating power plants' capacity to effortlessly plug into a country's electricity grid necessitated a series of negotiations with the host country.

Therefore the seemingly simple, makeshift qualities of temporary power infrastructure such as floating power plants were made possible by close and long-term relations. The third section of the chapter underlines the impact of take-or-pay contracts on Ghana's economy, showing how such long-term relations also offer the possibility of alternative plans for the future. In chapter 1, I analyzed how the geopolitical and geoeconomic associations between the United States, Iraq, and Turkey created the conditions for the emergence of floating power plants. In this section, I turn to the relationships between Turkey and various countries in Africa to chart how geopolitics and geoeconomics shape the operations of floating power plants and again demonstrate how such geopolitical relations help to sustain the illusion of linear progress.

The final section shows how temporary power producers were financially and politically invested in extending and prolonging the liminal period they generate as far into the future as possible, absorbing the country's resources and suspending the arrival of an age beyond their obsolescence. It asks: How exactly do liminal devices become mechanisms for forestalling progress? The long-term relations described in the second and third sections enabled the deferral of a renewable energy future. Despite ambiguities regarding how long the powership would remain, development goals for the period beyond the ship's use remained intact.

The Short Term as the Primary Space for Capitalist Intervention

While Karpower executives did not perceive their ships to be particularly original (see chapter 1), they believed that they were providing an innovative service, offering liminal devices to countries with unfulfilled electricity demand and helping them to move forward in a linear developmental timeline. Şahin, Fatma's maternal uncle and a second-generation board member, analyzed their innovations for me during a meeting in Beirut in March 2017. Şahin often traveled to Lebanon for meetings regarding their two floating power plants there. When I received an invitation to give a talk in Beirut, I contacted him to make an appointment and was happy that he invited me to breakfast at his hotel.

At the time of our meeting, Beirut was experiencing the spillover effects of the Syrian civil war, where participants in the conflict were attacking each other on Lebanese territories. The Lebanese government struggled to meet the needs of approximately 1.5 million refugees from the war who continued to settle in the city. The government's inability to provide essential infrastructural services such as electricity, water, and waste management, which had led to large demonstrations in 2015 and 2016, cast a pall over the city. Yet tourists from Saudi Arabia, the United Arab Emirates, and other Gulf countries still frequented Beirut, spending time and money in the city's Solidere-developed downtown.

"I must have visited Beirut at least five hundred times," Şahin said, referring to his busy travel schedule over the past five years. As a result of these visits, he had developed a different relationship with the city's social life and built a public persona across Lebanon. This public persona meant that he had to be more cautious and vigilant. For instance, he imagined that if he were to be in an accident outside his hotel, he would be featured in the news. After all, his company provided a quarter of Lebanon's electricity.

"Electricity operators always imagine that they can match supply and demand," Şahin said in explaining their projects, "but this never happens. Wealthy countries such as Switzerland always overproduce, but they can sell the extra electricity over the grid to other countries and make it seem as if their production levels match consumption. When the same thing happens [that is, when production levels do not match consumption] in a poorer country like Ghana, we see the emergence of energy hunger [*enerji açlığı*]. In fact, it is the same thing that happens in Switzerland: a mismatch of supply and demand." Despite all efforts, the physical properties of electricity—that it cannot be stored and therefore needs to be consumed immediately after it is produced—made it difficult for market mechanisms to work well. Anthropologist Canay Özden-Schilling (2021, 16) agrees with this perspective: "In the case of electricity . . . the time window to establish equilibrium is limited to seconds; that is the temporality enacted in keeping the electric grid intact and functioning. If the removal of supply (say, as a result of a tripped power station) is too sudden, blackouts can occur near and far. Similarly, transmission lines can malfunction if they are subjected to significantly more power than their carrying limit allows." For the executives, this was exactly where Karpower's work became necessary. Their intervention aimed to make supply match demand.[2] As the context of electricity excess in Ghana illustrated, however, this was not a straightforward task.

Şahin explained to me that the energy sector operates on long-term contracts, ranging from twenty to one hundred years.[3] Yet these contracts do not always satisfy industry needs, which are dynamic and fickle. As he described these longer-term investments, he referred to one of his favorite books, John Perkins's *Confessions of an Economic Hitman*, a *New York Times* bestseller published in 2004. The book is a semi-autobiographical account of how American engineering companies made various deals with leaders from the Global South, strong-arming them to accept substantial development loans for large construction and engineering projects. Drawing on his personal experience, Perkins demonstrates how these projects primarily helped local elites in countries such as Ecuador, Iraq, Indonesia, Venezuela, and Panama and enabled US contractors to gain profits but did not necessarily benefit societies at large. In his preface, he points to the idea of economic growth as the root cause of these troubles:

> [The system] is driven not by a small band of men but by a concept that has become accepted as gospel: the idea that all economic growth benefits humankind and that the greater the growth, the more widespread the benefits. This belief also has a corollary: that those people who excel at stoking the fires of economic growth should be exalted and rewarded, while those born at the fringes are available for exploitation. . . . In their drive to advance the global empire, corporations, banks, and governments (collectively the corporatocracy) use their financial and political muscle to ensure that our schools, businesses, and media support both the fallacious concept and its corollary. They have brought us to a point where our global culture is a monstrous machine that requires exponentially increasing amounts of fuel and maintenance, so much so that in the end it will have consumed everything in sight and will be left with no choice but to devour itself. (Perkins 2004, xii–xiii)

According to Perkins, capitalism was propelled by the widely accepted belief that economic growth benefits humanity. Yet its benefits have not been distributed equitably because capitalism rewards only those who foster and facilitate its practices while exploiting those on the margins. Oil production was essential in establishing and maintaining what Perkins labels a monstrous machine. Published in the aftermath of the Enron scandal, a major corporate fraud case in the early 2000s involving the manipulation of financial statements and accounting practices by the energy company Enron Corporation, and on the heels of the US invasion of Iraq in 2003, the

book was celebrated for identifying deep problems in American corporate practice. All in all, *Confessions of an Economic Hitman* offered Şahin a reliable map of global politics with energy at its helm.

Interestingly, Şahin situated his company's projects in opposition to these larger contracts with long-lasting impacts, such as the oil company operations that Perkins brings to the fore and that Appel (2019) analyzes ethnographically in *The Licit Life of Capitalism*. Even though the floating power plants were a by-product of US interventions in Iraq in the 1990s and early 2000s,[4] Şahin differentiated his company's objectives by suggesting that they embrace the short term as the primary space for capitalist intervention. As nimble prosthetics for collapsing electricity production systems, the ships offered emergency relief, assisting countries that had been devastated for decades by the kinds of large-scale engineering and construction projects that Perkins (2004) describes. This focus on the short term endows the floating power plants with a new kind of ethical function (see also von Schnitzler 2016), making them distinct tools for development or attending to an emergency. Not only does a focus on the short term denote a particular ethical stance; according to Şahin, it also makes it easier for the leasing countries to match electricity supply and demand.

Given the agility and mobility of its floating power stations, which serve as liminal devices, Şahin's company could offer short-term contracts ranging from two to twenty years that promised to act as correctives for the electricity market and, broadly, for global energy production. The ships could be attached to national grids with different regulatory and legal frameworks and enable supply to equal demand in places where infrastructural development and the provision of electricity had been contracted to international companies. Şahin suggested that the ships' effect would be instant once they arrived in a country. As we sat at the breakfast table at his hotel, he consumed small jars of jam with a spoon, eating them one by one like puddings, and frequently interrupted our conversation to reprimand me for being part of the brain drain from Turkey to the United States.[5] Perhaps the ships were a little like those jars of jam, readily available for consumption and inducing a quick sugar rush.

The relationship between infrastructure and time has received attention from scholars, especially in the past two decades. As the introduction to *The Promise of Infrastructure* (Anand et al. 2018, 9) summarizes, "infrastructure often appears as a temporal marker in techno-developmentalist teleologies. . . . A culture's 'arrival' at each progressive stage was marked by a signature technological achievement: fire, bow and arrow, irrigated

agriculture, iron manufacture, and so on. Infrastructures and technologies here are both material and symbolic, standing in for a culture (or an economy's) development along a linear temporal scale." While documenting such techno-developmentalist teleologies, the literature in anthropology has also foregrounded how such imaginations of the future have dissipated or lost their relevance. For instance, in his book *Global Shadows*, anthropologist James Ferguson suggests that modernity in Africa has ceased to constitute a telos and has become detemporized, arguing that "the promise of modernization [in Africa] increasingly appears as a broken promise, and the mapped out pathways leading from the Third World turn out to have been bricked up" (2006, 186–87; see also De Boeck 2011; Simone 2004a). While modernization through a myriad of technologies, including investments in infrastructure, seemed more plausible in the 1960s, Ferguson (1999, 2006) shows how this idea gradually lost its credibility and relevance. Despite connotations of progress, stability, and permanence, infrastructure projects embody oscillations (Carse 2014; Anand et al. 2018) born out of growing political and environmental challenges.

As producers of temporary energy infrastructure, representatives of Karpower insisted on creating a telos in which their products were regarded as bridge solutions rather than as objects of arrival, promising that, if their lessees relied on these infrastructures for a liminal period, they would be able to access what might be considered more desirable high-status products such as solar and wind power stations. This telos parallels the imagination of energy transition, which I analyzed in the introduction, whereby humans can substitute one energy source for another seamlessly without compromising their everyday habits. Organizations such as the United Nations also reiterated Karpower's claim of a potential bridge technology. For instance, in a promotional video shot for Karpower in 2016, the United Nations Development Programme's Time for Global Action initiative argued, "We all walk different paths to achieve the same goals. . . . Our future begins with what we do today" (Karpowership 2016). Even though Karpower representatives did not claim to offer "arrival," their work depended on the durability and the reproducibility of the telos of progress.

Karpower's position as a solution partner to countries in the Global South and an alternative to companies in the Global North imbued the company with an ethical function. In a 2019 interview with the Turkish newspaper *Hürriyet*, Fatma, a Karpower board member, commented, "Our biggest secret is becoming companions in misfortune with the countries where we provide electricity. The trust we have generated by being

troubled by the troubles of African countries, especially, opens the doors for new projects."[6] A Ghanaian businessman explained that he enjoyed working with companies such as Karpower for precisely this reason: Their employees did not position Turkey as better than Ghana but, instead, focused on the common problems the countries had experienced on the path toward development. "They are not patronizing or condescending, like American or French companies," he concluded. Given this emphasis on trust and familiarity, Karpower executives defined themselves as solution partners, working in collaboration with the countries where they operate and aspiring to solve shared problems, rather than as elusive providers of temporary energy infrastructure who might leave at any time.

While the floating power plants were unusual in terms of form, liminal devices are a recognizable feature of the conversation on energy and climate change. A good example is carbon capture and storage (CCS), a technology aimed at capturing carbon dioxide emissions from various sources, including power plants, and storing them underground in depleting oil reservoirs. By employing CCS technologies, fossil fuel producers seek to decarbonize their operations and eventually produce fuels with labels such as "clean coal" or, more recently, "blue hydrogen," each of which offers a temporary, at times oxymoronic, fix for energy and climate change–related problems, and promises its own obsolescence. The producers of such liminal devices acknowledge that their products or processes offer provisional relief but argue that these products and processes are crucial in paving the way for more rigorous permanent solutions. Such professionals present themselves as pragmatic planners who seek to bridge the energy future by instituting liminal devices as temporary workarounds (see Günel 2016, 2019). Liminal devices are, in some ways, equivalent to corridors, stairwells, and doorways. They are not places of arrival but merely points of passage.

Critics often contend that liminal devices create a crowding-out effect, pulling resources away from what might constitute best practices. For instance, commentary regarding CCS often focuses on how the technology diverts attention from developing and deploying renewable energy resources. Instead of prioritizing reducing emissions at the source and transitioning to solar- or wind-powered energy systems, CCS perpetuates humanity's reliance on fossil fuels. In discussing the idea of superimposition, geophysical scientists Ankit Bhardwaj and Radhika Khosla (2020) highlight a similar issue.[7] For them, superimposition is an approach to climate action that does not challenge existing bureaucratic practices or incentives. Instead, it produces climate projects that align with current political arrangements such

as housing, water, and waste management. While superimposition could lead to innovative and politically feasible climate initiatives, it is limited by the constraints of the existing governance system, and this results in tradeoffs in long-term planning, urban fairness, and public infrastructure ownership. Such superimpositions are products of compromise. Again, they do not constitute places of arrival in the larger project of crafting particular types of environmentally friendly commodities but offer only bridge solutions that echo and uphold existing practices.

This does not mean that such liminal devices have no positive impact on their users, however. "It takes four years plus to build a conventional power plant," Joseph, the well-respected and experienced operational director at GridCo whom I quoted at the beginning of this chapter, told me during a meeting in his office in July 2018: "So the arrival of the ship has been key [to ending *dumsor*]." The powership emerged at a time when the Ghanaian government could no longer subscribe to the modernist dreams of the 1960s or hope to achieve the high-tech renewable energy future that would arise after an energy transition. Their activities corresponded to what anthropologist Sophia Stamatopoulou-Robbins (2019, 53–58) called, in the context of Palestine, "landfill time," an in-between "for now" temporality that "offered a limited yet expansive time frame, constituting a stage in a Palestinian development that never arrives at its final, ideal stage—a state" (54). By putting an end to electricity crises, the powerships enabled a different experience of liminal time, centered on the short term as a space of capitalist intervention, and filled up the near future with productive activity.

In explaining their success in averting energy crises such as Ghana's *dumsor*, Kartal, a senior board member of Karpower, told me how discussions on energy tend to be fixated on the future, proposing solutions for forthcoming problems associated with climate change and impending energy scarcity rather than focusing on significant issues that impact many people around the world in the present. For him, the crucial question was how we could turn the lights on today. "What *now*," he concluded in English. As we spoke, Kartal played with his plain silver bracelet with a stamped inscription that read "electric man."

Despite the various kinds of commitments their company's projects demanded, including taking five hundred trips from Istanbul to Beirut over a few years, representatives of Karpower stressed that their work concentrated on the now. Such invocations of the short term as a space for capitalist intervention offered them two advantages. First, it allowed them to differentiate themselves from companies in the Global North and enabled

them to provide seemingly ethical tools for development that would serve as bridge technologies. They identified with Perkins's critique of extractive capitalist practices and imagined themselves as offering an alternative mode of conducting business. The ship's formal capacity as a floating platform that could appear or sail away gave further legitimacy to these claims. Second, invocations of the short term provided Karpower representatives with an opportunity to situate themselves in the telos of progress, where their products would serve merely as liminal devices. As energy production facilities that would appear quickly when necessary and disappear when the countries in need no longer required their assistance, floating power plants would pave the way for producing renewable energy and clean technology. In a global and regional context where the telos of development has lost its credibility, the narrative of energy transition reintroduced such imaginations of linear progress. Karpower's floating power plants were ensconced neatly in this context, functioning as bridges or hallways.

In some ways, this critique of long-term and extractive capitalist practice paralleled the forms of foreign policy that the Turkish government has advocated, centering on what historian Ayşe Çavdar (2013) labels "imperialism by anti-imperialists." For instance, when the Turkish government representatives introduced their foreign policy mechanisms to African countries, they emphasized that the Ottoman Empire had never participated in the Atlantic slave trade. Şahin's reference to Perkins's *Confessions of an Economic Hitman* fulfilled a similar role, underlining the extractive practices of companies from the Global North, presenting expertise from Turkey as a means of countering such exploitative contracts, and offering an alternative path forward, even when their practices also created unequal relations. In this sense, Karpower representatives framed themselves as companions in misfortune, suffering from the effects of the same fraudulent policies imposed by the Global North and broadly trying to attend to the impact of historical injustices such as the Atlantic slave trade and US imperialist interventions in the Middle East.

Long-Term Relations Through Geopolitics

Powership infrastructure relies on long-term relations produced through take-or-pay contracts and cultivated through international relations and individual commitments. Unlike their contemporary competitors, powership operators attempted to construct a sense of familiarity with the countries where they worked, as evidenced by their slogan "The power of friendship."[8]



FIGURE 2.2. *Osman Khan* powership with the *Suat Bey* shuttle barge positioned alongside, Tema, Ghana, 2018. Photo by the author.

Named after family members, the ships not only solidified the kinship network that gave rise to their production but were also explicitly presented as visitors to lessee countries. By adding honorifics to their names—*Bey* and *Khan* for men and *Sultan* for women—and hence evoking the Ottoman Empire rather than modern Turkey, company executives appeared to follow the Ottoman revivalist styles of Erdoğan's Turkey (figure 2.2). By personifying the ships as Ottoman elites, the company also recalled the Ottoman system of vassal states, where khan- or bey-led provinces reported to the centralized government in Istanbul. In some ways, this naming practice accentuated the power relations between Turkey and Karpower's lessees.

These corporate strategies are reflected in the way Karpower's employees approach their counterparts. For instance, Serkan told me that Turkey shares many customs with Ghana, including some marriage rituals: "Just like us, Ghanaian young men have to ask for their girlfriends' hands by paying a visit to the family." During informal meetings, many of the Turkish energy professionals I met in Accra and Tema made essentializing remarks about Ghanaian people that foregrounded the differences between themselves and the latter. Yet the corporate emphasis on shared customs was designed to focus on the possibility of shaping common developmental trajectories for Turkey and Ghana.

Despite the seemingly elusive nature of powerships, Karpower's operations in Ghana demand long-term multiscalar relations, including at the

level of the nation-state, which are cultivated constantly by company executives (Appel 2012; Chalfin 2010). In other words, the simple makeshift qualities of provisional power infrastructure are made possible by long-term geopolitical and geoeconomic connections between Turkey and Africa. In his address at the Dakar International Conference Center in March 2018, Erdoğan emphasized, "Depleting Africa's resources and adopting a modern colonial system is not our style."[9] As I found in the interviews conducted between 2016 and 2023, many members of Turkey's business community debate whether this populist propaganda is actually useful for commercial relations. Still, many claim that diplomatic trips to Africa have strengthened Turkish citizens' sense of commitment to Africa and reinforced the notion that all Turkish companies could become solution partners.

Ayşegül Sultan's arrival in Ghana corresponded to a specific moment in Turkey's so-called Africa opening, which AKP government representatives labeled "from opening to partnership" (*açılımdan ortaklığa*). Turkish foreign investment in Africa has grown over the past decade, mainly as a result of the country's interest in diversifying away from the Arab world and its attempt to influence Africa's large Muslim population at a time when Turkey's accession to the European Union has stalled (Baird 2016; Güner, n.d.; Langan 2017; Shinn 2015). Turkish investment in Ghana's energy sector followed closely behind the arrival of services provided by Turkish Airlines, which has direct flights and cargo services from Istanbul to more than fifty cities across Africa. The Turkish government has also expanded its presence in Africa since 2002 and currently has embassies in forty-four countries.

The anti-Western propaganda of President Erdoğan has found supporters in Africa. In addressing African audiences, Erdoğan resorts to invoking Turkey's Ottoman roots, criticizing the development strategies implemented across the continent by the International Monetary Fund (IMF) and the World Bank and seeking to offer an alternative to Euro-American networks. In doing so, he is practicing "imperialism by anti-imperialists." Beyond just supporting a belief in the possibility of advancement to clean energy use, powerships offer a potential for linear development by facilitating relationships between Turkey and Africa.

Turkish involvement in African countries started in the late 1990s, when Fethullah Gülen, a cleric initially blacklisted and now deceased, began operating schools across the continent before the arrival of the Turkish government or Turkish business.[10] Members of the well-known Gülen Movement had started settling in countries across Africa during these years, facilitating an early wave of Turkish immigration. Many of these initial immigrants

had operated businesses that took advantage of their connection to Turkey and were critical to the establishment of the Turkish Confederation of Businessmen and Industrialists (Türkiye İşadamları ve Sanayiciler Konfederasyonu, or TUSKON) in 2005, an organization with 40,000–50,000 members that relied on strong relations between the Gülen Movement and the Turkish government. When these collapsed in the aftermath of the July 2016 coup attempt, TUSKON disbanded. In the 2000s, the Turkish government started opening embassies in African countries, prioritizing places that had hosted Gülen schools (see, for instance, Güner, n.d.). As the home to the well-regarded Galaxy International School in Accra since 2001, Ghana was one of these countries. By 2013, the Gülen Movement was operating more than one hundred schools in over fifty countries across Africa, always in close collaboration with the Turkish government. However, 2013 saw a critical rupture when, among other issues, the AKP government accused the Gülen Movement of supporting the antigovernment Gezi protests. Schools in African countries were either closing or being transferred to different authorities.[11] This political context gave added weight to Turkish embassies, which now replaced Gülen schools in diplomatic significance. In this new era of partnerships, businesses that did not have affiliations with the Gülen Movement, such as Karadeniz Holding, played an important role and came to represent Turkish national interests in the region. *Ayşegül Sultan* not only bridged electricity shortages in Ghana but also came to embody a new kind of post-Gülen Turkish soft power across Africa.

Through such populist propaganda, Turkish exports such as floating power plants were, as anthropologist Antina von Schnitzler (2016, 28) put it with reference to prepaid meters, "harnessed to distinct ethical regimes and political projects." These distinct ethical and political regimes, as exemplified by Turkish businesspeople's willingness to suffer together with African countries, their ability to showcase Turkey as a model for overcoming some developmental issues, and their seeming desire to propose an alternative to companies from Europe and the United States, allowed populist leaders to claim an imperial legacy—in Erdoğan's case, both domestically in Turkey and across Africa. For instance, during conversations with Mauritanian businessmen who were interested in doing business with Turkish companies, I heard over and over again that Erdoğan would win a national election in Mauritania if he wished to become president there.

Turkish businesspeople who aspired to collaborate with companies in Africa joined in the praise for the populist leader: "Of course, here these [African] men's self-confidence has been crushed for years, which is why it



FIGURE 2.3. The author poses with businessmen from Turkey attending the diplomatic trip, Nouakchott Airport, Mauritania, 2018. Photographer unknown.

is hard for them to put themselves to work and to do business: It is hard for them to recover. We shared the same predicament, but thanks to Erdoğan we pulled ourselves together again."[12] A Turkish executive from a company with successful businesses all over Africa told me over coffee how they were tasked with showcasing Turkey's business capacity. Turkish investments in Africa not only relied on such nonimperialist imperialism but also sustained and augmented it. Like construction companies, power producers such as Karpower and Aksa were poster children for Turkey's expansion into African markets, acting as what some called a soft-power mechanism to exert Turkish foreign influence. These Turkish exports to Africa also added to Erdoğan's popularity back home in Turkey.

Turkish foreign policy in Africa is crystallized in diplomatic trips. I met Kartal on one such trip to Senegal in February 2018 and had stimulating conversations over meals with him for four days. The Foreign Economic Relations Board of Turkey had organized the trip, and its press relations team invited me to join the delegation of about 120 businesspeople and some journalists (figure 2.3).[13] Our presence at the Dakar International Conference

Center was significant because Turkish construction companies had developed this building. In Senegal's new city, Diamniadio (under construction nearby, and intended to ease congestion in the seaside capital, Dakar), two Turkish construction companies had collaborated on building an airport after the Saudi Binladin Group had given up on the project. Representatives of such companies believed that there would be even more large-scale construction projects, given that Macky Sall, then Senegalese president, intended to include an industrial park and university in the new city and argued that they were well-placed to beat their French and Chinese counterparts to win more contracts. Like these construction companies, power producers such as Karpower and Aksa exemplified Turkey's expansion into African markets, acting as a soft-power mechanism to promote Turkish foreign policy. By enacting Turkey's role in the timeline of development, these companies helped sustain geopolitical relations while contributing to the proliferation of fossil fuel–powered energy infrastructure and facilitating energy accumulation.

In addition to participating in such national strategies, joining diplomatic trips was, at times, commercially valuable for representatives of Turkish businesses such as Kartal. When two representatives from the Senegalese government approached him outside the large hall where Erdoğan was scheduled to give an address, Kartal kindly asked me to stay and listen to their negotiations. The Senegalese men had heard good things about powerships from their contacts in Ghana and knew that the ships were also in use in Gambia and Sierra Leone. When a construction company representative from the Turkish delegation told them that Kartal was there at the Dakar International Conference Center and offered to arrange a meeting, they were very interested. They were forthright about their lack of knowledge of electrical infrastructure but knew that the use of powerships was growing and becoming popular.

Without wasting too much time on pleasantries, the Senegalese representatives told us that they had been talking to some international companies that could provide electricity. They had been offered a rate of eleven cents per kilowatt-hour by these unnamed companies and asked whether Kartal's company could offer them a better rate. Kartal refrained from engaging with the representatives on their terms. "Rather than talking about price, let's talk about delivery times," he said. "Our ships can be here in two weeks. Can the other company give you electricity in such a short time?" He proposed leasing *Ayşegül Sultan*, the ship that used to power Ghana's

grid, to Senegal. When the men left, he turned to me and said, "Wouldn't it be very convenient if we did not have to move *Ayşegül Sultan* all the way back to Istanbul, and if we could use it in Dakar instead?"

Despite their makeshift character, floating power plants are entangled in complex processes involving not only geopolitical relations between Turkey and African countries but also various staff members and executives who make decades-long commitments to the company (see also chapter 1). Although Kartal was scheduled to return to Istanbul with Erdoğan's delegation that evening, he asked for his suitcase to be retrieved from the plane and stayed in Dakar for a second, more comprehensive, conversation with the Senegalese. His plans changed constantly. He was in the habit of taking a photograph of his suitcase with his iPhone because he often found himself asking flight attendants to remove his luggage from the plane so that he could attend a last-minute meeting. To cultivate closer and stronger relations with his clients, Kartal was always willing to revise his schedule. He believed this flexibility gave him the upper hand in conducting business in Africa (see also chapter 1).

Recognizing this flexibility, other businesspeople on the diplomatic trip reflected on how the structure of the family company carried considerable weight in African markets, especially when compared to European corporations. When I asked an executive with a large holding company why Turkish businesses might outshine European companies in Africa, he explained in an email, "Turkish companies follow a family-focused administrative model with few shareholders. They make decisions more easily. They are more homogenous, flexible, close to their clients, which are all relative advantages when compared with European companies."[14] This executive's perspective was critical, given how family companies constituted roughly 95 percent of the Turkish economy. In comparison, only about 60–80 percent of corporations in Europe were family-owned. Such faith in the agility of family companies helped them differentiate Turkey from European competitors in African markets, offering an advantage (figure 2.4).

"It's time for me to buy my own plane so that I don't deal with this kind of thing," Kartal said as he made calls to organize the removal of his luggage from the plane. "But once I buy a plane, I will also have to hire bodyguards. The nature of the business will completely transform." Several days later, he sent me a WhatsApp message to say that his conversations with the Senegalese authorities had gone well. There was a good chance he would lease them two ships rather than one. In late 2019, *Ayşegül Sultan* began supplying electricity to Senegal. Overall, such individual efforts, coupled with



FIGURE 2.4. The powership *Osman Khan*'s deck and bridge feature an evil eye, evoking the ship's Turkish origins, Tema, Ghana, 2018. Photo by the author.

foreign policy, helped position Turkey as the soft-power solution partner to help African countries progress along the predetermined timeline of development.

Long-Term Relations Through Take-or-Pay Contracts

Karpower's promotional material endowed powerships with an ethical function, allowing the company to become a companion in misfortune with the countries where they provided electricity. Turkey's foreign policy strategy, where Erdoğan reminded African audiences of their common conflicts with Euro-American countries, paralleled and reinforced this effort. This does not mean that relations between Karpower and its counterparts were free from tension or controversy. In practice, the discourse of familiarity and trust was combined with a particular contractualism where take-or-pay contracts remained in use regardless of how they impacted a government's interests. For instance, a World Bank report (Economic Consulting Associates 2020, 28) suggests, with reference to the Lebanese electricity market, where powerships produced electricity between June 2012 and May 2021, that, "with hindsight, it would likely have been cheaper to have invested in permanent capacity, rather than keep paying high take-or-pay charges." In

their investigative reporting on Karpower, reporters from South Africa's nonprofit news service AmaBhungane claimed that, once a powership entered a market, it remained there for the entirety of the twenty-year contract, regardless of whether it produced electricity for the grid. The reporters highlighted the problems with powership contracts, arguing, "it appeared that Karpowership had a practice of entering new markets by paying large facilitation fees to politically exposed persons which could be construed as bribery" (AmaBhungane 2021). All in all, the rhetoric of friendship paralleled extractive practices that ensured corporate benefits.

In framing the company's projects as flexible operations that benefit both parties, Karpower employees emphasize that ships can leave if countries fail to compensate them on time, if there is a war, or if they are no longer necessary. Yet their experience contradicts this statement because it is not always easy for ships to depart. For instance, when the Pakistani government breached payment obligations and unlawfully detained four ships, a prominent legal dispute erupted between Karpower and the Pakistani government. In August 2017, after four years of controversy, the World Bank–affiliated International Centre for Settlement of Investment Disputes (ICSID) awarded Karpower a settlement of $800 million, one of the highest settlements in ICSID's history. In reviewing the issue in June 2018, Bhatti (2018) wrote in *Pakistan Today*, "Turkish Shylock twists Pak's arm for $846m pound of flesh," referring to William Shakespeare's play *The Merchant of Venice*. On November 4, 2019, Pakistan's then prime minister Imran Khan tweeted that his government had resolved the dispute through a settlement facilitated by President Erdoğan and saved his country the penalty imposed by ICSID.[15]

Like many independent power producers, Karpower's powerships had entered the Ghanaian market through take-or-pay contracts, whereby the Electricity Company of Ghana either bought electricity from a producer or paid the producer a penalty for electricity it did not use, leaving the country with a significant financial burden and facilitating energy accumulation. It is important to underline that this arrangement is not unique to Ghana. Take-or-pay contracts are pervasive in the electricity market, especially across the Global South, because independent power producers seek guaranteed sources of income when they sign power purchase agreements with a utility, such as the Electricity Company of Ghana. Yet as the Ghanaian case reveals, take-or-pay contracts often lead to excess electricity on the grid and lock utilities into agreements they cannot exit easily. For instance, during an event about the Iraqi electricity grid at the Baker Institute in Houston in January 2025, decision-makers from the Iraqi government spelled

out how take-or-pay contracts have caused financial strain on the country's economy, precluding any planning for the future.[16] Such contracts also create stranded assets in the places where the power plants are built, deferring the arrival of newer, more efficient power production mechanisms. Yet government representatives in Global South countries believe they have no choice but to offer take-or-pay contracts to power producers if they wish to attract any investment in energy infrastructure and respond to their population's electricity demand.

In 2015, as soon as *Ayşegül Sultan* left the Turkish coast, the Ghanaian media started tracking its progress, anticipating its arrival in Tema. Some commentators issued warning calls, however. They asked politicians to review Karpower's history in Lebanon and Pakistan more carefully and to inquire into the possible financial impact of the ship on the country's economy (MyJoyOnline 2015; see also Fianko 2017). Yet representatives of Karpower understood themselves to be kingmakers who could facilitate the incumbent President John Mahama's reelection. In 2016, the Karpower ship appeared in Mahama's election campaign posters, although that did not help him to gain victory. Even after Mahama's presidency, the updated agreement Karpower signed with the Electricity Company of Ghana in 2017 indicated that the ship would supply 470 megawatts of electricity to the Ghanaian grid for a whole decade, rendering the ship's formal ability to sail away secondary to contractual obligations between the companies. In 2023, when I asked an executive at the Energy Commission in Accra what he thought of the Karpower ship, he answered, "It is the story of how the provisional becomes permanent." The flexible characteristics of the ship, particularly its mobile staff and technologies and its ability to float away, which had perhaps made it attractive to John Mahama's power-stricken government in 2015, had little impact on how it was utilized in Ghana.

As a result, the Ghanaian government paid over $500 million per year to different power producers for electricity it did not need or consume, and this led to a significant economic burden on the country's economy. A deputy minister of energy told me in March 2023 that the Ghanaian government had paid 33 percent of its tax revenue for excess capacity and that changing the currency of their transactions with independent power producers from US dollars to Ghanaian cedis had slightly improved these conditions. Starting in 2019, decision-makers across Ghanaian institutions looked for ways to monetize this electricity excess. Some proposed rural electrification campaigns to improve irrigation across the country, thereby reducing flooding and safeguarding food security. An Energy Commission

program called Drive Electric Initiative, for example, promoted the use of electric vehicles in the Greater Accra Region and beyond and provided incentives to electric vehicle importers and transport electrification start-ups (see chapter 4). The new power plants triggered an excess of fossil fuel–powered electricity on the country's grid, which led to a new set of challenges. In May 2023, the government of Ghana owed about $1.5 billion to independent power producers across the country. During this period, it received a $3 billion loan from the IMF on the understanding that some of the loan would be transferred as debt payments to various electricity producers, including Karpower.

In 2017 a news report revealed that the contract with the Emirati thermal power station AMERI had been overpriced by $150 million. This eventually led to the removal of energy minister Boakye Agyarko from his position (Widerøe et al. 2017). Agyarko had assumed office in February 2017, soon after John Mahama's National Democratic Congress lost the parliamentary elections. As a member of Nana Akufo-Addo's New Patriotic Party government, Agyarko had been expected to correct the nontransparent negotiations that many critics believed characterized the period of *dumsor*. Another corruption scandal broke out in April 2020, when the US Securities and Exchange Commission claimed that "Asante Berko, a former executive of a foreign-based subsidiary of a US bank holding company, arranged for his firm's client, a Turkish energy company, to funnel at least $2.5 million to a Ghana-based intermediary to pay illicit bribes to Ghanaian government officials in order to gain their approval of an electrical power plant project."[17] Given the context of mistrust and corruption, decision-makers in the country called for a renegotiation of these contractual terms (see, for instance, *Ghana Business News* 2019).

At the CERAWeek energy conference I attended in Houston in March 2023, a deputy minister from Ghana's Ministry of Energy summed up the current state of electricity production and consumption in the country for a broad audience, comparing its infrastructure to that of countries such as South Africa and Kenya: "The solution to power outages between 2011 to 2016 was to aggregate more power in a nontransparent manner, and now we have excess capacity. We are trying to sell to Burkina Faso and trying to build renewable capacity by the year 2030." However, electricity prices were high in Ghana, which made it difficult to generate interest from consumers in Burkina Faso. Because the financial burden had accrued through independent power producers, it had also proven challenging to invest in solar or wind power infrastructure. Efforts were underway to switch from

a take-or-pay model to a take-and-pay one. Yet energy professionals in Ghana knew that a shift toward take-and-pay contracts would not appeal to power producers and might offer them fewer incentives to continue working with the country at a time of future need. The government also tried to negotiate a delay in implementing some of the electricity projects they had already agreed to and attempted to change the currency for the transactions from US dollars to Ghanaian cedis. Overall, the deputy minister's comments demonstrated how take-or-pay contracts undermined the imagination of powerships as ethical infrastructure and delegitimized the claim that Ghana and Turkey had participated in the contractual process as equals.

Take-or-pay contracts were one of the country's most significant problems, but how could this issue be resolved? Energy professionals in Ghana, including the deputy minister quoted above, often suggested that transparency would help resolve the problem with take-or-pay contracts. For instance, a report on take-or-pay contracts by the Institute of Economic Affairs in Accra and the Energy for Growth Hub in Washington, DC, suggests that Ghana had thirty-two identifiable power purchase agreements in force for the provision of electricity generation:

> Ghana currently has 32 identifiable contracts, or Power Purchase Agreements (PPAs), in force for the provision of electricity generation. . . . To date, the country has relied almost entirely on unsolicited proposals to source new energy projects and negotiate PPAs, which limits competition and risks higher prices. In addition, most of these contracts were agreed on a take-or-pay basis, which means that the government of Ghana must pay for the generation capacity even if no electricity is consumed. The only publicly-disclosed aspects of these PPAs are the names of the project, contract type, technology/fuel, location, and total project cost. Most information needed to evaluate project viability or understand the substantial fiscal implications of new power procurement is not available to the public. (Ackah et al. 2021, 2)

According to critics, transparent contracts would allow informed citizens to contest the terms of electricity purchases and make those who sign the contracts accountable for their actions. Critics assumed that transparency would create change, that giving observers such as the authors of this report access to the content of contracts would enable them to point to instances of corruption or quell concerns regarding possible misconduct, and that this would lead to better financial agreements. For energy professionals in Ghana, transparency appeared to be the first step toward ensuring fair contracts.

As scholars have shown, however, transparent contracts rarely have this impact. For instance, geographer Andrew Barry (2013) criticizes the imagination of transparency in the context of the Baku-Tbilisi-Ceyhan pipeline and suggests that transparency efforts often involve the selective disclosure of information, which can serve various purposes, including the legitimization of specific actions or the strategic framing of issues. Similarly, in her review of the operations of a transnational oil company in Equatorial Guinea, anthropologist Hannah Appel (2019) suggests that, while it is touted as a remedy for the problems of extractive industries, transparency creates the illusion of accountability without addressing underlying power imbalances or structural problems. While seemingly apolitical, calls for transparency also have the effect of reviving politics (Hetherington 2014), giving rise to not only new sources of tension but also new publics that are constituted around these viewpoints (Barry 2013). In essence, scholarship on transparency recognizes that such calls may not always lead to meaningful corporate accountability or viable transformations in the energy sector.

Regardless of their impacts, such calls evidenced the existence of informed political blocs that contested these contracts, demanded more equitable power purchase agreements, and prioritized this transformation above all other electricity-focused concerns. Yet power purchase agreements have emerged as the most durable element of electricity infrastructure both in Ghana and globally, instigating the deferral of renewable energy and clean technology futures. In a context where electricity production facilities operate on a plug-and-play basis, power purchase agreements have created opportunities for these machines to stall. Even though floating power plants formally gestured at a flexible model of supply and demand, their contracts generated relationships that prioritized longer terms of attachment to national grids, extending the liminal era and deferring the arrival of progress. As the defining features of electricity provision across the Global South, take-or-pay contracts continue to deepen inequalities between producers and consumers.

Deferring the Future

While they enable a liminal period, powerships also postpone ideals of progress to an era that will commence on their departure. They generate electricity for the grid on a day-to-day basis and pragmatically attend to routine consumer demand until they are eventually replaced by clean and renewable electricity generation. Since their work depends on market-

based contracts, floating power plants seem more temporary in comparison to state-sponsored infrastructure projects such as the Akosombo Dam. Complying with the logics of the market, the executives who run the powerships have sought to stretch and expand that near future as much as possible. As the powerships remained in Ghana, the anticipated future grew ever more distant. As businesses operating according to market logics, temporary power producers were financially and politically invested in extending this in-between period as far into the future as possible, delaying the arrival of the era beyond their obsolescence. Stamatopoulou-Robbins (2019) makes a parallel point with reference to landfills in Palestine, highlighting how the interim time legitimizes the processes that prolong the here and now and therefore postpones progress. In early 2020, the powership continued to produce electricity in Ghana even when the country no longer suffered from electricity shortages or needed temporary power from a floating power plant. "We can extend this 10-year deal by another 10 years. We can even sell electricity to neighboring countries through Ghana," a company executive had said about the initial phase of its Ghanaian operations (quoted in Ergin 2014). But even when the floating power plant was no longer necessary to Ghana's electricity supply, it did not leave. This demonstrates how long-term political, financial, and contractual relations sometimes outstripped practical necessities. In some ways, the long-term relations I described in the previous section enabled such deferral.

Representatives of the Energy Commission, the Electricity Company of Ghana, and GridCo emphasize that the government had limited bargaining power when the powership arrived in 2016. It was trying to manage an electricity crisis and had therefore agreed to high prices, but it hoped to renegotiate these in the later years of the powership's operation. In seeking to explain how Ghana's electricity portfolio shifted radically from a condition of scarcity to one of excess, energy professionals in Accra took issue with the power purchase agreements, which not only allowed but also incentivized independent power producers such as Karpower to remain in the country.[18] By remaining on the grid and accruing debt for the Ghanaian economy, independent power producers such as the powership contributed to suspending future visions of development fueled by renewable energy. In response to electricity excess and to cut their losses, energy professionals in Ghana tried to promote transport electrification and to create incentives to allow consumers to purchase more electricity from the Electricity Company of Ghana (see chapter 4).

The powership's temporary presence in Ghana signified a prolonged period of liminality, a state of in-betweenness with particular temporal and spatial qualities that was meant to lead eventually to a renewable energy future. "While they rely on powerships, countries like Ghana could invest in renewables," Serkan, the country director of Karpower in Ghana, observed, reflecting a common view that sees temporary power systems as interim solutions that might enable Ghana to make the leap to renewable energy infrastructures such as rooftop solar panels and small on-the-grid power stations (Pinkus 2016; Weszkalnys 2015; Günel 2019).

As safe, mobile, and easy-to-manufacture technologies, powerships enable a state of liminality, a brief pause for the Ghanaian authorities to perhaps make plans for a future fueled by renewable energy. In this context, Serkan's comment suggests that temporary power has enabled some planning for the future, making up in some ways for what anthropologist Brenda Chalfin (2014, 93) describes as "an incapacitated developmental state." Representatives from the Electricity Company of Ghana, the Environmental Protection Agency, and GridCo supported this imagination of a renewable energy future. Salih, a Turkish ship engineer working for a thermal power plant in Ghana, defined temporary power infrastructure as "short-lived [*ömürlü*] items." According to him, manufacturers specified a lifespan for these short-lived items: "in terms of time (1,000 hours, for example) or usage (100,000 miles, for example)." He believed that hydrogen energy would eventually satisfy global energy demand and hoped that it would also meet Ghana's needs in a projected future beyond the era of powerships. As a thermal power plant employee, Salih regarded temporary power infrastructure as a stopgap solution, which will eventually need to be replaced. During the time of powerships, the renewable energy infrastructure can be built incrementally, although this project is often deferred (Ahmann 2018).

A Seascape of Power

Overall, temporary power infrastructure enables a vision of linear development and future progress, mainly by serving as transitional projects that renewable energy resources will eventually replace. Forms of temporary power infrastructure such as powerships are framed as liminal devices that contain a promise of their own obsolescence. This liminal and transitional era may be stretched indefinitely to suit various financial and political interests. Even during energy excess, for instance, the powership remained

operational in Ghana, demonstrating how the profit-making needs of independent power producers impacted the Ghanaian grid. In this context, extractive contractual relations between various decision-makers are perhaps the most durable element of Ghana's energy landscape. Regardless, the hope that a new era of modernization will commence when innovative renewable energy infrastructure replaces these temporary devices remains valid and intact.

In addition to enabling a belief in leapfrogging to renewable energy and clean technology, powerships brought to the fore ideas of progress through facilitating relationships between Turkey and Africa. Close transnational relations between solution partners evoked developmental trajectories, as Turkish businesspeople and diplomats suggested that a country such as Ghana could follow the same path toward development as Turkey's in the twentieth century. Implementing a particular grammar of capitalist relations that differentiated Turkey from other regional actors extended Erdoğan's popularity while helping to create a context for encounters between Turkish businesspeople and their African counterparts, whereby business decisions that foreground their flexibility can be made. Examining these multiscalar connections illustrates how temporary infrastructure's tenuous and makeshift qualities belie the social and political relations that catalyze this seascape of power.

In chapter 3, I investigate what the future beyond floating power plants might look like in Ghana. By analyzing the contemporary emergence of solar power stations, I attempt to show how technologies of arrival, such as rooftop solar panels and photovoltaic solar fields, shape social and political relations in the places where they are employed and point to the various local and global inequalities that result from their use.

Leapfrogging to Solar

In July 2018, the renowned American business magazine *Forbes* ran an article on solar power in Ghana titled "Why This 48-Year-Old Woman Is Building Ghana's Biggest Solar Farm" (Sorvino 2018). Salma Okonkwo, the CEO of UBI Group, a company that specializes in downstream petroleum operations, was the person behind the Blue Power Energy project, which was due to open in March 2019, with a capacity of 100 megawatts. In a country where the electricity grid's total volume was about 5,000 megawatts, a 100-megawatt addition was noteworthy. In November 2019, the International Energy Agency featured Okonkwo in an article titled "Seven Women Entrepreneurs of Solar Energy" (IEA 2019). Other sites, including AllAfrica, echoed the news and celebrated Okonkwo's success (Kiunguyu 2018). Along with another much-publicized plant called the Nzema Solar Power Station, located in western Ghana and built by the British company Blue Energy, Okonkwo's solar power station promised to revolutionize Ghana's energy future.

However, Kofi, an electrical engineer who has been working with Ghana's Energy Commission for more than a decade, was quick to tell me during my visit to the regulator body in December 2019 that neither Okonkwo's Blue Power Energy Plant nor the British Nzema Solar Power Station existed. Kofi was in charge of the country's renewable energy vision, which aims at 10 percent of renewable energy on the grid by 2030 as set out in the Paris Agreement, and administered the bureaucratic processes for register-

ing renewables. He explained that the Nzema Solar Power Station was the first solar power station between 2012 and 2016 to receive permission from the Energy Commission to start construction. Its location on the western coast of Ghana meant that the plant would displace too much farmland, and the company eventually gave up negotiating with the chiefs who governed the region. It was never built. According to Kofi, the plant trumpeted by *Forbes* had a more perplexing story, for it had never even been registered. The commission's website featured all the documents relating to renewable energy projects, and there was no trace of Salma Okonkwo in these files. Kofi could not understand how a respectable publication like *Forbes* could publish an article on a 100-megawatt plant without fact-checking. "If you end up finding the plant, I'll pay for your taxi ride there," he joked. A 100-megawatt photovoltaic power plant would require a large site; therefore the station would be difficult, if not impossible, to conceal. Some days after we met in his office, I messaged him to ask if we should try to find the plant. "I don't know where we will be going to, NoWhere [*sic*]," he wrote back. His colleagues at other institutions in Ghana, including the Electricity Company of Ghana and GridCo, confirmed that the plant was fictional and summed it up as "fake news." Despite my attempts, I could not secure a meeting with Salma Okonkwo herself.

Why has the Okonkwo story attracted attention in the international media? Discussions of energy in Africa tend to focus on leapfrogging, theorizing how the region may be able to avoid carbon-intensive fuels such as oil, coal, and natural gas and to start using renewable energy infrastructures directly (see, for instance, Kouame 2019). In an article on electricity in the Global South, anthropologist Akhil Gupta (2015, 564) suggests, for example, that "the real question is how the quality of people's lives in the Global South can be improved, not by emulating the destructive patterns of the Global North, but by pursuing new, sustainable developmental paths that have not yet been taken. There is a real opportunity to leapfrog the carbon economy and life on the grid to establish future-oriented, sustainable ways of living." Yet such attractive, future-oriented, and global visions do not always take into account the contexts in which these renewable energy power stations will be built and who they will benefit.[1] This may be one of the reasons why the story of the solar power plant was so attractive to *Forbes*: It indicated a green energy future led by an African woman whose work evidenced that leapfrogging might be possible, even though this was not necessarily matched by what was happening on the ground.

Blue Power Energy might be "fake news," but this does not mean that there are no real solar power plants in Ghana. In this chapter, I document and analyze the emergence of utility-scale solar power stations and on- and off-grid rooftop solar panels in various parts of the country and investigate what leapfrogging looks like materially. I argue that attempts to leapfrog ahead to solar power represent Ghana's capacity for stepping into the next phase of an emergent modernity, thereby reinforcing the linear timeline of progress and presenting a "clean" future, where "cleanliness" means both environmental sustainability and greater justice and equity. Thinking in particular about solar power infrastructure, energy humanities scholars Imre Szeman and Darin Barney (2021, 2) suggest that "the belief that solar can meet our energy needs *and* take care of humanity, and can accomplish both via technology alone, is at the heart of the promise of solar." In practice, however, the effects of renewable energy power stations have followed the logic of energy accumulation I set out in the introduction, as these infrastructures are unevenly experienced and ultimately perpetuate global and domestic disparities. On the one hand, large-scale solar power projects reproduce uneven governance frameworks, extending unequal relationships with Chinese investors. On the other hand, small-scale rooftop solar panels create what energy professionals call a utility death spiral, that is, a continuing decline in revenue and rise in costs for the utility company, the Electricity Company of Ghana, exacerbating income inequalities among electricity consumers.

It is essential to track and document the transformations in electricity generation at the national and global scale, but an exclusive focus on indicators at these scales runs the risk of rendering the intricacies of new energy infrastructure invisible. In a context where broader trends favor thermal infrastructure (see previous chapters), what kinds of social, political, and financial relations do smaller-scale renewable energy projects such as photovoltaic solar power stations or rooftop solar panels give rise to? Beyond celebrating the arrival of clean technologies as agents of climate change mitigation, the literature on renewable energy asks how and if these new technologies might contribute to the production of just societies and ask if renewable energy power stations might lead to opportunities for social change (Günel 2019; Howe 2019). An analysis of small-scale solar power production facilities and rooftop solar panels demonstrates how the adoption of these technologies facilitates a kind of leapfrogging to renewable energy for a select few, and how they might extend inequality in the context of Ghana.

The Multiple Meanings of Clean Energy

What does clean energy mean? "Here, this is clean energy," a Chinese engineer, at a solar power station in Winneba in coastal Ghana, pointed to a young man wiping off photovoltaic solar panels with a bright red mop and chuckled at his own joke (figure 3.1). Both men donned high-visibility safety vests that set them apart from the lush, dusty landscape. Unlike the engineer, the solar panel cleaner also wore a safety helmet and knee-high rubber boots, a sign of more extended periods spent outside in the elements.

The Meinergy plant, opened in 2018, employed three Chinese engineers in different positions and thirty Ghanaian and Togolese staff serving in various blue-collar roles, including cleaner, security guard, and control room operator. The plant was one of two 20-megawatt solar power producers in Winneba, both owned by the same Chinese technology firm, Beijing Fuxing Xiaocheng Electronic, but operating under two separate names. At the time of my visit in 2019, the solar power plants in Winneba were the largest solar power stations in West Africa but had very little online presence and put almost no effort into marketing and publicity (Kenning 2016). In chapter 2, I described how the operations of floating power plants were interwoven with Turkey's geopolitical and geoeconomic goals. Similarly, the emergence of the solar power stations has been part and parcel of China's broader influence on Ghana, for Chinese companies have funded and facilitated the construction of these infrastructure projects, often in exchange for access to raw materials. As political scientist Isaac Odoom (2015, 598) put it, "dam in, cocoa out; pipes in, oil out" (see also Neal 2021). Even though their combined electricity output was only a small percentage of the grid's now 5,000-megawatt electricity volume, the two Chinese solar power stations carried a symbolic weight among energy experts, who saw in them a possibility that set them apart from other independent power producers: Could Ghana perhaps forgo fossil fuels and leapfrog to a renewable energy future?

Like many power plants, the Meinergy solar power station is a world of its own. A high fence surrounds the manicured solar field, marking out acres of space for approximately 65,000 photovoltaic panels and four hundred inverters, alongside a house for employees and an administrative building. The three Chinese men, all labor migrants living on-site who had no families, jogged beside this fence every morning as part of their exercise routine. In their daily runs, they identified stolen cables and broken solar panels, tended to some papaya trees, and monitored unwanted vegetation



FIGURE 3.1. Man with a mop cleans dust and mud from solar panels during harmattan, Meinergy solar power station, Winneba, Ghana, 2020. Photo by the author.

that could cast shadows on the panels before retreating to their office building for the rest of the day. Like the always available floating power plant employees I described earlier in this book, these Chinese men were present on-site to attend to potential emergencies.

Ghanaian and Togolese employees lived in the nearby town of Winneba. Many of them had grown up there. For a long time, Winneba was a port town, facilitating the export of forest products from the neighboring regions, and therefore was historically embroiled in such geopolitical and geoeconomic relations. In 1962, however, the port closed, giving way to the much larger port in Tema, the industrial city where the floating power plant *Ayşegül Sultan* was based (see chapters 1 and 2). Now, the town's relatively small 60,000-person population practiced fishing along the Atlantic coastline. Since the 1990s, the University of Education, Winneba, a university that trains teachers, has drawn young people to the area. Winneba also boasts a series of hotels that attract day trippers and other tourists from Accra, located only about an hour's drive away. For the Chinese engineers who lived on the grounds of the solar power station, however, Winneba was a place they engaged with in a very limited way.

During the sandy months of the harmattan, a period of particularly low efficiency for solar power stations across West Africa, twelve cleaners were



FIGURE 3.2. A papaya tree grows amid solar panels at the Meinergy solar power station, Winneba, Ghana, 2020. Photo by the author.

taking turns mopping the panels inside the two compounds, wishing that it rained more often. Although the language of operation in this plant was mainly English, several staff members had picked up some Mandarin in the two years since the opening of the solar power station. All electricity produced on-site goes into the national Ghanaian grid, managed by the Electricity Company of Ghana. The staff's collective ephemeral labor culminated in what my Chinese guide described as clean energy.

The Meinergy engineer's pun—his definition of clean energy—had revealed the double meaning of the word *clean*. First, the word was a descriptor for a set of tangible material solar panels that we could all sense and that needed consistent wiping to retain their efficiency, alongside other kinds of repair and maintenance. But the same harmattan dust that makes the panels unclean does not soil the papaya trees (figure 3.2). In this context, the word *clean* demonstrates that there is a systematic material order in place in the photovoltaic power plant. In complying with this order, staff identify and eliminate the elements that threaten productivity to achieve a kind of temporary purity.

The second meaning of *clean*, which turned the engineer's comment into a witticism, is its national- and planetary-scale abstraction. In this sense, *clean*—more specifically *clean energy*—refers to the global movement to



FIGURE 3.3. BXC solar power station, Winneba, Ghana, 2020. Photo by the author.

replace or supplement fossil fuels with renewable energy resources, to mitigate climate change and rescue humanity from present and future environmental catastrophes. In this context, clean promises not only effective and nonpolluting energy generation but also justice, equity, and inclusion. Even though the construction of renewable energy power stations does not replace fossil fuels at present but simply adds to the energy mix, this movement still strives to safeguard humanity against a time when the supply of fossil fuels will be depleted or will have become too difficult and costly to extract.

A Chinese businessman who had been based in Accra for almost a decade, Tony held the position of chief executive officer at Meinergy and had made my visits to the Beijing Fuxing Xiaocheng Company (BXC) and Meinergy plants in Winneba possible in December 2019 and January 2020 (figure 3.3). Soon after, he asked me to meet him for dinner in Labone in Accra. Labone was a neighborhood that catered to the residents of the nearby Cantonments, an upper-middle-class area that was home to embassies and other international organizations and therefore had a range of international dining options that Tony enjoyed. He brought along the pilot for his private Cessna plane to the restaurant, a twenty-something Chinese woman who had recently completed an undergraduate degree in English literature and moved to Accra for this job. Even though Tony was satisfied

with BXC and Meinergy's operations in Winneba, he wished to discuss the future of his company's work in Bui, home to the 400-megawatt Bui Dam. Over a meal of grilled tilapia and quinoa bowls, Tony showed me drone photographs on his phone of upcoming solar power stations. He described the images depicting vast verdant landscapes adorned with glistening solar arrays with enthusiasm. His growing business in the region had necessitated a private plane and the services of the pilot who now dined with us, for it cut down the ten-hour car journey between Accra and Bui significantly. The pilot appeared to be uninterested in the photographs; she had already seen it all from above.

The Bui Dam had opened in December 2013, only a few years before I met Tony, on the Black Volta River at Bui Gorge, at the southern end of Bui National Park in an area straddling the Northern and Brong-Ahafo regions in Ghana.[2] In an article on Chinese soft power in Ghana, geographer Kwame Adovor Tsikudo (2022, 319) suggests that the dam has transformed China-Ghana relations "from sporadic to sustained engagements." Soviet and American companies had competed for the construction of the Akosombo Dam in the 1950s and '60s, but the construction of the dam in Bui was funded and managed single-handedly by the Chinese. The Bui Dam project shifted the funding of large infrastructure projects from state owned to private sector led (Miescher and Tsikata 2009–10) and became an essential asset during the *dumsor* period of 2012–16. As Miescher and Tsikata (2009–10) demonstrate, supporters of the project employed modernization narratives to promote the construction in the face of vehement criticism regarding the environmental damage it would inflict on humans and nonhumans in the region and despite the forced removal of communities from the area now flooded by the dam.[3]

Soon after it opened, two solar power facilities appeared in the region demarcated for the dam. The Chinese investors wished to maximize the project's electrical output, and an easy way to achieve this goal was to complement the hydroelectric scheme with solar fields. Collaborating with the Chinese technology conglomerate Huawei, Meinergy initially helped install a small floating solar power station in Bui reservoir. While conserving land, the floating solar power facility would also slow down evaporation in the reservoir. Other dams, such as Thailand's Sirindhorn Dam, had already experimented with floating solar panels on a much larger scale. Tony's drone photographs included some images of the floating power station. In describing the plant, he emphasized how it was the first of its kind in West Africa. Alongside the small floating facility, Tony had been involved in putting

together the much larger 100-megawatt photovoltaic plant, which would be finalized by the end of 2023. The numbers made sense since the kilowatt-hour rates for solar power stations were considerably lower than what other thermal power stations could offer. He explained that soon there would be no need for Chinese engineers in the region because Ghanaian experts were eager to learn and could easily take over the operational responsibilities of the plants. In June 2023, the Chinese companies Huawei and Meinergy organized an event in collaboration with the Bui Power Authority, a governmental body responsible for managing the Bui hydroelectric project, to demonstrate that Ghana was moving forward with its Renewable Energy Masterplan, which had been put together under Kofi's guidance by the Energy Commission in February 2019 (Energy Commission Ghana 2019). During the event "Powering a Sustainable and Digital Future for West Africa: Pioneering Cases from Bui Power Authority, Ghana," Samuel Kofi Dzamesi, CEO of the Bui Power Authority, announced, "We are exploring wind, solar, and other clean energy sources, aiming to meet the increasing demand for electricity in an environmentally conscious manner" (Anku 2023). When I asked Tony if climate change was a concern for him, he responded, "No, no, just money."

The Ghanaian CEO of the Bui power plant had underlined the significance of environmentally conscious energy options in his opening speech. But, as Tony said, the projects facilitating leapfrogging to solar power stations were not driven by and did not result in ethical or equitable energy infrastructures. Tony had stated openly that the motivation for developing solar power stations in Ghana was primarily the pursuit of increased profit for Chinese investors, with the greatest expenses borne by those who could least afford them. Yet this context was not unique to solar power stations sponsored by Chinese investors. While seeking to mitigate climate change and energy security issues, other solar facilities in Ghana, such as the Volta River Authority–owned Kaleo Lawra solar plant in the Upper West region, which had received funding from Germany's KfW Development Bank, stripped small farmers of their land. The new power station produced what geographer Ryan Stock and his collaborators (2023) call "a solar surplus population"—people who lose their farm-related jobs and have no employment prospects at the new facilities. In addressing regional and national-scale electricity provision, such solar power stations also exacerbated energy access for the inhabitants of the area surrounding the plant by rendering firewood out of reach.[4] In this context, leapfrogging was merely a technological prospect with positive financial outcomes for its

developers rather than a transformative event to uphold justice and equity, as it is sometimes assumed with renewable energy power stations.

Not only was the construction of utility-scale solar power stations a profitable business, but it also allowed Tony to expand into other industries. During our lunch meeting in the lobby of the four-star African Regent Hotel in Accra in March 2023, about three years after our dinner conversation in Labone, he told me how he now ran "about 7,000 hectares of sugarcane plantations employing six hundred women from the region," near the power station in Bui. The COVID-19 pandemic had not affected his affairs in the area. He had stayed put in Accra and had continued to work without interruption since the last time we met. He was a man in a hurry, ordering waiters around for quicker service without paying much attention to what he was ordering. "Men in the region are lazy, but women are hardworking," he said of Bui, inviting me to visit the solar power station and the plantations in 2024. Such men and women were valuable only for what they could offer Tony's projects. The availability of human labor in the region also compelled Tony to invest in solar power stations and plantations at once, demonstrating that the development of energy infrastructures happens symbiotically.

As the region's sugarcane capacity grows, Tony explained how he will be building a sugarcane-processing plant there to supply Ghana's pressing domestic sugar demand and possibly to export sugar to neighboring countries.[5] The land is cheap in Bui. There is no need for irrigation. The Bui hydroelectric plant and the new solar power station produce electricity that can be used to run the sugarcane-processing facility. All of these factors make it easier for Tony to start a solar power station and a plantation at once. The following month, the agreement was made public: The Bui Power Authority had leased 13,000 acres of land to Bui Sugar Limited, another Chinese company.[6] By 2025, the sugarcane-processing plant had not yet been opened. Still, this expansion strategy shows that solar infrastructure does not signify the completion of a geopolitical and geoeconomic project between China and Ghana; instead, it is a liminal device in its own right (see chapter 2), providing opportunities for Chinese investors to strategize about other potential investment options.

The plantation and the solar power station appear to be at odds with one another. A sugarcane plantation recalls histories of monocropping and enslaved labor, whereas the construction of a 100-megawatt solar power station in Bui signifies the possibility of leapfrogging to an emerging technology and constitutes a kind of arrival. But the relationship between

sugarcane plantations and energy production has long been interwoven. For instance, as geographer Kathryn Yusoff (2018, 15) writes, "That the massive increase in sugar consumption in 1850 maps directly onto the massive increase in coal use is perhaps not surprising, as sugar was the conversion of inhumane slave energy into fuel, then back into human energy, plus inhuman energy, to produce industrialization. Coal was the inhuman corollary of those dehumanized black bodies." Anthropologist David McDermott Hughes (2017) also shows the material connections between plantations and oil in the context of Trinidad and Tobago, framing enslaved peoples in the plantations as the first fuel that would eventually facilitate the production of oil and fostering a sense of fuel without morality. Despite the global enthusiasm for renewable energy, solar power stations do not impart morality to fuels (see also Lennon 2025). Today, solar power stations and plantations feed into one another (see also Ulrich 2024). In this sense, the promise of solar power remains unfulfilled.

This condition may be an unsurprising product of the core motivation behind this set of developments, which have prioritized profit maximization for Chinese investors. A review of China's aid policies across African countries since the 1960s shows that Tony's decisions were not arbitrary. In the 1960s, China began its projects in Africa by helping to build a factory that would enable Guineans to produce cigarettes by using domestic tobacco. In the late 1980s, Chinese corporations managed or leased sugar plantations and factories in Mali, Sierra Leone, Benin, Togo, and Madagascar (Brautigam 2009, 196). This model of providing aid to African countries echoes China's experience of receiving aid from Japan. Against the backdrop of Chinese projects in Africa, construction of the sugar plantation and the sugar-processing facility in Ghana can be seen as an extension of this legacy of aid but with the possibility of financial gain. Therefore, the Chinese plantation embodies another form of foreign investment whose logics and effects may not be identical to those of other plantation histories.

The connection between sugarcane plantations and power stations extends beyond the historical ties between sugar and fossil fuels. In her exploration of the futures shaped by plantations, Katherine McKittrick (2013, 3) posits that the concept of the plantation is "migratory." McKittrick asserts that the plantation is not merely a physical entity but also a governing framework whose influence extends beyond its tangible boundaries, foreshadowing the emergence of contemporary global capitalism.[7] Beyond traditional agriculture, plantations now take the form of industries involved in extracting rare minerals used in computers and mobile phones, as well as of terrestrial

and marine plantations that facilitate oil production. In all these contexts, rationally ordered large-scale extractive landscapes that foster monocropping in peripheral regions supply the raw materials that enable the smooth functioning of capitalist practice, rendering the imprint of the plantation form indisputable. In the context I describe here, the sugarcane plantation and processing facility represent the latest phase in a three-part process of Chinese frontier development that commenced with the Bui Dam and continued with the establishment of solar power stations. These facilities produce electricity and sugar for domestic use rather than export. Yet they rely on the region's cheap land and readily available workers, generating spatial enclosures to extend profit maximization for Chinese investors far away. Like the floating power plants I analyzed in the previous two chapters, such spaces of production promise flexibility but continue to grow through the attachments people, including the solar power station employees who run alongside the fence each morning, develop to particular technologies and regions to ensure their effective functioning. They are worlds within worlds.

While they do not advance Chinese capital in Ghana or make claims to being clean, the floating power plants I described in previous chapters also operate in the wake of plantations. Ships often anchor in harbors to load raw materials from onshore facilities and then move them elsewhere.[8] On West African shores, this transfer of raw materials evokes a specific and very violent history. The slave ships Paul Gilroy (1993) studies in *The Black Atlantic* were floating tombs and floating laboratories that transformed people into what Canadian poet Dionne Brand (2011, 93) has called "bodies emptied of being, bodies emptied of self-interpretation, into which new interpretations could be placed." According to these new interpretations, African bodies became the fuel for plantations, or what anthropologist David McDermott Hughes (2017, 29) calls "the first fuel," with reference to the accumulation of enslaved people's bodies, a shift whereby plantation owners began to imagine energy as a commodity. "The first fuel, thus, flowed imperfectly, slowed by the friction of moral scruple," Hughes (2017, 31) argues: "It flowed well enough, nonetheless, to establish the conventions under which we now extract oil and ship it across oceans by the boatload." As shipping and logistics have emerged as defining features of contemporary global capitalism, ships have acquired diverse forms and functions, but perhaps certain organizational principles have endured. As a ship-cum-generator, the floating power plant *Ayşegül Sultan* constitutes a prosthetic factory, complementing and supporting land-based power generation in Ghana.[9]

What if we were to look at the co-emergence of the dam, the solar power station, and the sugarcane plantation to understand what leapfrogging in Ghana might mean materially? How might they differ from floating power plants? While the sugarcane plantation and sugar-processing facility produce the much-needed calories to extend labor, the dam and the solar power station promise to generate kilowatt-hours for energy-hungry industries. All of them allow for the expansion of Chinese capital in Ghana, drawing on ideas of linear progress while at the same time advancing an arrangement where raw materials can be extracted in exchange for loans.[10] They diverge from the floating power plants in two ways. First, their developers frame them as arrival technologies (see chapter 2) that fulfill an infrastructural promise. Second, they facilitate geopolitical and geoeconomic relations with different actors, strengthening Chinese frontier-making projects in Ghana. None of this seemed to matter to Tony, "just money."

The clean commodities that facilitate the emergence of clean energy worldwide, ranging from solar panels to electric cars, entrench unequal relationships. When the word *clean* is used to describe these commodities, it does not mean equitable or just. By wiping solar panels, cleaners are helping the Ghanaian government to achieve its future climate change mitigation goals. They are contributing to China's geopolitical mission in Ghana while warding off *dumsor*, in some ways. A solar energy future is appealing because it allows for the expansion of the grid in what many energy professionals perceive to be an ethical manner and demonstrates that Ghana might skip one of the usual stages of development. A utopian goal that now manifests itself in corporate enterprises of different sizes and shapes, such national- and planetary-scale cleaning depends on the thankless task of wiping solar panels each and every day.

In the next section, I explore another ubiquitous form of solar power production, investigating why and how residential and industrial consumers across Accra have adopted rooftop solar panels, and tracking the impacts of such projects on the electricity grid. In the same way, being clean does not mean being ethical on the global scale, nor does it mean equitability on a national scale in Ghana, as the next section details.

The Inequities of Rooftop Solar

In the 1980s, Fadi's father had purchased an island that faced the Atlantic Ocean on one side and the Volta River on the other, a unique spot among an archipelago of small islands scattered at the river's mouth. A tall and

slim man with silver hair and blue eyes, Fadi had completed his undergraduate and graduate degrees outside Ghana, then moved back home to manage the successful businesses his father had built in Accra. He enjoyed making small talk with me about his daughter's educational pursuits in Europe and the United States. On weekends, his family would entertain their many guests on this whimsical patch of sand, carrying the essentials in a high-speed boat from the nearest fishing village, Ada. For decades, they had transported diesel for their generators, too, but this arrangement had changed when Fadi's savvy cousin took on the responsibility of cladding the house with rooftop solar panels. Their initial investment of 187,000 Ghanaian cedi paid off in only a few years.[11] Originally from Lebanon, Fadi's family had been importing car parts and luxury vehicles to Ghana since the mid-twentieth century. They did not seem to have any trouble financing the project. The Porsche SUV that Fadi drove was one of the models they had recently introduced to the Ghanaian market, and so far it had been doing well. As we discussed solar power production, Fadi's cousin singled out their batteries as the technology most in need of advancement, an argument that had been put forward by many in the renewable energy sector. Fadi's family had opened their island home to me on the recommendation of a mutual friend who worked for the Turkish energy company Aksa and who often helped them with their generator needs. They kindly offered me a beer that had been cooled in a solar-powered fridge and told me to enjoy myself alongside their other visitors on this beautiful Sunday afternoon.

"Rooftop solar is a status symbol, like owning a luxurious car," Belinda, a young energy professional with the Energy Commission, argued when I told her about my experience of visiting Fadi's island near Ada. She confirmed that most rooftop solar power stations were self-financed, not only for those with homes off the grid, such as Fadi's, but even for people with resources who had easy access to the grid. I mentioned to Belinda that I had also visited Solomon, a well-known man-about-town whom she had heard of but had never met. Solomon had fitted his home and office with solar panels even though he lived in central Accra, near the US Embassy, and had full access to the Electricity Company of Ghana's electricity supply. Solomon had spent most of his life in Washington, DC, working with various international organizations, including the World Bank. Later in life, he moved back to Accra and became a policy adviser while writing informative coffee table books about Ghana that were hard to come by. He had agreed to host me in his home for an afternoon upon the recommendation of a US-based colleague. And he was no stranger to debates on energy

infrastructure in Ghana: One of his many books documented the inauguration of the Akosombo Dam in detail and was available for purchase in the Akosombo Dam's gift shop. A well-traveled and well-connected man, Solomon was proud of his rooftop solar project and used a small monitor to check its production levels throughout the day. Nearly half of his electricity was produced by the 7-kilowatt panels on his roof. When I asked what had prompted him to install the panels, he referred to the persistent electric power outages that Ghanaians had been experiencing, christened *dumsor*, and the resulting tariff increases.

Solomon was not alone in his worries. The tariff increases led many individuals, institutions, and industrial facilities to rethink their electricity consumption patterns. Many people installed rooftop solar panels, which cut their reliance on the Electricity Company of Ghana by half. A green finance specialist I spoke with used the example of Kasapreko Bottling Plant in Accra, which relied on rooftop solar panels for its electricity needs (see *PV Magazine* 2019). Other institutions I visited, such as the Australian High Commission and CalBank, had also opted for solar energy, training their facilities staff to operate and maintain their rooftop panels. The Australian High Commission was the first embassy in Accra to switch to rooftop solar power, and the first Australian High Commission in the world to do so. The facilities manager at the high commission informed me that, since the installation of their solar panels, they had purchased only 53 percent of their electricity from the Electricity Company of Ghana. "You stop buying your electricity from ECG, and suddenly ECG has lost a good, paying customer," a foreign aid worker who specializes in energy issues and who had experience in the electricity sector in South America and South Asia said, putting these conditions in perspective for me. "The energy sector here can sink the whole economy."

As a consequence of losing more and more of its steady-paying clients and being trapped in take-or-pay contracts (see chapter 2), the Electricity Company of Ghana was forced to increase tariffs even more. "Imagine these high-paying institutional and industrial facilities as the business class passengers on a plane," Belinda from the Energy Commission remarked. "They subsidize flights for economy class passengers, and in turn receive special treatment, say, they're offered champagne. Industrial and institutional consumers in Ghana subsidize residential consumers and complain that they are not receiving any special treatment. We give them no champagne, so they slowly reduce their reliance on the grid." These observations echo what is known among energy professionals as the utility death spiral, where tariff increases

cannot cover a utility company's costs, and the growing adoption of rooftop solar photovoltaics among customers increases the discrepancy between the utility company's expenses and income, leading to even further price increases.[12] As high-paying industrial and institutional facilities invest in rooftop solar panels and reduce their reliance on national distributors, electricity consumption has become more and more of a financial liability for participants in the grid across the country. A 2021 article in *Energy Research and Social Science* argues, "Since 2015, following the contract for electricity from Karpowership, electricity in the South [of Ghana] has been much more reliable, but more expensive" (Baker et al. 2021). The authors suggest that the region serviced by the Electricity Company of Ghana has come to take reliability for granted and now wants to reduce costs. The implementation of rooftop solar panels in Ghana demonstrates that, despite promising a more equitable and optimistic future, solar power stations are not equally accessible to all Ghanaians. The installation of rooftop solar panels has actually led to energy price increases for those who cannot afford them and have to rely on the national electricity grid for their everyday needs.

Increasing electricity tariffs also rendered rooftop solar power more attractive to those with more modest means. Hope, a sixty-something shopkeeper in Achimota, a central neighborhood in Accra known mostly for the prestigious Achimota School, had acquired rooftop solar panels with 6-kilowatt capacity in January 2023 in exchange for sharing space with the battery-swapping start-up Kofa (figure 3.4). Hope had married young and moved outside the city to live with her husband, but returned to her parents' home in Accra in her late twenties, along with her three little sons, when he started mistreating her. Eventually, she began a relationship with one of her neighbors, a Liberian man who passed away soon after she had a daughter with him. While mourning his death, she started a shop outside her parents' house, selling goods such as eggs, matches, peanuts, soda, and bread. Her sons had settled in Kumasi, while her only daughter, now in her thirties, was employed as a teacher in Accra and lived with her in the house behind the shop. A calendar featuring photographs of a charismatic pastor from Kumasi hung on the wall behind her chair.

Hope said she had immediately warmed to Olaf, the founder and CEO of Kofa, when he approached her with the idea of renting space in 2022. She accepted 6,000 cedis from him as a fee for one year, which, at the time, amounted to about $600. A swapping station is a place where electric motorcyclists can replace their empty batteries with fully charged ones by using a vending machine. The ideal consumer for Olaf's company was a repair



FIGURE 3.4. Kofa swapping station next to By God's Grace shop, Accra, Ghana, 2023. Photo by the author.

person using an electric motorcycle to travel to customers' homes. Upon arrival, they would unplug the battery and use it to power their tools as they carried out the repairs. This meant that motorcyclists, many of whom were plumbers working in neighborhoods close by, would stop outside Hope's shop for their batteries to be changed (see chapter 4), which took about forty-five seconds. The shop's location along the plumbers' routes was one of the reasons why Olaf had reached out to Hope in the first place. When we spoke at her shop in March 2023, Hope explained that the presence of the swapping station had not necessarily improved her business, but that people from the neighborhood occasionally walked over to her shop to admire her rooftop solar panels. The charging station consumed 4 kilowatts of power, so Hope could use the remaining 2 kilowatts for her own needs. She also maintained her connection to the national grid. An old television that she no longer watched sat atop one of her shelves. While the radio played in the background, she avidly wrote messages on her smartphone. She added that she enjoyed the technical support she received from various technicians for her rooftop solar panels. A sign on the ground outside her shop welcomes swapping station customers to "step into the future." The future is not only a time but also a place—in this case, Hope's shop.

How does Hope, a shopkeeper with more modest means, fit into the broader economic picture that I have painted here? Even though she did not have the funding to purchase solar panels in the more straightforward and capital-intensive way that Fadi and Solomon did, she was drawn to using solar panels not only because of their financial benefits but also because of the prestige associated with the technology. Following a personally difficult period in the 1980s, Hope had started the shop that now gave her a platform to engage with the Kofa founder, Olaf. In this context, she could enter into a relation of exchange with Olaf, thanks to her centrally located shop, which was a desirable location for a swapping station. Through such unforeseen, and perhaps unreliable, exchange relations, which might be terminated if Kofa went bankrupt or found a better location for the swapping station, the spatial and temporal qualities of Hope's shop shifted, allowing customers to "step into the future," at least for the time being.

Energy professionals in Ghana aspire to attract more customers who can afford to pay for rooftop solar panels. Recent scholarship on green infrastructure singles out Ghana as a country that needs backup for its financing schemes. In a 2020 book, *Green Building in Developing Countries*, financing specialists Darko et al. (2020, 226) write, "Ghanaian practitioners have a difficult time trying to find financing sources for green projects that can defray the high costs of GBTs (green building technologies). Again, the lack of financing schemes also makes it hard to deal with the cost barrier in the GBTs adoption in Ghana. Bank loans, for example, are one of the most common financing schemes for green projects from around the world. Yet, within Ghana, it is arduous to find banks and other financial institutions that grant loans for green projects." This kind of critique, reflecting a particular zeitgeist, has prompted the flow of relatively inexpensive financing from international organizations such as the International Finance Corporation (IFC) to Ghanaian banks.[13] One of the large financial institutions in Ghana, CalBank, started its green loan programs in 2017 with support from the IFC.

Green finance experts at CalBank explained how their loan programs have not yet had the desired effect of expanding the market for rooftop solar panels, but they look forward to future transformations. "People who are interested are interested in our loans because of a lack of energy, not because they are concerned with a switch to renewables," Richard, a member of what the bankers have come to call the "green team" at CalBank, told me. "*Dumsor* was a great opportunity for initiating a switch to green energy, but most of us just switched to generators." Urgent solutions during *dumsor*

had resulted in a transition to fossil fuel–driven electricity production across the country. Eric, another member of the green team, followed up, explaining how they search for individuals who are creditworthy, specifically, he said, "salaried workers, who won't have problems with collateral, but we don't have a lot of such people approaching us." Still, they aspire to develop a definition of what counts as green in Ghana and hope to reclassify existing projects as green in a way that satisfies their additional requirements.[14] "Tech for green energy is moving very fast. People are learning that energy from the national grid is more expensive from going solar," Eric continued. "Up-front capital is high for a lot of people, but now even the presidential palace is going green."

Green finance professionals view the growing palpability of climate change in Ghana as an opportunity for advancing their green loan programs. "Look at Australia," Richard said, offering as an example the wildfire raging on the country's east coast at the time of our conversation in January 2020. Some weeks before our meeting at CalBank, I had participated in a panel on climate change at Accra's Jamestown Café, where the debate had focused on these wildfires. My fellow panelists had suggested that the situation in Ghana was not so different from that of Australia, as both countries had been stuck between a rock and a hard place, facing rising temperatures and unavoidable sea-level rise. Work had to be done in both places to strengthen coastal defenses, change building codes, and determine the populations that would eventually need to be relocated. Providing a more specific perspective, Jonathan, a climate change specialist at Ghana's Environmental Protection Agency who often attended the United Nations Framework Convention on Climate Change climate summits as a negotiator, suggested that the country had struggled with dramatically low water levels in its hydroelectric power facilities between 2006 and 2010: "Water levels were so low that we could only keep one turbine active in the Akosombo Dam in 2008." "Temperatures are increasing, there is no water in the dams, and we are afraid of sea level rise; we need to do something about all this," members of the green team at CalBank agreed. At the time we were unaware of the COVID-19 pandemic that would soon disrupt our lives globally and lead to more questions on the impacts of climate change.

Such understanding of climate change issues is relatively rare in Ghana. At a time of unreliable access to electricity, they had taken a back seat.[15] Energy professionals in Ghana repeatedly told me that they did not think they should be held accountable for climate change impacts because they had not participated in the over 150 years of industrial activity that had led to

the high concentrations of greenhouse gases in the atmosphere. Therefore many of them regarded leapfrogging as somewhat superfluous or unnecessary. If the Global North were to stop using fossil fuels and to limit their emissions, countries of the Global South would have the capacity to burn such fuels and speed up their processes of industrialization. Rather than diverge from the timeline of development by skipping a stage, Global South countries could then follow the linear transformations as preordained, "carbonizing before decarbonizing," and moving to renewable energy stations only after they had harnessed the power of fossil fuels to their full extent.

Many energy professionals I met between 2016 and 2023 argued that it would be impossible to industrialize by relying only on renewable energy systems. "How would we run an aluminum plant on solar power?" many of them wondered. Ghana's iconic Akosombo Dam had been opened in 1966 with the primary purpose of providing electricity to the country's aluminum industry, but none of the contemporary renewable energy power stations, including the recently opened Bui Dam, could match the dam's production capacity. According to these energy professionals, industrialized countries such as Germany should now rely on renewables so as to allow nonindustrialized nations such as Ghana to build factories and other industrial facilities that require high concentrations of energy and therefore emit greenhouse gases. "Our emissions are already so low," an electrical engineer at the Electricity Company of Ghana explained. "Why should our country pay the price for the climate emergency?" While many argued that Ghana had already experienced the impact of climate change, such as low water levels in hydroelectric plants, they did not all agree that they had to be held accountable for these effects. Accordingly, they questioned the value of leapfrogging and reiterated the advantages of following a linear trajectory without skipping a stage.

Affluent individuals, such as Fadi and Solomon, as well as less privileged people such as Hope, began to see rooftop solar panels as a way to decrease their energy costs and their reliance on an unsteady grid. This led to the new technology becoming a status symbol in Ghana. Many institutions, including the Australian High Commission, CalBank, and the Kasapreko Bottling Plant, also followed this trend.[16] Finance professionals both in Ghana and elsewhere understood the inequality that results from the adoption of rooftop solar panels as a business problem that can be resolved by developing innovative green financing tools, most importantly green loans. Their approach follows a larger trend toward "making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient

development," as predicated by the Paris Agreement (Sustainable Development Goals 2022). By allowing bankable middle-class Ghanaians to apply for low-interest three- to five-year loans to build rooftop solar panels, financial institutions such as CalBank and Stanbic Bank aspired to increase the populations who benefit from already available rooftop solar technologies. One aid worker told me how climate change and energy issues were no longer related to access to the right technological solutions but rather needed to be able to rely on and reproduce the right business models. Anthropologist Jamie Cross (2019, 48) points out how "selling solar power to people living in chronic energy poverty presents itself as an ethical-economic utopia: the opportunity to express care for others and the environment at the same time as fulfilling a fiduciary duty of care to investors and shareholders." A wider look at the rooftop solar panel landscape in Ghana shows that it is not necessarily the solar panels themselves that fulfill this "fiduciary duty of care" but rather green loans, which might facilitate the adoption of solar power and other energy efficiency technologies among bankable consumers (see also Baker 2022). This is one of the reasons the finance professionals I met across Ghana saw themselves as fundamental to facilitating a shift to a renewable energy future in the Global South and hoped for educational programs to teach Ghanaians the value of efficient energy use. Confronting the tangible effects of climate change, educated Ghanaians would then find more value in the green financing programs their banks offered.

The production of a clean, equitable energy future initially depends on the availability of technologies in various communities that are sometimes delivered as "little development devices." But an investigation into rooftop solar panels in Ghana shows how the emergence of solar-powered electricity is no longer contingent on the availability of technology, as solar panel production has grown tremendously over the past decades, especially in China, leading to the proliferation of more affordable solar panels of various qualities. Rather, the development of renewable energy power stations now requires financial flows that might support such visions of the future. This change of emphasis has led to the emergence of climate finance as a growing business among energy and climate change experts. It has also resulted in a context where climate finance practitioners espouse the creation of equity and justice through what we might call "clean," socially responsible loan programs. In an informative article on climate finance, Aneil Tripathy et al. (2024, 93) explain how such attempts to render climate finance responsible, or in their words "to 'hack' the financial industry to shift capital toward material infrastructure changes that could dramatically decrease the emissions

intensity of human work and life across the globe," have not worked. It remains to be seen how Ghana's green financing programs will develop in the upcoming years and whether they will achieve the kind of popularity they seek among bankable consumers who may be attracted to lower-interest loans. Regardless of their future, it is remarkable to observe how business models have emerged as silver bullets for a variety of problems with very different causes, trying to attend to inequality, fossil fuel consumption, and climate change all at once. If, as Tripathy et al. (2023, 96) suggest, "climate finance extends preexisting social dynamics," historical inequities of financial flows may shape how financing for rooftop solar panels develops in Ghana. Future ethnographic work on climate finance will clarify these questions.

Even as these consumers reduced their reliance on the Ghanaian national grid, electricity distributors in the country were having trouble paying independent power producers such as Meinergy and BXC and balancing their books. Eventually, they responded by increasing tariffs for consumers who most likely could not afford the up-front costs of rooftop solar panels and so had no choice but to remain on the grid. The construction of rooftop solar panels by organizations and companies who were well-off or who could afford to pay had the unexpected and undesirable effect of making electricity consumption a heavier financial burden on consumers across the regions serviced by the Electricity Company of Ghana, which increased inequality. Surprisingly, such pragmatic, seemingly ethical, and environmentally conscious choices put electricity consumption even further out of reach for those who rely on the grid for their power needs.[17] All in all, the proliferation of rooftop solar panels resulted in a utility death spiral that reinforces class status and wealth and is transforming Ghana's solar-powered future from a technological into a financial operation.

A Diverse Portfolio of Resources

Most of the growth in the world's energy supply and demand will take place in the Global South, especially across Africa. Increasing urban populations and the continent's overall economic expansion have contributed to this growth. What kinds of social and financial impact will this growing demand and supply have? As this book shows, the energy portfolio of Ghana has changed drastically in the past twenty years, as the country experienced low water levels in its hydroelectric power plants and faced an upsurge in electricity demand. In spite of the prevalent discourse on leapfrogging to renewable energy in the Global South, these emerging

electricity needs have actually incentivized Ghanaian decision-makers to enter into contracts with various independent power producers that rely on natural gas and heavy fuel oil for their electricity production. However, this growth in natural gas and heavy fuel oil consumption does not mean a homogeneous energy portfolio in Ghana. Instead, as anthropologist Michael Degani (2022, 197) also suggests in his analysis of Tanzania's grid, these developments indicate how "Africa's energy future will not lock into any one technology or mode, but rather continue to involve a diverse portfolio of resources and arrangements designed to manage uncertainty." During this period of ad hoc modifications in electricity generation, Chinese companies such as Meinergy and BXC financed and built small-scale solar power stations in various parts of Ghana, while planning on more significant investments. In addition, some institutional, industrial, and residential consumers chose to clad their buildings with rooftop solar panels, commencing small-scale solar energy production for their own use.

Energy professionals such as members of the Energy Commission, GridCo, the Environmental Protection Agency in Ghana, and the Electricity Company of Ghana; executives at solar power companies such as BXC and Meinergy; and green finance professionals at CalBank and Stanbic Bank employed a range of technological models and business solutions to usher in a new era of renewable energy. Of the 5,000-megawatt electricity production capacity on the grid, 40 megawatts came from the by BXC and Meinergy solar power stations in Winneba.[18] Commentators often argue that the demand for climate change mitigation technologies, such as solar power stations or electric vehicles (see chapter 4), has strengthened the geopolitical and geoeconomic power of China, given the country's access to minerals and broad investments in such climate change mitigation technologies. In early 2020, Meinergy started building an additional 100-megawatt plant in the area of the Bui Dam in northwestern Ghana and found solar power stations to be a gateway to establishing other kinds of industries in the region, such as sugarcane plantations and sugarcane-processing facilities. A second strand of solar electricity generation developed through rooftop panels, which have emerged as a viable option for individuals and institutions with access to up-front capital. Many industrial facilities also built rooftop solar panels, cutting their reliance on the Electricity Company of Ghana by half and causing a utility death spiral. The often-idealized renewable energy future has given rise to its own unique set of problems.

Foregrounding the significance of such small-scale renewable energy production, this chapter has analyzed the emergence of utility-scale solar

power stations as well as rooftop solar panels and shown how clean energy does not necessarily denote justice or equity in the Ghanaian context. First, utility-scale solar panels have allowed Chinese companies to expand into different sectors, such as sugarcane-processing facilities, and served as a geopolitical and geoeconomic claim-making opportunity. None of these initiatives has made solar power a moral fuel. Second, the increasing volume of rooftop solar panels installed by consumers whom Belinda labeled "business class passengers," that is, the Electricity Company of Ghana's well-off clients, has led to declining participation in the electricity grid and thereby increased electricity tariffs for everyone else who has no choice but to remain on the grid. In response to such growing inequality, decision-makers searched for innovative business models, appealing to green loans to expand this class of consumers. As a result, while a select few have managed to leapfrog to renewables, others have continued to put up with the grid, struggling with unsteady electricity provision and ever-higher tariffs.

So far, this book has traced the development of various kinds of energy infrastructure in Ghana, trying to discover the cause of the problem of overcapacity. In chapter 4, I track what happened to such excess electricity and how various actors from government and private institutions attempted to capitalize on it. I study the emergence of electric cars in Ghana, another technology of arrival that draws on the geopolitical and geoeconomic connection between Ghana and China, with different consequences for each party.

Drive Electric

In April 2022, during her ten-day stay in Houston, Texas, Doris Edem Agbevivi did some sightseeing around her hotel near the medical center and was impressed with the number of luxury electric vehicles (EVs) parked on driveways outside single-family homes. Doris, an energy economist in her early thirties, had been working with Ghana's Energy Commission for several years, coordinating the Drive Electric Initiative. A buoyant and energetic person, she makes friends effortlessly. We had spent time together in Accra in late 2019 and early 2020 while I conducted fieldwork on the emergence of the Turkish-owned Karpower floating power plant and tracked its impact on Ghana's electric grid. Occasionally, our mutual friend Alan, who carried out policy-focused research on water issues across Africa, would reach out to express his delight at having introduced us to each other. Throughout the COVID-19 pandemic in 2020 and 2021, Doris and I chatted on WhatsApp and Zoom, trying to think of ways we could collaborate, and she could visit Rice to meet fellow energy economists and give a talk about her work with the Energy Commission.

Doris is well known among energy professionals in Ghana. People call her "Ms. EV." After working as an auditor with Ernst & Young for a year, she had joined the Energy Commission as an energy analyst in 2016. Three years later, she became the program coordinator for the Drive Electric Initiative, promoting electric vehicle ownership among Ghanaian drivers. Having drafted the original concept note for the initiative, she identified

deeply with the project. Most of the time she worked on the Drive Electric Initiative alone, which gave her independence. Beyond meeting many of the stakeholders involved in implementing electric vehicle infrastructures in Ghana, she formed connections with global actors specializing in transport electrification, regularly talking to energy experts from South Africa, Kenya, Germany, the United Kingdom, the Netherlands, and the United States. She had completed her undergraduate degree in Accra and then gone on to pursue a master's in energy economics in the United Kingdom. Some of her global connections stemmed from that period, but most had come from attending professional meetings organized by international institutions such as the United Nations and the World Bank. Most recently, Doris was selected for an Emerging Climate Leaders Fellowship by Yale University. She was the go-to person for anyone who wished to learn about transport electrification in Ghana.

In Ghana, Doris faced a tricky situation. The electricity excess that had resulted from investments in various fossil fuel–powered power plants had created a new set of financial problems. A diverse network of actors, including government agencies, established companies, emergent start-ups, and interested individuals with widely varying political and social ideals, had reformulated the condition of excess to allow for the emergence of electric vehicle infrastructure, which could consume the excess electricity on the grid and offer some financial relief to the Electricity Company of Ghana. Despite their varying political and social ideals, these decision-makers shared specific goals and methods. For instance, all of them agreed that price incentives would guide consumers' decisions; they had all worked with Chinese producers; and they all supported Doris in her work with the Drive Electric Initiative. Most importantly, they were all enthusiastic about creating space for electric vehicles and charting new futures that would prevent Ghana from being the dumping ground for old technology, namely secondhand gas-powered cars.

Like the utility-scale solar power stations and rooftop solar panels I analyzed in chapter 3, electric vehicles are a foretaste of the future. While they may be emblems of a post–fossil fuel modernity, it is crucial also to differentiate how so-called clean technologies such as solar panels and electric vehicles might shape social life in the places where they are used, bringing with them distinctive challenges and collaborations. For instance, solar power stations fit the larger linear pattern of progress in Ghana and have therefore emerged as a celebrated technology in a context where there are problems with electricity supply. Electric vehicles, however, appear to have arrived too early in

the country, challenging how energy transition is meant to happen as advocated by the Global North. In short, while solar energy production followed an attempt to leapfrog along the presupposed linear energy timeline, the development of electric vehicle infrastructure charted a different trajectory.

In some ways, the move to develop electric vehicle infrastructure diverged from the established flow of goods associated with the linear energy transition timeline—where Global South countries like Ghana serve as the dumping ground for the Global North's old gas-powered cars—and challenged the presupposed temporality of electric vehicle infrastructure based on Global North contexts. In doing so, it pushed back against the dominant timeline of development. By opting instead for new, affordable vehicles such as the Chinese Ora Black Cat, Ghana further strengthened its geopolitical and geoeconomic connections with Chinese companies and sought a new timeline that these companies could help produce and follow. Decision-makers such as Doris often found themselves defending their choices and explaining why, say, the Norwegian or Danish model of electric car adoption, which incentivizes electric vehicles to manage renewable-energy-powered grids, is not the only way of promoting transport electrification. All in all, the implementation of electric transport in Ghana reoriented the Global North's chronology of energy infrastructure development and forged an alternative material politics with future potential. This imagination of progress can be easily absorbed into the framework of energy accumulation as an alternative direction that may help to replace gas-powered cars with electric cars without displacing the broad use of fossil fuel products across many other industries.

The Problem of Overcapacity in Ghana

Doris responded to a particular context of electricity excess in developing the Drive Electric Initiative. Electricity excess is surplus electrical energy that must be discarded or curtailed, mainly because it cannot be used to satisfy existing consumer demand on the grid or to charge batteries. Contemporary debates regarding energy often focus on electricity excess generated through the mass installation of renewable energy power stations. For instance, a solar farm might produce excess electricity at midday, but electricity demand is more likely to be higher in the evening when consumers return home from work and are likely to operate a range of appliances. However, this typical portrayal of excess, which derives from a Global North context, does not characterize Ghana.

As I have discussed earlier, from 2012 to 2015 Ghana experienced an electricity crisis known as *dumsor*, which resulted in extensive load shedding throughout the country. This crisis caused power outages lasting up to twenty-four hours for both industries and homes, with only twelve-hour periods of electricity availability (Ahlijah 2017). Such an erratic electricity supply made it difficult for businesses and households to plan and led to widespread disapproval of the Mahama government. To address *dumsor*, the Electricity Company of Ghana, the primary electricity distributor serving the country's southern region, entered into forty-three power purchase agreements with various vendors from Turkey, the United Arab Emirates, and China. Karpower's ships, for instance, appeared to be one quick and reliable solution for the Ghanaian government in 2016 (see chapters 1 and 2). Floating power plants were attractive because they could be integrated into the grid quickly and disconnected when they were no longer necessary. However, the powership did not leave Ghana when electricity excess emerged, evidencing the significance and durability of contractual obligations and profit-driven aspirations. Between 2015 and 2019, Ghana's electricity supply surged from 2,800 megawatts, which was in line with the demand placed on the grid, to over 5,000 megawatts. The introduction of new power plants led to an overcapacity of fossil fuel–powered electricity on the national grid, which in turn created an unforeseen set of environmental, financial, and political challenges.

In conceptualizing the Drive Electric Initiative, Doris had considered various plans for electrification, imagining alternatives such as the possibility of increasing household electricity consumption through energy-intensive appliances such as air-conditioning. But she recognized that such plans depended on creating consumer demand for products that were not popular in contemporary Ghana and did not necessarily lead to emission reductions. "It is a luxury for most people," she said as we sat in a heavily air-conditioned café in Houston during her visit in April 2022. "Why pick it up when they already have a fan?" Like many of our visitors to Houston, Doris was surprised by how cold our building interiors were, requiring many of us to put on jackets and sweaters on pleasant spring days. Many Houston residents believe that the city has grown thanks to air-conditioning, even though its expansion may have had more to do with converging business interests. For instance, as historian Robert S. Thompson (2007, 88) suggests, "The [ensuing] dedication to climate control has convinced contemporary Houstonians and many others that the city could never have grown into a megalopolis without cooling and evaporative technology." In

the twenty-first century, such cold interiors not only recalled this urban and regional history but also signified the availability of cheap and abundant electricity (Thompson 2007). In the introduction I pointed to how adding new fuels to the energy mix often leads to new forms of energy consumption rather than disrupting how we consume.[1] The availability of more electricity created openings for commercial and residential consumers to adopt additional ways of utilizing power, rendering what was once unfeasible—such as the consumption of air-conditioned air—feasible. Yet Doris did not merely adopt what had been done in other parts of the world, such as the city of Houston or, more broadly, the Sun Belt of the United States (see Mavhunga 2014). Instead, she saw Ghana's overcapacity issue as an opportunity to shape how Ghanaians use electricity, pushing back against promoting air-conditioning.[2]

With this general principle in mind, Doris started brainstorming. When she researched industrial clients, she quickly saw that graduated electricity prices, meaning electricity tariffs that increase as one's volume of consumption increases, deter individuals from exceeding the 600-kilowatt threshold. Then she had a moment of clarity: "What were other ways to absorb electricity? Transport! There were millions of cars on the streets; what if, in the next twenty years or ten years, half of these cars became electric? What would that mean for us?" Gas-powered cars already had a central place in everyday life (see Hart 2016), so electric vehicles could simply be substituted for them. As anthropologist Katie Ulrich (2023, 452) suggests, "Substitution, at once molecular and conceptual, masquerades similarity and continuity of problematic status quos behind the idea of desirable difference." Electric vehicles would reinscribe a car-centric lifestyle onto urban environments worldwide, extending the status quo, but substituting, as the energy industry vernacular has it, "molecules with electrons" (meaning fossil fuels with electricity) would also generate ruptures in trade flows, ultimately reshaping how Ghana uses its excess electricity, purchases cars, and imagines its place in a global hierarchy. If transport electrification were to take hold, future renewable energy power producers would be able to rely on car batteries as a source of storage and would therefore have more incentives to build power plants in Ghana. Transport electrification could alter existing methods of electricity generation and serve as a stepping stone toward a renewable energy–powered grid.

The Drive Electric Initiative was launched with these aspirations during the Fifth Renewable Energy Fair at the Accra International Conference Centre on October 7, 2019. It was the result of a collaboration between

Ghana's Energy Commission, a regulatory body responsible for electricity licensing, and the Ministry of Energy. Proponents of the project argued that transport electrification would not only find new uses for excess electricity but also decrease air and noise pollution in Ghanaian cities while allowing the country's automotive sector to spearhead the global transition to electric vehicles and eventually lead Ghana to a sustainable and green future. For them, the next revolution for electric cars was to take place in Africa, incentivizing start-up companies to manufacture, assemble, and sell cars domestically, thereby decreasing the price of acquiring a vehicle while mitigating carbon emissions. To reach this goal, they planned a multifaceted strategy that included raising public awareness about electric cars; putting together standards, certifications, and regulations for electric vehicle production and use; and relying on public-private partnerships to build charging infrastructure across the country. Even though they specialized in different aspects of transport electrification and had different motivations for participating in the production of electric mobility infrastructure, representatives of Accra-based electric vehicle importers and start-ups broadly agreed with these ambitions. All in all, many energy professionals from various institutions in Ghana perceived the problem of electricity excess through the framework of transport electrification.

The developers of Drive Electric knew that their plans did not follow the typical way electric cars become integrated into the electric grid. For instance, one reason electric cars have received public attention across the Global North is because they have the potential to act as extensions to the grid, absorbing electrical energy whenever it is most available, say after midnight, when demand is at its lowest. Fully charged vehicles, if appropriately configured, can supply electricity back to the grid when needed. As anthropologist Gretchen Bakke (2016, 243) argues in *The Grid*, "Many people who care about grid reform don't see electric cars as cars so much as great big batteries on wheels. . . . The grid guys . . . see an ingenious form of storage that doesn't rely upon the quirks of geology or climate, that blends seamlessly into its environment, and that can be made to work for tiny grid imbalances as well as big ones." Such discrepancies in supply and demand have led to research and innovation in other grid-scale batteries that can perhaps store all the electricity produced in a renewable energy power station, making it available for users throughout the day. In sum, electric vehicles can absorb excess electricity that results from the inherent unpredictability of renewable energy power stations. While the organizers of Drive Electric appreciate this broader context, they do not think it matters

much. Regardless of the differences in how electricity is produced, electric vehicles are an effective means of absorbing such excess.

The literature on the history of electricity shows that electric vehicles have not been the first mechanisms for absorbing overcapacity. For instance, in his analysis of the development of the streetcar in the late nineteenth and early twentieth centuries in the United States, historian David Nye (1990, 127) offers a remarkable example of electricity excess that illustrates how amusement parks such as Coney Island "became important outlets for the traction company's unused electrical energy, and many a park was created to buy the surplus." To operate streetcars during rush hour, streetcar companies had to build extra electrical capacity, which remained unused at night, on weekends, and during holidays; these happened to be the periods when amusement parks could attract clients. Streetcar companies not only sold their excess electricity to these newly built parks but also profited from transporting visitors to them, spatially and socially transforming the country. As Nye (1990, 127) remarks, "all experts agreed that spectacular lighting was essential to pleasing a crowd at night." Electricity excess was simply the condition where the minimum output from generator sources exceeded consumer demand. By creating the amusement park as an institution of leisure, streetcar companies diverted this excess.[3]

Overcapacity had large-scale spatial impacts worldwide, including the development of illuminated amusement parks. It also shaped domestic interiors. For instance, in the 1920s, as streetcars lost their allure, utility companies had to manage electricity excess once again, and this time they began marketing and selling appliances to households (Tobey 1996; also see Kline 2002). Similarly, in her analysis of the emergence of prepaid electric and water meters, anthropologist Antina von Schnitzler (2016, 120–21) describes how overcapacity of electricity generation facilitated Eskom's Electricity for All program in 1988 in South Africa, which advocated for the electrification of all Black households. In addition to putting together the hard infrastructure to extend electrification across the country, the public utility company focused on increasing demand for electricity by distributing free essential appliances, such as lamps and hot plates. Consumers were initially skeptical about these new appliances, often preferring to use wood stoves rather than Eskom-sponsored products, but regardless of the varying outcomes of these campaigns, the South African example shows how excess electricity facilitated movements toward electrification and electrical modernization.[4] In short, excess electricity transformed the kitchen and the night sky.

These historical examples indicate how Drive Electric extended a classic electrification problem: How do institutions create new electricity consumers? More specifically, Doris asked, could overcapacity shape transportation infrastructure as it had shaped the kitchen and the night sky? Unlike the South African example, Ghana's transport electrification program aspired to generate electricity demand mainly among middle- and upper-class consumers who might be willing to purchase electric vehicles with varying price tags primarily for their personal or professional use.[5] In this sense, it was perhaps more aligned with electrical modernization programs, such as the rise of kitchen appliances in the United States (Tobey 1996). But, perhaps more importantly, transport electrification requires the collaboration of institutions that do not often work together in electrification campaigns, such as Eskom's Electricity for All. Car importers, car assembly plants and manufacturers, electricity transmission authorities, charging infrastructure operators, logistics companies, port authorities, and oil marketing companies all have to cooperate in the initiative while consulting with universities in their research. For instance, during Ghana's first electric mobility conference and exhibition, organized under the rubric of the Drive Electric Initiative in September 2021, representatives from the Ministry of Transport, the Ministry of Energy, the Energy Commission, car dealerships, and port authorities all presented their perspectives on the adoption of electric vehicles. As technological objects with political potential, electric vehicles brought together new public bodies, creating what science and technology studies scholar Michel Callon (1986, 23) calls "an actor-world." In his analysis of electric vehicle projects in France in the 1970s, Callon emphasizes that "without the actor-world, the technical object would not exist." As such, Drive Electric attempted to create more consumers of electricity by building a new actor-world that would enable and support the emergence of electric vehicles.

During our conversation in that heavily air-conditioned café, Doris drew a diagram of transport electrification for me (figure 4.1). In putting together this diagram, she acted as what Callon (1986, 25) calls a translator, building "an actor-world from entities." Once the technology is operational, this actor-world may fade into the background, becoming ordinary and invisible. But, during the process of formulating electric vehicles as a viable transportation system, Doris has to be intentional, negotiating with each entity on its own terms and finding ways to attract it to this emergent actor-world. As the diagram shows, Doris's translation work also reproduces her understanding of social relations in Ghana, with the government situated at the

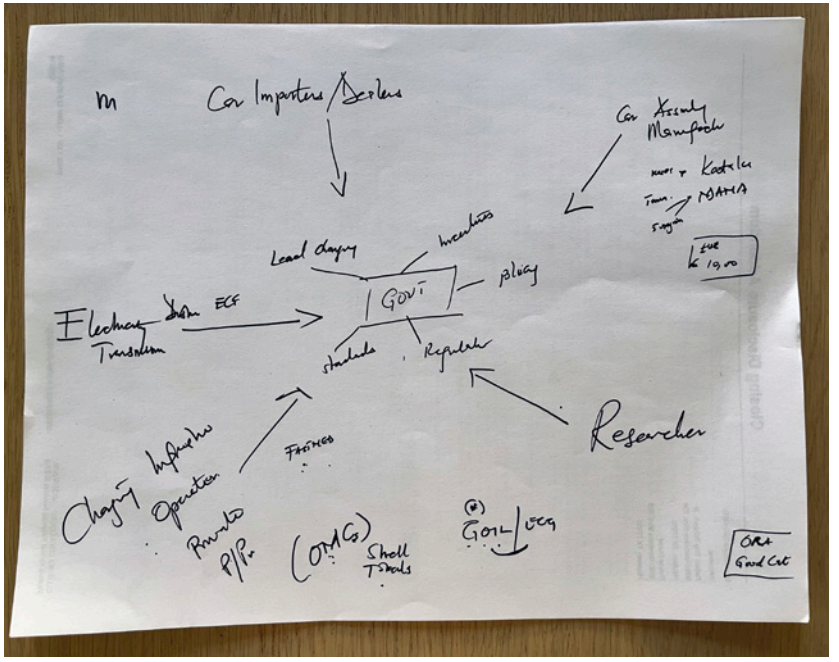


FIGURE 4.1. Doris Edem Agbevivi's diagram of actors participating in transport electrification in Ghana. The word "GOVT" (government) is at the center of the image, while other entities such as car importers, charging infrastructure operators, car assembly and manufacturing, and researchers encircle the government. The car model, the Ora Good Cat, is in the bottom right corner of the image, framed in its own box. Houston, Texas, 2022. Photo by the author.

center of the white sheet of paper. As she drew the diagram, she pointed to the significance of electricity transmission operatives such as Electricity Company of Ghana; car importers; car assemblers and manufacturers, such as Mana Mobility and Kantanka as well as Porsche; researchers; charging infrastructure operators; and oil marketing companies such as Shell and Total, along with Ghana Oil. These institutions offer input to the government and hope to receive incentives, policies, regulations, and standards in return. The diagram not only shows the entities that have entered into relationships with the government but also includes entities that remain ever present, such as the Ora Good Cat, which is given its own clearly demarcated box in the lower right-hand corner (mainly because Doris was driving it). Regardless of the back and forth between the government and the entities surrounding it, Chinese vehicles, such as the Ora Good Cat, continue to hover over them as a reminder of the geopolitical and geoeconomic

dominance of Chinese technology producers over the other entities in this ever-changing scenario.

In short, the problem of overcapacity requires the formulation of new collaborations to allow for the materialization of new consumers of electricity. Doris's diagram demonstrates that the emergent collaborations in Ghana's electric vehicle worlds are significant in the formulation of this infrastructure. Yet these collaborations are also uneven, defined by various domestic and international hierarchies. In the same way as the electric grid had offered me a methodological pathway for tracking the various power producers, this diagram has led me to explore how electric vehicles look from different vantage points, some of which I analyze in the next section.

The Alternative Trajectories of Electric Vehicle Importers

In March 2023, Doris and I visited the entrepreneur responsible for importing Great Wall Motor's Ora Good Cat to Ghana. A self-made man in his mid-fifties who had grown up in a poor community in northern Ghana, Yusuf worked out of a three-story strip mall on a crowded intersection in Accra's affluent East Legon neighborhood. The swarming parking lot outside his office was a fitting introduction to his multiple projects. As Doris parked the Ora Good Cat that Yusuf had kindly lent us for the week, his employees loaded dishwashers and washing machines into Wuling electric vans, preparing them for delivery to clients across the city. A collection of unwrapped refrigerators of various sizes awaited their new owners in another corner of the parking lot. Customers entered the building to browse various appliance models showcased in the ground-floor showroom. As an act of generosity toward the people in his neighborhood, Yusuf had mounted a massive monitor on the glass facade of his establishment, which screened soccer matches from the popular sports streaming channel LaLigaTV. At all hours of the day, soccer fans spilled out onto the street, transfixed by the games. Yusuf explained that he sponsored soccer events because, unlike religion, soccer has the power to unite people from all walks of life.

Yusuf was a confident and charismatic businessperson who believed he could change Ghana's future just as he had shifted the course of his own life. When Doris and I took seats in his private office, he started pitching ideas to us. "What if we retrofit some *tro tro* into electric vehicles?" he suggested. "It would decrease fuel costs for *tro tro* drivers and generate more awareness regarding electric vehicles at the grassroots level." The most popular

form of public transport in Ghana, *tro tro* are privately owned minibuses that transport ten to twenty passengers along fixed routes. These vehicles share similarities with *matatu* in Kenya, *dala dala* in Tanzania, and *dolmuş* in Turkey. Yusuf chuckled when I proposed that *tro tro* drivers could use their fuel savings to purchase televisions and refrigerators from him. Doris carefully took notes, impressed by his pragmatic and inventive perspectives. Earlier that day, she had met with representatives from a European foundation who expressed an interest in potentially supporting transport electrification and offered to introduce them to Yusuf. She concurred that it might be an easy project: All they needed was some funding and some drivers willing to experiment. Yusuf had already put research and development plans in motion, cooperating with engineers from Kwame Nkrumah University of Science and Technology in Kumasi who could design and complete the retrofit in collaboration with him. He imagined that the batteries could be placed on top of the vehicles.

Yusuf had earned a degree in business administration from an Australian university, where he had spent some time working before moving to Accra with his Australian wife. Their company focused on importing appliances from China and distributing them throughout West Africa. His extensive fleet of trucks and delivery vans transported these appliances from the port of Tema to their designated destinations.[6] Many of the drivers he employed were from the town where he had grown up. Initially drawn to electric vehicles to reduce fuel and maintenance costs for his appliance deliveries, Yusuf leveraged his existing networks in China to start importing vans and trucks for his personal and professional needs. Despite acknowledging Great Wall's reliability as an automotive company, Yusuf diversified his range to include other Chinese automobiles and motorcycles, including Wuling electric vans, Wuling electric trucks, and Dongfeng Joyear sedans, which now filled his office parking lot and maintenance facility. His maintenance yard also provided services to customers who had purchased vehicles through his company, relying on temporary support from Chinese consultants to train local mechanics. Given the financial benefits of his electric fleet, Yusuf saw an opportunity to import cars at the same time as he planned to retrofit vehicles such as *tro tros* that dominated Accra's streets.

Yusuf was pleased that other successful entrepreneurs in the city were also venturing into importing electric vehicles from China. One of these was Fadi, a second-generation Porsche importer and dealer in Ghana I introduced in chapter 3. In one of our conversations, Fadi had told me how the COVID-19 pandemic had disrupted supply chains and led to lengthy

wait times for acquiring luxury electric vehicles. I had first met Fadi in late 2019 through a Turkish friend who was then employed by the Turkish energy company Aksa in Ghana. Soon after our initial meeting, I had also paid a visit to his off-grid weekend house in Ada to observe his rooftop solar panels in use (see chapter 3). When I stopped by his car dealership in Accra's North Industrial Area in 2023, Fadi believed that, even if the logistical challenges were resolved, the market for luxury electric vehicles in Ghana would not be substantial enough for his business. The Porsche charging infrastructure at the Kempinski Hotel, now tucked away between two gas-powered Toyotas, had failed to gain the attention they had hoped for. According to parking attendants at the hotel, the charging infrastructure remained unused. Fadi began reassessing his business strategy in relation to electric vehicles to find a solution that suited Ghana. Unlike cities such as Houston, where Doris had admired the range of luxury electric cars, Accra's electric vehicle infrastructure did not need to start with high-status cars that would have mass appeal. Fadi began browsing catalogs for more affordable options to develop a larger market for his products in Ghana.

In April 2022, as some of his struggles with pandemic-related supply chain crises were coming to an end, Fadi brought two Pickman minitrucks to Accra to assess their performance on the city's streets over a year. In stark contrast to the Porsche, the Pickman truck, manufactured by Kaiyun Motors, a subsidiary of CSG Holding, China's most significant architectural glass manufacturer, boasts a maximum speed of just under thirty miles per hour and prioritizes lightweight design, compact size, and affordability (figure 4.2). The white electric trucks stood out from among hundreds of vehicles showcased at his car dealership as they regularly maneuvered in and out of the facility. Adorned with the "I Am Fully Electric" tagline, the trucks had the blue-and-white color profile of police cars. Despite displaying his phone number prominently on the vehicles, Fadi never received any calls regarding his Pickman trucks, but the lack of attention did not discourage him. The car's plastic components were of lower quality, and one of the trucks even lost its antenna during a test drive, but he held firm in his belief that the trucks can withstand Accra's roads and saw a potential to sell two thousand to three thousand Pickman minitrucks monthly in Ghana. Like many others whom I met in the electric vehicle community, Fadi took into account the material qualities of the existing transportation infrastructure by bringing up Ghana's roads as a participant in the actor-world that Doris had drawn up and underlined the Pickman minitruck's adaptability to such conditions. That Kaiyun Motors had expanded its exports to



FIGURE 4.2. A Pickman minitruck features a sign that says "I AM FULLY ELECTRIC," Accra, Ghana, 2023. Photo by the author.

the United States further bolstered his confidence in the company's credibility, and he intended to enter into a formal agreement with them in April 2023. In some ways, such affordable electric vehicles recall the ideal of "the people's car," where a domestically manufactured, inexpensive, and functional vehicle fulfills the dream of private car ownership for a broader segment of the population. India's Tata Nano (Majumder 2018) and Germany's Volkswagen Beetle (Rieger 2013) are suitable analogs for such vehicles. Like Yusuf, Fadi saw this import agreement as only the beginning of his venture into electric vehicles.

As Doris and I prepared to leave his office, Yusuf shared his perspective on Ghana's development: "Our aspirations for development are always geared towards emulating Europe, and yet we constantly fall short." He proposed an alternative approach: "Why don't we create our own model for transformation?" Following this question, he pondered the idea of acquiring two electric buses to transport passengers between Kumasi and Accra, a distance of approximately 250 kilometers, which would mean setting up a solar-powered battery-swapping station midway to ensure an

uninterrupted journey.[7] Yusuf believed that embracing clean technology would enable Ghana to diverge from the dominant path of development espoused by the Global North and to venture into uncharted territory. "If we fail to implement these systems, our grandchildren will be relegated to cleaning the glass walls of the Line in Saudi Arabia," he observed, with reference to the real estate development project announced by Saudi Arabia's crown prince and prime minister, Mohammed bin Salman, in 2017, highlighting how a lack of investment in clean technology will only reinforce the dominance of global oil producers (see Günel 2022b). As Yusuf's comment shows, if Ghana were to stay on the Global North's energy transition timeline, its future population would remain on the losing end of the dominant trajectory.

The Varying Social and Political Ideals of Electric Vehicle Entrepreneurs

Even though they all agreed with Yusuf's vision that Ghana has to chart its own future, the entrepreneurs who helped to realize the Drive Electric Initiative subscribed to varying social and political ideals. They knew that importing electric vehicles such as the Ora Black Cat could have a significant impact on transport infrastructures globally but also that Ghana has to manufacture and assemble its own electric cars and electric car infrastructure. Recent changes in Ghana's automotive policy have incentivized companies such as Volkswagen, Toyota, and Nissan to start assembly plants in Ghana. But these companies are taking advantage of low labor costs in the country to hire the larger crews required to produce gas-powered vehicles. The *Ghana Electric Vehicles Baseline Survey Report*, prepared by the Energy Commission in 2022, notes that "there are currently no incentives for EV users in Ghana. EV importers pay Customs duties of 20%, irrespective of the size and capacity of the EV, in addition to all the other taxes at the port" (Energy Commission Ghana 2022, 48). This customs charge was higher for electric vehicles than for gas-powered cars, mainly because electric vehicles were categorized as luxury goods even though many electric vehicles entering the country, including the Pickman, were not luxury cars. These customs charges made importing electric vehicles more challenging. Given these conditions, Accra-based start-ups such as Mana Mobility, Ijanu, and Kofa sought to specialize in electric vehicle design and assembly in diverse ways, to contribute to the domestic growth of the electric mobility sector.

Responding to conditions of electricity excess and often willing to experiment, the founders of these companies aspired to take advantage of the incentives offered by the Drive Electric Initiative.

Consider Simon, who invested in electric vehicle charging infrastructure in Accra. A soft-spoken African American man in his mid-thirties, Simon had decided to move to Accra from Maryland when his mother retired there in 2017. First, he opened a restaurant called Nuru, whose name means "light" in Swahili. Then he became interested in electric mobility issues and self-financed a charging infrastructure company called Ijanu, which means "harness" in Yoruba (one of his best friends in the United States, who came from a Nigerian background, had suggested the name). Simon had played football as a college student and worked on Wall Street for a brief period before returning to Maryland to pursue US government contracts. Now visitors to Ijanu's minimally furnished, slick lobby, located near Fadi's car dealership in Accra's North Industrial Area, were welcomed with a quote from Kwame Nkrumah's *Africa Must Unite*: "For this end Africa needs a new type of citizen, a dedicated, modest, honest and informed man. A man submerges self in service to the nation and mankind. A man who abhors greed and detests vanity. A new type of man whose humility is his strength and whose integrity is his greatness" (Nkrumah 1963, 130). Surprised to see such signage in an office space, I imagined that Simon aspired to be the kind of man Nkrumah had envisioned. On the wall opposite the quote was a black-and-white image depicting portraits of Martin Luther King Jr., Malcolm X, Patrice Lumumba, and Fred Hampton, all Black activists and politicians who had been killed in the 1960s. Simon wanted his company's name to reflect his pan-Africanist political ideals. However, the name *Ijanu* mostly puzzled his Ghanaian colleagues and made them wonder whether the company had originated in Nigeria.

Ijanu was unique because it housed the fastest charger in Accra and sold monthly subscriptions to electric vehicle owners who needed the services. Subscription costs were slightly lower for those who purchased their cars through Ijanu. This was a small-scale operation, and at the time of our conversation in 2023, Ijanu had sold only seven vehicles, with ten more on the way. While conversing with Simon in the lobby, Doris stepped outside to Ijanu's parking lot to charge the Ora Good Cat we had borrowed from Yusuf. As soon as she plugged in the vehicle (figure 4.3), the lights in the building flickered, and the power went out. Simon explained that their solar inverter had malfunctioned, putting extra strain on the Electricity



FIGURE 4.3. Doris Edem Agbevivi plugs in her electric vehicle at the Ijanu charging station, Accra, Ghana, 2023. Photo by the author.

Company of Ghana grid, and that this tended to happen during midday hours. The Good Cat had a battery twice the size of their standard cars', clocking in at 60 kilowatts. "Usually, things here are substandard and not designed for Africa; people simply dump things here," Simon lamented of the solar inverter, a device that converts the variable direct current from his rooftop solar panels into alternating current to ensure additional power for his charging infrastructure, supplementing the electricity from the grid. The poorly built solar inverter belonged to the same category of dumped goods as secondhand gas-powered vehicles.

The flickering lights also pointed to a second, perhaps more pervasive and systematic, problem in Ghana. There was excess electricity on the grid, but a lack of investment in transmission infrastructure means that power cuts and load shedding continue (see Acheampong et al. 2021). The problem of overcapacity hindered the possibility of maintaining the grid because so much of the financing for electricity was channeled directly to independent power producers for electricity generation. During a panel on Africa's energy future at the CERAWeek annual conference in Houston

in 2024, Matthew Opoku Prempeh, the minister of energy in Ghana, acknowledged that the country has a very poor transmission system. It could continue generating electricity, but that was of no use if it could not be transferred to users. There were also difficulties in finding development partners who would invest in the transmission system: "We are hit by take-or-pay contracts and a poor transmission system."

There was little that start-up owners such as Simon could do about this broader issue. Simon looked for smaller-scale solutions to his flickering lights that did not involve international development partners. Through a joint venture with a Chinese company he did not name, he aimed to manufacture products specifically designed for Africa in Africa. For instance, he believed that if the charging infrastructure were privately owned, there would be more motivation to maintain each component: "You follow up, you fix the charger so that you can make money." He referred to this process as "regenerative" and believed that it was time for the average person in Africa to participate in the electric vehicle revolution that populations were experiencing globally. Like Yusuf, Simon was convinced that Ghana had to chart its own future rather than fall behind on the linear pathways to energy transition as defined by the Global North. With this ambition, he was participating in what science and technology studies scholar Lilly Irani (2019, 2) calls "entrepreneurial citizenship," where "citizens can construct markets, produce value, and do nation building all at the same time." Entrepreneurial citizenship means that, rather than engaging in political action in the way that the people whose portraits he had on his walls had done, he was investing his hard-earned savings into speculative projects in Ghana rather than in Maryland. If the systemic issues in the country could not be resolved, perhaps there was a way for private individuals to offer technological fixes.

Simon was not the only politically motivated entrepreneur I came to know in Accra. Others who participated in similar start-up ventures also voiced vague political ideals, even though these were not always in agreement. I encountered Karl by chance while waiting to meet Fadi at his car dealership. His messenger bag and canvas jacket did not give him the appearance of what I had in mind as a stereotypical automotive engineer. "*Mana* means 'essence' in Polynesian," he explained as he gave me his business card, "which is why we gave the car company this name. It is also easy to pronounce." I was surprised by Karl's interest in the term, given the ink spilled over the meaning of *mana* in the social sciences and humanities. (A few months later they changed the company's name to Wahu!, mean-

ing "horse" in Dagbani, a language spoken primarily in northern Ghana and Togo.) After a long educational career at the BMW headquarters in Munich, Karl started a purpose-driven business. He continued to live in Munich but traveled to Accra several times a year to collaborate with his growing team, who were working out of a collective office space called Impact Hub in Accra's central Osu district. By March 2022, Mana Mobility had completed a design sprint in collaboration with Ghana's Design and Technology Institute and was advertising plans to produce electric vehicles in the country starting in 2023. Mana Mobility offered cheaper cars that were comparable to imported gas-powered vehicles. Karl found it difficult and time-consuming to come up with meaningful transformations, given the range of stranded assets in the car industry and that "every project takes at least a decade." Ghana's high digital literacy rates and high electrification levels had initially drawn him to the country, where he found the people friendly and open to business. Overcapacity was now the country's most prominent topic, which meant that transport electrification mattered more to a broader array of constituencies. Karl hoped to collaborate with Fadi to start an assembly plant for electric vehicles in Ghana soon.

Concentrating on two complementary processes for building electric vehicle infrastructure, Simon and Karl were producing charging stations and hoping to start an assembly plant. Olaf, whom I introduced in chapter 3, focused on another area in seeking to implement the idea of battery swapping across Accra. When his Norwegian father started working with a cement company in Accra in the late 1980s, Olaf had enrolled in an international school in the city. Working as a financial analyst for various energy companies in the United Kingdom in the 2010s, he had not imagined that his professional life would ever take him back to Accra. In January 2022, at the tail end of the COVID-19 pandemic, he self-financed a battery-swapping start-up called Kofa. Having grown up in Accra, Olaf had a network of acquaintances and friends whom he could recruit for the project. Nana, a specialist in user experience research with degrees from reputable schools in the United States and Italy, for instance, was intrigued when Olaf reached out to him about Kofa and soon joined the company. Inspired by successful battery-swapping initiatives such as Taiwan's Gogoro, Kofa offered electric motorcycles and swapping stations, although Olaf aimed to focus solely on the batteries and eventually to leave the importing of electric motorcycles to established car dealerships like Fadi's. He was looking for a vendor to sell his bikes and wondered if I would mention his project to Fadi the next time I saw him.

On the second-floor porch of Olaf's gated live/work space, two parrots sat in a large cage singing to our conversation. The spacious yard below was covered with a sprawling assortment of electric motorcycles and idle swapping stations awaiting trials and deliveries. Olaf's political perspective on electric cars diverged from Simon's pan-Africanist perspective in that he saw Kofa as a development initiative aimed at addressing urban problems. Even though Africa had the fastest urbanization rate globally, surpassing even China's, Olaf believed that the focus on rural development was disproportionate and that electric motorcycles and swapping stations might solve the last-mile problem, supplying electrical power to urban contexts where the grid did not penetrate, not necessarily because of physical barriers but because of high electricity costs. In this context, Kofa would constitute a cheaper alternative than connecting to the grid, allowing consumers to avoid monthly subscription fees.

One such space is outdoor markets. Densely laid out, these markets allow multiple vendors to share a single resource for illumination and offer a potential for batteries to replace generators. One of Kofa's customers was Mike, a shoe stall owner near Accra Mall who relied on one light bulb every day between 6 p.m. and 11 p.m. and shared the battery for this light bulb with nine other stalls, each of whom paid him three cedis per day. The other vendors also gave Mike two cedis to charge their phones. However, he was unsure about the future of this arrangement as they were canceling their subscriptions to Mike's battery now that *dumsor* was over and trust in the Electricity Company of Ghana grid was being restored. With a falling number of clients, Mike was also considering attaching his stall to the electric grid to cut the cost of batteries. Olaf's infrastructure, by contrast, is primarily connected to the grid, except for one swapping station that draws some electricity from rooftop solar panels (see chapter 3), benefiting the Electricity Company of Ghana. The batteries allowed for the kind of urban development that Olaf had envisioned only in the absence of a grid, when it could fill the gaps the grid could not.

Entrepreneurs such as Fadi, Yusuf, Karl, Simon, Olaf, and Nana formed alliances to create a space for the emergence of electric vehicles in Ghana in response to electricity excess in the country. Even though they drew on different political and social ideals in describing their projects, they also admitted that potential customers' decisions were guided primarily by cost. These men all worked with various Chinese producers to import either the vehicles directly or the parts that allowed them to assemble them in Ghana.

Pushing back against the idea that the adoption of electric cars should follow the construction of a renewable energy–powered grid, they had supported Doris, the only female decision-maker I met in the world of transport electrification in Ghana, in her work at Drive Electric. Together they supported the new timeline of development.

ICE Killer

A deputy minister of energy from Ghana addressed the audience during a presentation at Houston's CERAWeek 2023 conference, the annual energy industry gathering: "Where are we that we have to transition? We haven't even started. Electric vehicles need to come to Ghana. We can't be left behind and be dumped gas vehicles." The deputy minister voiced concerns regarding how the adoption of electric vehicles in the Global North would lead to Ghana becoming a recipient of the world's unwanted, older, and more polluting gasoline and diesel cars. The key to resolving this problem, from his perspective, was to situate Ghana as a hub for electric mobility by encouraging the local assembly and manufacturing of EVs and batteries and taking advantage of local mineral resources like lithium.[8] At a panel titled "Overcoming Africa's Power Shortage," the deputy minister took the stage alongside representatives from the Nigerian and South African energy industries while audience members sat around large dining tables and enjoyed a sumptuous breakfast buffet. The panel's abstract started with the sentence, "It has been quipped that Africa's energy transition is a 'transition from no energy to energy'" and went on to describe a condition of severe energy poverty, a portrait that did not accurately reflect Ghana. In his comment, the deputy minister stated that he couldn't locate Ghana on an energy transition spectrum. Like Paul, whom I introduced earlier (see introduction), the deputy minister did not know where Ghana was supposed to be and where it was headed. Regardless, he underlined the significance of bringing electric vehicles to the country, mainly to stop secondhand gas-powered cars from being disposed of in Ghana. Like him, other members of the Ghanaian electric vehicle sector saw the Drive Electric Initiative as a way of protecting their country from becoming a pollution sink for gas-powered vehicles, a practice that is likely to increase in volume and speed as consumers in the Global North switch to electric cars. But they opted for new products such as Chinese Great Wall cars or Pickman minitrucks. The Drive Electric program has attempted to disrupt the

existing international networks of car assembly and manufacturing and of secondhand car imports and exports, in other words, to shape global material flows.

How exactly do electric cars stop Ghana from becoming the "dumping ground" for secondhand gas-powered vehicles? In her talk at Rice University, Doris casually listed the various Tesla models she had identified around campus. Part of her responsibility as the originator and the coordinator for the Drive Electric Initiative was to raise public awareness about electric vehicles, and she wanted to see more electric cars and buses on the roads in Ghana. By the end of 2022, there were more than ten thousand electric vehicles in the country, and Doris was considering how to increase the number. Several electric car companies had given her cars for promotional use over the past year. She had driven a Hyundai Kona for two weeks in July 2021 and a Great Wall Ora Good Cat between January and June 2022. After each promotional period, she wrote a report on the car she had test-driven, commenting on the aesthetics of its interiors and dashboard, and whether it had been easy to steer and accelerated quickly. She shared these reports with the respective companies at the end, acknowledging that each vehicle had unique strengths. For instance, the Hyundai Kona, a relatively expensive option priced around $50,000, offered four-wheel drive and prepared the ground for Hyundai's introduction of its Ioniq model in Ghana. Doris preferred the Great Wall Ora Good Cat, a luxury vehicle that, in her view, paralleled Tesla's Model S. She admired its leather interiors and found its sensors and cameras particularly user-friendly and suitable for African cities. For Doris, as for Fadi, the African city itself was an actor that shaped the development of the electric infrastructure industry. In response to Doris's comment about the Tesla automobiles she had noticed in Houston, a colleague at the talk suggested that the areas around the Rice University campus were mostly affluent neighborhoods and that the Teslas she had spotted could be interpreted as symbols of status rather than of environmental sensitivity.

However, such luxury EVs could also help prevent the export of secondhand cars to Ghana. Doris believed that technologies became successful only if they served multiple purposes simultaneously and did not think Tesla's role as a status symbol contradicted the Energy Commission's broader goals. She believed that adaptation, reconfiguration, and changeability—say, as opposed to immutability (see de Laet and Mol 2000)—would facilitate electric vehicles' success in Ghana. Doris's approach to electric cars, meaning her openness to the multiple purposes of electric cars, was driven by her desire to chart a new way forward for EVs in the country. Others

also subscribed to this perspective. For instance, during Ghana's first electric mobility conference in September 2021 at Accra's Kempinski Hotel, the minister of energy, Matthew Opoku Prempeh, quipped about electric cars:

> A couple of weeks ago I traveled to Europe, and I had a ride. A gentleman who picked me up from the airport. I saw he was driving a Ferrari, so I was enjoying the ride. Then he said, "Matthew, would you like one of these cars?" I said, "Yes, but I haven't reached there yet!" "This one is electric; I have the conventional one and now I got the electric one." And I couldn't believe it! This one was programmed with the sound of a normal Ferrari car. As you zoom, you really feel like you are in a Ferrari.

Associating electric cars with luxury brands such as Ferrari did not trouble the audience. Even though they mostly sat idle, three of the six electric car charging stations in Ghana had been sponsored by Porsche and were located at Total fuel stations on Liberation Road and at the Palace Mall and the Kempinski Hotel. As the organizer for the electric mobility conference, Doris knew that other clean technologies, such as rooftop solar panels in Ghana, also served as status symbols and at times increased existing inequalities between those who could afford to pay for them and those who had no option but to rely on the grid (chapter 3). She pointed out that the middle- and upper-middle-class consumers who could purchase electric cars were also the ones who were willing to spend money on the country's overpriced electricity tariffs, helping to pay for take-or-pay contracts rather than opting out of the system. In this context, electric vehicles could curb the problem of electricity excess, help stop secondhand cars from being exported to Ghana, and reduce carbon emissions. Doris knew that the association with luxury had also led to higher customs charges for electric vehicles, thereby disincentivizing consumers, and hoped that these high charges would soon be dropped. While acknowledging the complexities associated with the project, she still perceived it to be the best way forward.

Luxury vehicles could play a part in preventing the flow of secondhand cars from the Global North. A third car that Doris test-drove between August 2021 and January 2022, the Great Wall Ora Black Cat, distinguished itself from the vehicles that she had noticed around the Rice University campus. Priced between $8,000 and $10,000, the Chinese-made Black Cat was known for being one of the most affordable electric cars in the world. In a 2021 master's thesis on the future of electric cars, Jingqiao Li (2021) predicted that the electric vehicle market would grow along these

two divergent paths and that there would be more competition between premium models such as Tesla Model S and cost-effective models such as the Black Cat. Writing for the clean technology website *CleanTechnica*, Remeredzai Joseph Kuhudzai (2021a), the founder of Electric Drive Africa, an organization that promotes electric vehicle use across Africa, labeled Ora Black Cat "an ICE Killer," where ICE stood for internal combustion engine. He argued that cars such as the Ora Black Cat "could land in Africa at prices comparable to used ICE vehicles that dominate imports into these markets and will be able to displace a good portion of used ICE vehicle imports and could help catalyze this transition."[9] While the luxury car market would attract affluent buyers, vehicles like the Ora Black Cat could significantly transform global flows. This was an important function that luxury vehicles could not fulfill.

In this sense, the Drive Electric Initiative could claim to have safeguarded Ghana's automotive future by shaping the market to avoid the usual inheritance of old technology from the Global North. Old technologies (in this case, internal combustion engine vehicles) and new technologies (electric cars) often do not replace each other but rather coexist, as historian of science David Edgerton (2007) shows. While elite consumers take advantage of innovations, the poor maintain and repair, or repurpose, older products. A quick look at the global used-car market demonstrates Edgerton's point clearly. According to a 2020 report by the UN Environment Program (2020), the three largest exporters of used vehicles, the European Union, Japan, and the United States, exported 14 million used vehicles worldwide between 2015 and 2018, 40 percent of which went to African countries. These networks of exchange emerged in the 1990s as trade barriers were eliminated and were strengthened through an increase in the number of Africans living abroad (Beuving 2015). Ghana now imports about 100,000 vehicles each year, about 90 percent of which are used cars (for example, see Beisel and Schneider 2012; Chalfin 2008; Green-Simms 2017; van der Geest 2009; Verrips and Meyer 2001).

In this context, transport electrification specialists in Ghana argued that they are trying to protect their country from becoming a magnet for gas-powered vehicles. For instance, in their presentations at the electric mobility conference in September 2021, many representatives pointed to the possible effects that the European Union's ban on gas-powered vehicles by 2030 could have on Ghana. In addition to drafting minimum quality benchmarks for the importing of used cars, such as the new Customs (Amendment) Act of 2020, which prohibits the importation of any secondhand car

older than ten years, Ghana has accepted the cleaner fuel and vehicle standards set by the Economic Community of West African States in 2021 (for previous versions of such regulations, see Chalfin 2008; Beuving 2015). In comparison, India, Brazil, and Egypt have banned the importation of used vehicles altogether. In 2023, Ethiopia banned importation of all private ICE vehicles, leading to a surge in electric vehicle demand (Getachew 2024). By popularizing electric cars such as the relatively low-priced "ICE killer" Ora Black Cat, decision-makers in Ghana thought they could minimize the need to import used vehicles from around the world, in some ways pushing back against the influx of refuse from affluent societies. Decision-makers from the Ministry of Energy and the Ministry of Transportation appeared to appreciate that electric vehicles can have a greater impact on car imports and exports than any regulations they could possibly draft.

Why does it matter that Ghanaian decision-makers seek to stop receiving old technology from the Global North and that they see the Great Wall Ora Black Cat as the key to such transformation? Broadly, electric vehicles constitute what I have elsewhere termed *technical adjustments* (Günel 2019): imaginative and wide-ranging responses to global climate change that open up certain interventions (such as extending technological complexity) while foreclosing others (such as asking larger-scale moral, ethical, and political questions about how to live). A distinct electrification project, Drive Electric Initiative, has attempted to change power production in the country by imagining that more renewable energy producers would be interested in building power stations in the country if they knew there was already a network of car batteries moving around the country. This understanding has challenged and reversed the order of energy transition in Global North countries such as Denmark and Norway, where innovations in storage have followed the extensive installation of renewable energy power stations. In drawing on the language of environmental and financial sustainability, the proponents of Drive Electric aspire to new business models, technological innovations, and design solutions that offer contextual responses to climate change and to push back against the assumption that Africa is not yet ready for electric vehicles—an implicit view in globally circulating reports[10]—emphasizing that there is no single route to creating such technical adjustments and, therefore, mitigating emissions globally. This form of technology, like solar power stations, has strengthened the infrastructural connections and attachments between Chinese producers and Ghanaian consumers and given Chinese companies significant power and influence. The demand for clean technology has resulted in political and financial

connections between Chinese and Ghanaian actors that extend beyond such infrastructural alliances. The Great Wall Ora Black Cat embodies this critique of contemporary trade flows by serving as the iconic ICE killer.

This does not mean that the proponents of electric vehicles are unaware of the criticism regarding the effects of transport electrification. In a January 2023 report titled "Achieving Zero Emissions with More Mobility and Less Mining," political scientist Thea Riofrancos and her collaborators warn policymakers about the impact that electric cars will have on expanding large-scale lithium mining, specifically in the US context, and call for a reduction in our dependence on cars to avert the social, political, and environmental impacts that such mining projects will have. In her analysis of secondhand cars in Botswana, anthropologist Julie Livingston (2019, 114) has called this "self-devouring growth" a carcinogenic model of development: "As soon as the poor finally get their turn, everyone cries foul. The rich, consuming at a rate far greater than any poor person can hope to match, have dirtied the rains, polluted the sea and air, and digested great swaths of life like the sperm whale, the bison, and the coal-bearing mountain until they wobbled on the edge of oblivion, only to smugly pronounce some things shouldn't be consumed after all (as they go on consuming)." During her visit to Houston, while enjoying some crawfish, Doris described how Ghana's Volta region might become a site for lithium extraction, since it was rich in spodumene, a lithium-bearing mineral mined in countries such as Australia, Canada, and Zimbabwe. Spodumene presented an alternative to the lithium brine operations across the "Lithium Triangle" of Chile, Argentina, and Bolivia, which extract this resource from underground salt flats (see Goodale 2025). Spodumene lithium mines could facilitate an investment in battery production industries, allowing Ghana to take part in the electric vehicle supply chain. In late 2023, Ghana's Ministry of Lands and Natural Resources granted a mining lease to Atlantic Lithium, an Australian company, to start the Ewoyaa Lithium Project. Doris questioned whether and how these mines could impact Ghanaian landscapes negatively. But she quickly dismissed such potentialities. She hoped that new battery technologies would emerge in the coming years to render such issues irrelevant.

Doris believed that, overall, the goal of transport electrification made sense for Ghana and facilitated the production of a market for sustainable products. She went on to explain that the path toward adopting electric vehicles in Ghana did not replicate the path that the Global North followed, comparing Norway and Ghana. Norway is prominent in discussions of

electric cars, especially because it has the largest per capita fleet of electric vehicles in the world (see Anfinsen et al. 2019; Gjøen and Hård 2002; Winther et al. 2018). When I asked Doris about the comparison, she offered a helpful response:

> Every country will come at it from their own angle. Norway came at it from where they needed it the most. Ghana is coming at it from where they need it the most. It just happens to be that the needs are different. In their case, it was just where people could applaud it more because it was a clean source. Ghana has the same issue as Norway: excess capacity, excess supply. In [the] case of Norway, if that supply wasn't being used, it wouldn't go to waste. The wind would still be blowing. Ours was a case where the money is being lost. Everybody just has an issue they're dealing with, and they're using EVs to deal with that issue. I think in the larger context, the bigger context is creating a market for sustainable energy development, and in that context that's also what we are doing in the long term.

Then she likened technological transformation to individual career development, saying that people follow different steps in their professional lives even if they have the same goal: "If everybody decides to become a doctor, some will come to it through a nursing route, some will go to school, go to college, and be doctors, some will be teachers for five years and then become doctors. But then at the end of the day, are we all becoming doctors?" From Doris's perspective, all the countries invested in the project of transport electrification shared the end goal of reducing carbon emissions and building a green and sustainable future. "Some will go a longer route," she added. "Even when you are using a dirty fuel, you are still reducing emissions. There are no exhaust pipes. Tail-end emission is zero for a pure electric vehicle. Yes, we have well-to-wheel emissions, but they can be reduced in the future. We all speak in one language of sustainability."

An Alternative Temporal Order

At a time when the language of crisis appeared to dominate discussions on electricity, the Drive Electric Initiative claimed to perceive crisis as an opportunity and a site for emergence. In this sense, the electric vehicle program I described in this chapter was not a return to normalcy but an aspiration for a different kind of future. Unlike many contexts in the Global

North, where electric cars served as batteries for renewable energy power stations, electric vehicles in Ghana rely on fossil fuel–powered electricity supplied to the electric grid because of take-or-pay contracts (see chapter 2). However, the initiative's promoters believe that electric cars can have an impact on power generation, incentivizing the construction of renewable energy power stations across the country.

In pushing for this future, the initiative promotes specific features that differentiate it from other climate change mitigation programs. It is mainly intended for upper-middle- and middle-class consumers. It aspires to shape car import and export networks worldwide, possibly disrupting used vehicle exchange between the Global North and the Global South. The initiative aims to stop Ghana from becoming a dumping ground for gas-powered cars while finding new uses for electricity excess. It relies on unlikely alliances between oil marketing companies, car producers and dealers, and electricity providers while reinscribing car-centric living onto urban environments. Perhaps most importantly, the developers of electric vehicle infrastructure have shown how electric cars are actually challenging the presupposed temporal order of development in Ghana.

Epilogue: A Global Future of Energy

Many worldwide await an energy transition where humans will replace dirty fossil fuels with clean, renewable ones. Such wishful thinking has particular implications for the Global South. Policymakers promote fossil fuels to ensure energy justice, allowing countries to "carbonize before they decarbonize" along a linear modernization timeline and safeguarding development in the Global South. Others underline how Global South countries have the opportunity to leapfrog to renewables, endorsing the potential of clean technology while retaining a commitment to the same modernization timeline and advocating that Global South countries can skip a stage. As I described in the previous chapters, visions of linear progress enliven both perspectives.

Yet, in researching this book, I have observed how the energy industry, aligned with other critical decision-makers, has set and refined its future strategies to invest in all available fuels for the longest possible time until an undeniable crisis erupts—what the energy economist I quoted in the introduction labeled "a Lake Erie moment." According to this vision, "technologies of deferral," which extend fossil fuel use, define the future of energy infrastructure without envisaging fossil fuel phaseout as a subsequent stage. This formulation of "all of the above" transforms the developmental timeline that global populations can access, eliminating the notion that there is a set of stages that could be followed or skipped. Instead, time

comes to a standstill. The processes of energy accumulation extend into the future until an irrecoverable breakdown occurs.

Despite this empirical condition, imaginations of linear progress do significant geopolitical work today. For energy industry leaders, making affordable energy sources available to the Global South has been the key argument for expanding fossil fuel consumption globally. For instance, as the leader of the United Nations Climate Change Conference, COP28, in Dubai in December 2023, Sultan Al Jaber had vouched for the right to burn fossil fuels to ensure social and economic development, echoing others who repeat that Global South countries should "carbonize before they decarbonize." Representatives of the fossil fuel industry often relied on the one-dimensional timeline of the energy transition narrative to enable such deferral, positing that renewable energy would follow oil and gas infrastructure in an unidentified future. Perhaps this perspective helped them argue against leapfrogging while demonstrating a recognition of histories of industrialization in the Global North.

Since 2008, complementary research questions regarding how infrastructure transforms amid energy and climate change–related challenges have led me to participate in many small- and large-scale conferences, such as the COP28 summit in Dubai, pursuing patchwork ethnography. While my object of study remained consistent throughout these experiences, my objects of observation were malleable, reflecting on issues ranging from transport electrification to ship construction. This praxis revealed global connections between contexts that might seem distant at first sight while allowing me to refine conceptual priorities. As I described in the introduction, patchwork ethnography stems from a recognition of a researcher's intersecting responsibilities. Such conditions might pose certain restrictions on research design, but they also lead to new openings and insights. Living in Houston, a city many describe as the world's energy capital, has created some of those openings and insights. By pursuing a persistent research question throughout many years, even in divergent contexts that are not always thought of in combination with each other, I have been able to trace how energy-focused narratives transform, even if in subtle ways.

Perhaps this is why, in March 2024, some months after the COP28 meetings, I was surprised to hear the CEO of Saudi Aramco, Amin Nasser, challenge this long-held modernization timeline as he addressed CERAWeek attendees in Houston, Texas. "We should abandon the fantasy of phasing out oil and gas, and instead invest in them adequately, reflecting realistic demand assumptions," he suggested (Nasser 2024). The statement described

existing material transformations openly and publicly, perhaps expressing a sentiment that fossil fuel industry representatives often kept to themselves. Many media organizations criticized the speech because of its disregard for energy transition. His words not only introduced a rupture to the modernization timelines I described above but also echoed some of the arguments I have made here. This book also foregrounds how the imagination of carbonizing before decarbonizing is not what its proponents have long rendered. In some ways, I agreed with Amin Nasser that the energy transition narrative deserves a rigorous materialist critique.

Yet my justifications for this argument are different. In the book, I show that energy accumulation benefits from technologies of deferral, such as the floating power plants at the center of the first two chapters, which extend the fossil fuel economy while absorbing the limited resources of the countries where they operate, often precluding the deployment of future infrastructure projects. Studying temporary power infrastructure, such as powerships, is helpful because it shows how contractual obligations between companies rendered the ship's formal ability to sail away secondary. In addition, examining collaborations between South-South actors demonstrates how Turkish representatives could promote fossil fuel–based development as a necessary evil to help Ghana skip stages in the modernization timeline because they could argue that they had skipped those stages themselves. Even when "technologies of arrival" associated with post-oil modernity, such as solar power stations and electric vehicles, are put to use, the dynamics of social, political, and economic inequality endure. In short, energy accumulation perhaps creates opportunities for electricity production in Global South countries while at the same time posing multilayered challenges.

This book mainly draws on research in Turkey and Ghana, but its proposed conclusions have global implications. In exploring how these dynamics characterize the future of energy worldwide, consider the discussions at COP28 in Dubai in December 2023, where participants convened to review strategies for limiting the global impact of climate change. Around 85,000 people attended the event, doubling the number of participants at COP27 in Sharm El-Sheikh in 2022.

In the mornings, Doris and I took a shuttle bus from our hotel in Jumeirah Village Circle to Dubai's Expo City, a manicured space initially built for the Dubai World Expo 2020, where the conference was held. Doris spearheaded a government-sponsored program called Drive Electric that promoted transport electrification across Ghana (chapter 4). We had known each other since 2019 and spent time together in Accra and Houston

before this meeting in Dubai. As we planned our days during the summit, we shared our previous experiences of attending COP summits with each other. For instance, as a member of the Ghanaian delegation, Doris had given talks about transport electrification at COP27 in Sharm El-Sheikh in 2022. She prepared to do the same work in Dubai while joining her Yale University Climate Fellows cohort for a series of events. My recollections from the climate summits were more distant. I had attended COP 17 and COP 18 in Durban and Doha in 2011 and 2012 to track global carbon capture and storage (CCS) policy negotiations and wrote about these experiences (Günel 2016, 2019; also see Günel 2024). At COP28, I planned to follow how different actors framed the idea of energy transition. Attending the summit while it took place in Dubai was also important to me because I had carried out ethnographic research on energy infrastructure in the United Arab Emirates (UAE) since 2008, and I knew that hosting a global climate change–focused event had been an aspiration for many since the early 2000s. Doris and I agreed that this summit differed in scale and attracted higher participation from corporate actors—including about 2,500 fossil fuel company lobbyists.

I found it helpful to compare COP 18 in Doha and COP28 in Dubai, given their location in the Arabian Peninsula and the eleven-year gap between the meetings. For instance, one of the most remarkable events at COP 18 was a climate march, the first public demonstration in modern Qatari history. During the march, activists called upon Arab officials to lead the climate debates. A Dubai-based journalist told me, "It's just the environment, it's not politics, so they can allow this to happen here." Such overt political gestures were more limited in Dubai in 2023. Instead, COP28 often had the feel of a trade show, serving as a platform to demonstrate various corporate investments in sustainability. One of my Dubai-based friends, who had extensive work experience in many energy-focused organizations in the UAE and beyond, told me in whispers that no one dared to point out that humans had to consume less. In the past two decades, climate change has emerged as a business opportunity, creating the grounds for energy accumulation.

In fact, during an online event in the run-up to COP28, the chair of the summit, Sultan Al Jaber, had remarked that there was "no science" behind demands for phasing out fossil fuels and added, "Please help me, show me the roadmap for a phase-out of fossil fuel that will allow for sustainable socioeconomic development, unless you want to take the world back into caves" (Carrington and Stockton 2023). Although it is difficult for participants to monitor how the summit is covered in the media and develop

a comprehensive perspective of the meeting in real time, these remarks, which became public during the early days of the summit, did not go unnoticed. Negotiators and scientists attending the meetings were in disbelief at witnessing how the United Nations Climate Change Conference chair could promote fossil fuel use while sidelining and challenging climate change research.

Among some Ghanaian delegates, however, the recognition that fossil fuels were necessary agents of development generated relief. As I have shown earlier in this book, at a time of unreliable electricity access, Ghanaian decision-makers often deprioritized concerns regarding climate change. Many repeated that they were not liable for climate change impacts, given how Ghana had not taken part in the industrial activity whose consequences the world now attempted to mitigate. If the Global North relinquished fossil fuels, then the countries of the Global South could follow linear transformations as intended and begin to rely on renewable energy sources after harnessing the developmental potential of fossil fuels (chapter 3). Ultimately, fossil fuels were cheaper and more effective than other alternatives. Many delegates believed that climate activists and negotiators who raised concerns about the planet's future did not appreciate what it took to keep the lights on in their homes. In analyzing these prominent remarks, delegates wondered if Al Jaber comprehended the African continent's conundrum, where countries were tasked with transitioning away from fossil fuels while ensuring economic growth. In his later speeches at COP28 and elsewhere, Al Jaber underlined how world leaders had to acknowledge that the Global South countries deserved to consume fossil fuel resources at affordable prices, reaching Global North levels of wealth and comfort.

"What else did you expect from Dubai?" Doris asked in response to Al Jaber's remarks. After all, the UAE extracted and refined the fossil fuels that would bolster development in the Global South only a few miles away from Expo City and had a clear incentive to market them. An environmental journalist who has been following climate change negotiations for the past thirty years suggested, however, that it has been easy to blame oil- and gas-exporting countries, including Saudi Arabia and the UAE, for climate change. By focusing only on these countries, the rest of the world ignored that they produced oil and gas for an eager global population that could not quit fossil fuels. He reiterated that understanding both the supply and demand side of things will be crucial as the world attempts to bring global warming under control. "Regardless," Doris reminded me, "Sultan Al Jaber

has no proof that fossil fuel phaseout will take humans back into caves." This perspective did not grant him the right to ignore all other future scenarios.

I had met Al Jaber in 2010, when conducting ethnographic research on renewable energy and clean technology development in the UAE. In December 2023, I marveled at the fact that the former CEO of Abu Dhabi's flagship renewable energy and clean technology company, Masdar, now acted as the global leader for climate policy as well as the UAE's Special Envoy for Climate Change, while holding the position of CEO at the Abu Dhabi National Oil Company, one of the largest energy companies in the world, owned by the Abu Dhabi government. Friends and acquaintances who had worked at Masdar with Al Jaber shared my fascination with his ascent, especially given how so many of Masdar's projects—including the development of Masdar City, intended to be a zero-carbon urban community and technology hub—had not delivered the promised results.

Back in 2010, consultants at Masdar believed that drafting a CCS policy would allow the UAE to demonstrate and publicize its commitment to climate change mitigation goals, improving its image in the international policy sphere (Günel 2019). At COP 18 in Doha in November 2012, an alliance between the UAE, Norway, and Saudi Arabia ensured the approval of CCS as a climate change mitigation strategy, despite complaints by members of the Association of Small Island States. Carbon capture and storage served as a technology of deferral, extending oil and gas consumption while postponing fossil fuel phaseout to a later date (see chapter 2). Masdar consultants had predicted that the inclusion of CCS as a climate change mitigation strategy could lead to a major diplomatic success, contributing to the UAE's transformation into an international leader in defining climate change policy. About a decade later, COP28 validated their perspectives. These efforts have not only allowed the UAE to enhance its geopolitical and geoeconomic power but have also generated additional capacity for fossil fuel producers to claim a central role in policy debates.

While I find continuities and ruptures in the narrative regarding energy and climate change significant and informative, my primary goal in this book has been to track material transformations. My examination of CCS-focused debates in the United Arab Emirates in the 2010s led me to follow how technologies of deferral characterize the imagination of energy and climate change today, steering me toward floating power plants as comparable agents of deferral. The resulting ethnographic analysis not only evidences that a commitment to energy accumulation does not create a level playing field for the institutions that manage infrastructure but also

illustrates that energy accumulation is relevant beyond the sites I examined in this book. Methodologically, these insights confirmed that patchwork ethnography can help study global phenomena that transform in accumulative ways over many years and across many locations. In this sense, patchwork ethnography foregrounds the significance of repetition and return, even when it happens infrequently and amid other personal and professional responsibilities.

In the coming decades, growth in energy demand will occur in the Global South, shifting from what energy industry professionals deem traditional demand centers, such as Europe and North America, to countries in Africa. While this book mainly draws on examples from Ghana's electricity sector, its conclusions can issue warnings regarding contemporary global energy and climate change policy trends. Fossil fuels will not become obsolete unless globally accepted phaseout plans and policy proposals are implemented. In this sense, this book reflects contemporary empirical conditions and calls for productive insights that derive from these conditions.

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At Brandeis, I started perceiving the project as an investigation of geopolitics and geoeconomics. As a fellow at Crown Center in 2019–20, I shared drafts with Hayal Akarsu, Maryam Alemzadeh, Yazan Doughan, Youssef Elchazli, Nader Habibi, Pascal Menoret, David Patel, Gary Samore, and Naghmeh Sohrabi. I thank Kristina Cherniahivsky and Karen Spira for their assistance. In Somerville, I lived with Bettina Stoetzer and Patricia Alvarez Astacio. The fellowship allowed me to begin unpacking how our personal lives shape the process of knowledge production, in this case, on transnational networks.

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Notes

INTRODUCTION. **Technologies of Deferral**

Parts of this introduction appeared in Gökçe Günel, "Energy Accumulation." *e-flux*, September 9, 2020, https://www.e-flux.com/architecture/accumulation/339454/energy-accumulation/; and Gökçe Günel, "Accumulation: Exploring the Materiality of Energy Infrastructure," in *The Handbook for the Anthropology of Technology*, ed. Brit Ross Winthereik and Ayo Wahlberg (London: Palgrave, 2022), 689–703.

1. These percentages are commonly used by decision-makers but are not always accurate. Every day, power producers in Ghana offer different amounts of electricity to the grid, based on a system of merit order dispatching that is administered by the control room at GridCo, the national grid company. I use these percentages to symbolize the ship's impact but acknowledge that they are not factual indicators.

2. The other independent power producers in Ghana are TICO, Sunon Asogli, CENIT Energy, AMERI, and Karadeniz Holding. For more on the Ghana power market, see Ahlijah (2017).

3. Waller Marine, Power Barge, Modec, Chiyoda, Wison Group, Samsung Heavy Industries, Sevan Marine, Hyundai Heavy Industries, IHI, Mitsui O.S.K. Lines, and Mitsubishi Heavy Industries are some of the other actors in the floating natural gas–fueled power plant market. Karpower distinguishes itself from these other players by using secondhand equipment and retrofitting existing ships. Karpower executives told me that this allows them to offer their clients more affordable prices, which makes them popular in Africa. For an overview of independent power producers in Ghana, see Eberhard et al. (2016).

4. For an insightful analysis of how energy infrastructure bridges land and sea in Takoradi, see Chalfin (2018).

5. Floating vessels as a component of the temporary power market face competition from distributed generation facilities, which produce electricity close to points of end use. Most distributed generation facilities offer electricity outputs with a capacity smaller than 100 megawatts, but planned blackouts, power quality problems, unexpected power outages, and general increases in electricity prices have incentivized institutional and residential consumers to use such equipment. Given their relatively small and scalable size, distributed generation facilities are available for purchase to a variety of

consumers, including residential consumers. Around the world, companies such as Aggreko, APR Energy, Atlas Copco, Energyst, United Rentals, and Symbion rent out temporary generation equipment that is often powered by diesel, heavy fuel oil, and natural gas. However, none of these companies currently provides a significant portion of Ghana's electricity. While floating power plants tend to generate higher volumes of electricity for a grid and to enter into contracts with governments, distributed generation facilities have a more diverse range of clients.

6. The same delegate defended the implementation of carbon capture and storage (CCS) technology, which I analyze in chapter 2 as a technology of deferral. CCS, which is controversial outside fossil fuel circles, is a climate change mitigation technology that obtains carbon dioxide from industrial compounds, carries it to storage sites, and injects it into the ground. By injecting carbon dioxide into fields and forcing oil out, oil producers can extend the lifespan of their oilfields. While this technology has gained global appeal over the past decade, some policymakers and scientists have argued that CCS could cause concentrated amounts of carbon dioxide to leak out into the atmosphere. They also point out that liability protocols related to such incidents are ambiguous. CCS has received additional criticism because it can cause a crowding-out effect whereby funds are pulled away from developing renewable energy and instead put toward a project that prolongs the use of fossil fuels.

7. These conversations mainly refer to fossil fuel consumption as a tool for development. But as anthropologist Gisa Weszkalnys (2015) shows, the possibility of finding and exporting fossil fuels also generates expectations for future wealth. Oil extraction has been beneficial to Ghana's economy since 2007, with crude petroleum constituting one of Ghana's most important exports. For reflections on the way expatriate oil workers reflected on the potential of extraction in Ghana, see Destrée (2023).

8. All of the above became popular in the United States in the early 2000s in response to domestic energy security concerns, with Republican congressperson Benjamin A. Gilman (Congressional Record 2000) suggesting in a speech that "an effective national energy policy, must at a minimum allow for all of the above." By arguing that the United States was under attack from OPEC nations, and therefore suffered from high energy prices, this approach gave further grounds for the 2003 invasion of Iraq (see chapter 1). Legal scholar Albert C. Lin (2014) argues that all of the above was ratified with the Bush administration's 2005 Energy Policy Act and became formalized as a policy framework with the Obama administration's Blueprint for a Secure Energy Future in 2011, receiving extensive criticism because it did not adequately plan for fossil fuel phaseout. In 2025, the idea of all of the above still characterizes the ways energy professionals approach the future. Yet rather than foregrounding domestic energy security, such professionals spotlight the demands for fossil fuel–based development in Global South countries, rationalizing the expansion of fossil fuel infrastructure by reminding audiences of the significance of energy justice.

9. In 2012 and 2013 I conducted ethnographic research on how fossil fuel executives in Houston, Texas, and beyond understand the emergence of CCS policy (see Günel 2016). I also conducted research on CCS policy in the United Arab Emirates between 2010 and 2012 (see Günel 2019).

10. For a reflection on a corporate history of the Lake Erie moment, centering on Dow Chemicals, see Müller (2018).

11. A proliferation of such technologies in the world of energy and climate change, including CCS, receives support from governments and corporations worldwide.

12. For an analysis of generators in Nigeria, see Larkin (2016).

13. Northern Electricity Distribution Company (NEDCo), the second electricity distribution company in Ghana, services the north. Because the northern part of the country has fewer industrial facilities, the power supply of NEDCo is significantly lower than ECG's, which makes ECG the most significant actor in electricity distribution. Since the unbundling of the country's electricity sector in the early 2000s, these two companies have served only as distributors and have no power production capacity.

14. As sociologists Louise Seamster and Victor Ray (2018, 317) argue, debates over progress often take three shapes: "slow cumulative progress in knowledge and morality; cataclysmic social change attained through upheavals, violence, or innovational leaps; and regression (anxiety about society moving backward, coupled with the normative assumption society should move forward)."

15. Although York and Bell's (2019) article is illuminating, the conclusions they offer, such as a cap-and-trade system, could leave countries of the Global South stranded with no access to electricity, while favoring the maintenance of existing patterns of consumption in the Global North.

16. Perhaps not surprisingly, Rostow (1990, xix–xx) concludes that "corrective action [would] depend on forehanded domestic and international public policy."

17. This statement is a reference to what many in the energy industry refer to as the "energy ladder" argument that posits a linear movement from old fuels to new fuels. Yet scholars have criticized the idea of the energy ladder and demonstrated how empirical evidence points to "fuel stacking" in households instead, where many different sources of fuel remain in use concurrently, rather than one fuel replacing another.

18. For an example of this argument, see Batinge et al. (2017).

19. Anthropologist Ezgi Güner (2023, 2024) has written about the emergence of Turkish whiteness in Africa, examining how Turkish humanitarian actors build upon and change an existing racialized affective regime between Turkey and African countries.

20. I use Doris's real name here as I believe she is uniquely situated in the field of electric vehicles in Ghana. Doris has read and commented on a draft of chapter 4 and a draft of the epilogue and is aware that I am not anonymizing her. In making this decision, I have been inspired by Weiss (2021). All other names I include in this book are pseudonyms.

CHAPTER 1. *Cin Fikir*

Parts of chapter 1 appeared in Gökçe Günel, "Cin Fikir: Infrastructure, War and Progress," in *Against Catastrophe*, 2025 online exhibition edited by Orit Halpern, Eylül İşcen, and Nadia Christidi, https://againstcatastrophe.net/cinfikir; and Gökçe Günel, "Offshore Grid: The Rise of the Power Ship," *Architectural Review,* February 2025, 110–13.

1. Even though *cin fikir* may parallel the idea of life hacking, as these examples illustrate, it does not emphasize efficiency, optimization, or utilitarianism in the way life hacking does. *Cin fikir* also involves taking a risk and endows the person taking the action with the subject position of a quirky innovator. In some ways, *cin fikir* recalls the idea of *jugaad*, but it does not necessarily arise from the necessity for frugal innovation or anticapitalist intervention. For an analysis of life hacking, see Saval (2014). For an analysis of *jugaad*, see Rai (2019).

2. Anthropologists such as Hayder Al Mohammad (2007, 2012), Bridget Guarasci (2024), and Kali Rubaii (2020, 2024) have documented these conditions, studying the broader impacts of war.

3. For decades, the state-owned vertically integrated company Türkiye Elektrik Kurumu (TEK) dominated the electricity sector in Turkey. Liberalization efforts began in the early 1990s. In 1993, TEK separated into TEAŞ (generation, transmission, and wholesale) and TEDAŞ (distribution). The Electricity Market Law in 2001 divided TEAŞ into three legal entities: EÜAŞ (generation), TETAŞ (wholesale), and TEİAŞ (transmission). Privatization efforts continued, with new frameworks implemented in 2009 and 2013.

4. For an interesting parallel where wars in Asia allowed for the growth of Korean family-owned businesses, see Jeong (2023).

5. In his book *Oilcraft*, political scientist Robert Vitalis (2020) explores how myths regarding oil scarcity impact world politics. My work in this chapter advances this question to investigate how oilcraft, as Vitalis labels it, not only shapes geopolitical and geoeconomic relations between countries such as the United States and Saudi Arabia, but rather extends to places that are less commonly associated with this dynamic, in this case Turkey and Ghana.

6. General David Petraeus later became the director of the CIA.

7. "KARTET Yönetim Kurulu Başkanı Rauf Osman Karadeniz de Türkiye'den komşu ve kardeş ülkeye 'dostluk enerjisi' nin iletimini başlattıklarını belirterek, 'İlettiğimiz enerji, aydınlatacağı her haneye yüreklerimizdeki sevgi ve dostluğu da götürecektir' dedi" (*Hürriyet* 2003). An English translation of the quote would be, "KARTET Chairman of the Board Rauf Osman Karadeniz stated that they started the transmission of 'friendship energy' from Turkey to the neighboring and brother country and said, 'The energy we transmit will bring the love and friendship in our hearts to every household it illuminates.'"

8. I have explored this process (Günel 2022a); see also Yolaçan (2022) and Al Bulushi et al. (2023).

9. Criticism regarding this transaction continued in Turkish newspapers: "Turkey, which sells electricity to its citizens for 12.4 YKr, exports electricity to Iraq for 8.8 YKr through KARTET, owned by Karadeniz Holding. There is an effort to close the deficit in the country by purchasing electricity from Iran for 14.6 YKr" (*Radikal* 2007).

10. In some ways, Karadeniz's transformation parallels the Kuwaiti family business Agility, which Laleh Khalili (2020, 243–65) examines, where the localized work that the company performed could be modified and scaled up later to serve a global market.

11. Later in its operations, Karadeniz Holding would start selling electricity directly to the Kurdish Regional Government (see, for example, Reuters 2013).

12. Soon, Ciner Holding, a family-owned company built on soda ash production and known for its close ties to the AKP government, founded new thermal power plants in Silopi with support from the China Machinery Engineering Corporation, despite Silopi residents' persistent protests about the environmental impacts of these new coal-fired plants (Akdemir 2019). *Evrensel*'s four-part documentary on the Silopi power plant further lays out the political contestations regarding the project (Akdemir 2020).

13. According to a United Nations Conference on Trade and Development report from December 2009, "In deadweight terms, more was scrapped in the four months to April 2009 than in any of the three years between 2005 and 2007" (64). The report shows how the Great Recession impacted ship demolition, among other aspects of shipping, providing evidence as to how and why scrapping rates skyrocketed. One finding from the report is how economic downturns, like the one in 2008, decrease the average age of ships worldwide, because shipowners perceive an advantage in the breaking of their oldest ships during such periods.

14. Nicky Gregson, Mike Crang, and others have written about such translatability of ships in Bangladesh's shipbreaking sites. Their research points to how "the destructive labour of ship breaking on a beach at Sitakunda is shown to create a range of objects and differentiated streams of material which form the basis for secondary manufacturing, craft and retail activities" (Gregson et al. 2010, 847). Although Karpower retrofits ships without breaking them down as Bangladeshi shipbreakers do, they also benefit from the afterlives of ships; this evidences their translatability. For analyses of shipbreaking in Bangladesh, see Gregson et al. (2010) and also Jackson (2014).

15. In response to demonstrations regarding Iraq's electricity infrastructure in June 2010, Karim Wahid resigned from his position as minister of electricity, which he had held for four years.

16. See Hayder Al Mohammad's (2007, 2012) work on Basra's infrastructure during these years.

17. As of 2025, problems with the Iraqi electricity grid have not been resolved. In stabilizing electricity supply, decision-makers have made promises to end flaring, meaning the practice of burning natural gas during the process of oil extraction and instead capturing that gas to generate electricity while at the same time connecting the Iraqi grid to the interconnected Gulf Cooperation Council grid (for the GCC grid, see Günel 2018). In the meantime, US-based policymakers insist on the necessity of cutting the flow of Iranian gas to Iraq to weaken Iran's economy, rendering a significant fuel source for electricity generation inaccessible. Climate change–related concerns also shape such future speculations as decision-makers interrogate how the Iraqi population may respond to power outages during excessively hot summer months and if such outages may instigate political protest. In August 2025, news organizations announced that two of Karpower's floating power plants had docked in Basra's ports to generate nearly 600 megawatts of electricity.

18. Perhaps an additional layer of irony here is that the now-deceased leader of ISIS, Abu Bakr al-Baghdadi, as well as the current president of Syria, Abu Mohammed al-Jolani, who has now dropped his nom de guerre to use his real name Ahmed al-Sharaa, were both imprisoned in Camp Bucca. I thank Ali Bektaş for this reminder.

19. In May 2018, a Russian nuclear floating power plant called the *Akademik Lomonosov* made headlines claiming to be the first floating nuclear power plant in the world. This is inaccurate, as the US Navy had relied on nuclear-powered submarines and ships since the mid-1950s. On USS *Sturgis*, see Gardner (2017).

20. Hat-San Shipyard has benefited significantly from this expansion. In September 2023, Hat-San's initial public offering reached approximately TRY 1 billion and 3.7 million investors.

21. Labor practices at Tuzla Shipyards have been controversial, however (see Güney 2016).

22. In March 2018, Karpower representatives shared a list of their forty-three ships with me. I have included this list in the introduction to this book.

23. In her book *The Corporeal Life of Seafaring*, Laleh Khalili (2024) describes her happiness at being able to eat Filipino fare on a ship where cafeterias were divided based on seafarers' ranks. The powership's food services differed from such seafaring vessels in that everyone ate together in the same space and could choose between Ghanaian and Turkish cuisine.

24. Science and technology studies scholar Anto Mohsin's *Electrifying Indonesia* (2023) helps situate the emergence of powerships in Indonesia by analyzing how and why the country historically relied on large regional grids alongside many smaller networks spread across the archipelago.

25. This argument diverges from Simone's (2004b) concept of "people as infrastructure." Staff did not become infrastructural because they were marginalized and did not have access to other forms of collaboration but rather as a result of their affective attachment to their work and the resulting forms of personhood.

26. Many research collaborators stressed that African governments do not have many opportunities to finance long-term energy projects. World Bank and IMF loans come with strings attached and at high interest rates. The African Development Bank offers some financing for Turkey-Africa collaborations. The Turkish Eximbank provides funding for large-scale construction projects to African governments willing to hire Turkish developers, but energy projects do not constitute a large part of their portfolio. Given the complications in generating funding for infrastructure projects, many of my interlocutors connected China's rise in Africa to their mixed economic models, which allow for barter agreements. One businessman, heavily involved in arranging financing for infrastructure projects in Africa, argued that Chinese contractors would build a new grid in an African country in exchange for all the minerals they find while they are developing that grid. Turkish companies aspire to these types of barter agreements but are unable to author such contracts because of the conditions of their OECD (Organisation for Economic Co-Operation and Development) membership. When he addresses African governments, President Erdoğan declares that Turkish companies are also open to barter, but in my research I have found no evidence of such agreements. For an analysis of donors in Ghana, see Zeitz (2015).

Parts of chapter 2 previously appeared as Gökçe Günel, "A Floating Power Plant: Provisional Energy Infrastructure and Afro-Asian Connections," in *Infrastructure and the Remaking of Asia*, ed. Max Hirsh and Till Mostowlansky (Honolulu: University of Hawai'i Press, 2022), 63–82.

1. For instance, compare Karpower's operations to those of Aggreko, a large temporary power company headquartered in the United Kingdom, which made a proposal to Ghana for a possible 100-megawatt power plant that required twenty-seven acres of land at Esiama on which to place its generators. So far, the project has not been realized (see Bonface 2015).

2. Özden-Schilling (2021) explores the extensive labor that goes into matching supply and demand across different parts of the electricity sector and shows that it is not only about the integration of particular technological devices into the grid. Also see Günel (2018).

3. When I inquired about the terms of power purchase agreements (PPAs), one energy journalist in Istanbul explained to me how long-term PPAs allow for revenue visibility and therefore become attractive opportunities for investors. Yet he added how he had never heard of a one-hundred-year PPA, and in fact, underlined that such a condition would be impossible given how power plant licenses last for about forty to fifty years.

4. Perkins (2004) devotes a significant section of his book to the US interventions in Iraq (see, for instance, pp. 182–88).

5. While Turkish businesspeople and government representatives I met in the course of my research for this book often asked me about this, labor migrants in Ghana inquired instead about strategies for moving to the United States, requesting contact details of good immigration lawyers and quizzing me about the green card application process.

6. My translation; the Turkish original: "En büyük sırrımız elektrik götürdüğümüz ülkelerin dert ortağı olmak. Özellikle Afrika ülkelerinin dertleriyle dertlenerek oluşturduğumuz güven bize yeni projelerin kapılarını açıyor" (Güler 2019).

7. I thank Nikhil Anand for this reference.

8. In their work on development and infrastructure, architectural historian Ayala Levin (2022) and anthropologist Christina Schwenkel (2020) show how discourses on collaboration characterized the relationship between Israeli engineers and African governments and between the East German government and their northern Vietnamese counterparts. Both authors explore the tensions behind such discourses of collaboration (see Baumgardt and Günel, n.d.).

9. My translation; Recep Tayyip Erdoğan's official address of March 2018: "Afrika'nın kaynaklarını tüketmek ve modern sömürü modellerini benimsemek, bizim için asla söz konusu değildir." For a recording of this speech, see X (formerly Twitter) post by T. C. Cumhurbaşkanlığı from March 3, 2018, at https://twitter.com/tcbestepe/status/969863732003246081.

10. Gülen schools had initially been established in post-Soviet republics in the early 1990s and quickly spread to Africa. For an analysis of Gülen networks in Kazakhstan, see Turam (2006, 89–109).

11. See Gabrielle Angey's work on the Gülen Movement in Africa (e.g., Angey 2018).

12. Interview with businessperson, February 2018; my translation. The Turkish original: "Tabii burada adamların kendine güveni senelerce sarsılmış, ondan iş yapmaları zor, toparlanmaları zor. Biz de öyleydik ama Tayyip Bey sayesinde kendimize geldik."

13. The Foreign Economic Relations Board of Turkey (DEIK), founded in 1986 by then prime minister Turgut Özal as part of the country's economic liberalization efforts, organizes such events for members of Turkey's business community to expand the country's foreign commercial operations. My companions in the delegation knew that I was an academic at a research university in the United States and that I was studying Turkey's Africa initiative. However, because I was the only woman in the business delegation, my presence attracted attention and led to the assumption that I was an administrative assistant at DEIK. That we all traveled together on a private plane, shared meals, and stayed at the same hotels meant that I was able to socialize easily with delegation members. During the trip, I also interacted with some Turkish ministers. I have analyzed the details of this trip elsewhere (Günel 2022a). For a review of the Turkish business world, see Buğra and Savaşkan (2014) and Buğra (1994).

14. My translation; the Turkish original: "Tabii ki, bunda Türk şirketlerinin aile odaklı, az ortaklı ve yönetim tarzından kaynaklı farklılığı ile, hem benzeşme hem de böylece hızlı karar alma, esnek olma ve müşteriye daha yakın olma gibi göreceli artıları bulunmaktadır."

15. For updates on this dispute, see Ghumman (2020). I thank Zahid Ali for sharing these news articles from the Pakistani press with me.

16. A certain forgetting of history structures the conversations between energy experts. During the meeting at Baker Institute on the Iraqi electricity grid, none of the participants pointed out how the electricity problems that the country currently faced were a direct result of US attacks on Iraqi electricity infrastructure during the Gulf War in 1991.

17. For more information on the case, see US Securities and Exchange Commission (2020). For Berko's response, see MyJoyOnline (2020).

18. Energy professionals from various Ghanaian institutions argued that Karpower had actually been more efficient in its power production than some other power producers, which were responsible for overcapacity. Therefore they did not consider Karpower to be underperforming compared to other power plants that also benefited from take-or-pay contracts.

CHAPTER 3. **Leapfrogging to Solar**

Parts of chapter 3 previously appeared as Gökçe Günel, "Leapfrogging to Solar," *South Atlantic Quarterly* 120, no. 1 (2021): 163–75; and Gökçe Günel, "Clean: What Does Clean Energy Really Mean?," in *Power Shift: Keywords for a New Politics of Energy*, ed. Imre Szeman and Jennifer Wenzel (Morgantown: West Virginia University Press, 2025), 74–75.

1. Interestingly, there are fewer analyses of new power stations in contexts where electricity outages have been consistent. For some good examples, see Akrich (1994), Cross (2013, 2019), Mains (2012), and Winther (2008).

2. The project had long been in the making. As Stephan Miescher and Dzodzi Tsikata (2009–10) describe eloquently, the British geologist Albert Kitson, while journeying downstream in a canoe in 1915, had conceived the idea of constructing a dam in Akosombo on the Volta River with the goal of generating hydroelectric power to facilitate the processing of bauxite into aluminum. A decade later, Kitson published a comprehensive report on the mineral and water-power resources of the Gold Coast, where he included the possibility of a second dam in Bui. This additional dam offered the potential to provide electricity for a railway network extending to the northern regions. Duncan Rose, a South African engineer, later took up Kitson's plan. When the demand for aluminum increased with World War II, Kitson and Rose, ignoring domestic needs, saw the Akosombo and Bui as engines that could help the war effort across the Commonwealth. In the 1950s, however, these hydroelectric projects became part of a larger nationalist rhetoric, signaling independence and development. While negotiating with the US-based Kaiser Industries for the construction of the Akosombo Dam, Kwame Nkrumah, the leader of Ghana at the time, also pursued the Bui Dam. The coup of February 1966 halted progress on the second hydroelectric project, and subsequent efforts in the 1970s and '80s faced various obstacles. Despite a feasibility report funded by the Australian government in 1976, the World Bank failed to provide financing for the project. The 1980s and '90s saw electricity shortages as a result of low water levels at the Akosombo Dam, which reignited discussions about the construction of a dam in Bui (see also Tsikata 2006; Gocking 2021; Miescher 2022). In November 2005, the government of Ghana, led by John Agyekum Kufuor of the New Patriotic Party (NPP), accepted an unsolicited bid from Sinohydro, a Chinese state-owned hydroelectric power company established in the 1950s. Sinohydro had by then become the largest hydropower construction company in the world. Anthropologists have detailed Sinohydro's projects in Nepal (Lord 2016), Cambodia (Pal 2013), and Malaysia (Fam 2017). Paralleling the patterns of Chinese infrastructure development in other regions, this unsolicited bid also made financing available from the Export-Import (Exim) Bank of China. In return for providing funding for 90 percent of construction costs for the dam, the Exim Bank would hold onto the proceeds of 30,000 tons of Ghanaian annual cocoa exports to China. According to the agreement, once the plant started its operations, the Exim Bank would absorb 85 percent of the proceeds of electricity sales from the hydropower facility, with the remaining 15 percent going to Bui Power Authority's operational expenses (Hensengerth 2011). Also see Tang and Shen (2020).

3. The flooded area was much less extensive than the Akosombo Dam's: 444 square kilometers for the Bui Dam as opposed to 8,502 for Akosombo. The dam construction led to the removal of about 1,200 people. Overall, the Bui Dam was much smaller in size than the Akosombo (Gocking 2021).

4. Please also review findings from the collaborative research project, "Energising Landscapes: Lands, Livelihoods, and Energy Infrastructures in Ghana," by William Otchere-Darko, Raymond Abdulai, Pauline Destrée, Austin Ablo, Helen Akolgo-Azupogo

and Deborah Darko, which examines how hydroelectric, petroleum, and solar energy stations in Ghana shape their surrounding regions: https://www.thebritishacademy.ac.uk/projects/energising-landscapes-lands-livelihoods-and-energy-infrastructures-in-ghana/.

5. Since the 1960s, the Ghanaian government has attempted to build sugar-processing facilities in the country, yet none of these projects have reached fruition (Boamah and Sumberg 2019).

6. As of October 2023, Bui Sugar Limited was not part of the One District One Factory initiative, started by the Nana Akufo-Addo government in 2017 to accelerate industrialization across the country (*GhanaWeb* 2023).

7. Scholars such as Anna Tsing (2015, 37–41) and Donna Haraway (2015), who advocate replacing the term *Anthropocene* with *Plantationocene*, echo this perspective. By emphasizing the ecological ramifications of plantation agriculture, they also shed light on the social disparities ingrained in plantation labor, revealing how the consequences of climate change are often racialized. In his book *Decolonial Ecology*, literary critic Malcom Ferdinand (2022, 47) further illustrates that plantations have evolved significantly from their seventeenth-century origins. See Katie Ulrich's (2024) unpublished dissertation for an excellent review of the literature.

8. Unlike the African ports that fed raw materials to the outside world, shipping in the context of the Ottoman Empire, especially in the late nineteenth and early twentieth centuries, did not often stem from the empire's capacity to produce exports. Instead, its largest and most significant port, Istanbul, was a passage point for goods and people, a center for maritime traffic in the Eastern Mediterranean and the Black Sea (Harlaftis and Kardasis 2000). Historian On Barak's (2015) work offers a complementary perspective, demonstrating how this does not mean that the Ottomans did not produce exports. Through the long nineteenth century, Zonguldak, with its coal production, was a significant node in facilitating British power, setting the stage for the arrival of oil and its related geopolitics.

9. According to Marxist historian Peter Linebaugh (1982, 108), starting in the seventeenth century, the plantation and the ship provided two of the unique ways in which capital organized the exploitation of human labor. "The plantation provided the first site in modern history of mass cooperation," while "the ship . . . provided the place where the articulation of disciplinary rules and the ratio of variable to constant capital (men to equipment) forbode the factory of the future." Linebaugh understands both the plantation and the ship as "a framework of human interaction, a framework both conducting and moulding human experience," where they both constitute "'the public realm' of working-class self-activity," each organizing labor relations in distinct ways. Perhaps contemporary floating power plants extended this logic. The disciplinary regimes Linebaugh foregrounds in his article have been replaced by flexible work practices, which draw on affective attachments to labor and machines. Finally, Linebaugh underlines how "the ships' holds carried the congealed labour of the plantations, the manufactories, and the work-shops to their new destinations."

10. While recognizing the inequitable arrangements between Chinese investors and the Ghanaian representatives, I am not following the arguments regarding "debt-trap di-

plomacy" here. For a critique of China's so-called debt-trap diplomacy in Africa, see Brautigam and Rithmire (2021). Perhaps some of the arguments regarding debt-trap diplomacy stem from a geopolitical and geoeconomic race between the United States and China. While the United States has stakes in extending the fossil fuel economy in maintaining its hegemonic status in the world, China has managed to create a clean technology industry that exports goods ranging from rooftop solar panels to electric cars to countries around the world at affordable prices, perhaps unsettling the fossil fuel sector. Regardless, this book's main argument on energy accumulation shows that both industries are likely to grow in the coming years, expanding the use of fossil fuels and renewable energy power stations at once.

11. At the time of construction, the cost amounted to about $35,000. The gross domestic product of Ghana was about $750 per capita.

12. Although the ECG case bears out many of the arguments regarding the utility death spiral, there is debate about how valid the term might be. See, for instance, Costello and Hemphill (2014). For other articles that detail the relationship between utilities and rooftop solar, see Laws et al. (2017).

13. For a review of IFC's green financing programs, see International Finance Corporation (2017).

14. As anthropologist Aneil Tripathy (2017, 242) writes of the green bonds market, such financial institutions "need to reify nature objectively to appease the bureaucratic logic of institutional investors and finance at large."

15. As I set out in the introduction and the epilogue, understandings of energy justice have been celebrated by fossil fuel company representatives globally, with energy justice seen as more urgent than climate justice because it will facilitate social, political, and economic development across the Global South.

16. Kaufmann and Vaid (2016) argue that the installation of rooftop solar panels by some people has led to a reduction in prices for all electricity consumers in Massachusetts. A comparative analysis would provide a better understanding of why and how rooftop solar power has not had this impact in the Ghanaian context. The debate on the utility death spiral broadly helps to parse such differences.

17. According to recent research by USAID's Power Africa initiative, 83 percent of the population currently has access to the grid in Ghana. There is a stark distinction between rural and urban communities, with rural access to the grid at 50 percent, and urban access at 91 percent (USAID 2016).

18. There are other solar power stations in Ghana that extend this 40-megawatt capacity. According to an Energy Commission report (2024), VRA Solar (Navrongo), VRA Solar (Lawra), VRA Solar (Kaleo), BXC Solar, Meinergy, Bui Solar, and Safisana Biogas produced solar-powered electricity for the grid. See also Stock et al. (2023).

CHAPTER 4. **Drive Electric**

1. In some ways this argument echoes what economists have called the Jevons paradox. In his book *The Coal Question*, British economist William Stanley Jevons (1865) warned that Britain would exhaust the coal supplies that were fueling its growth and

prosperity. He argued that increased efficiency in consumption would not reduce demand for energy but rather spur increased use and further deplete supplies. The Jevons paradox is now used to explain why increased energy efficiency does not necessarily reduce present-day demand for electricity or gasoline: "It is a confusion of ideas to suppose that the economical use of fuel is equivalent to diminished consumption. The very contrary is the truth" (Jevons 1865, 103).

2. In May 2024, I visited the International Energy Agency (IEA) in Paris to share some of my research results and to meet some staff members. One participant at the meeting told me that they had recently hosted Ghanaian government representatives for a workshop on energy efficient appliances. Throughout the workshop, Ghanaian representatives had told organizers that they did not want energy efficient appliances, explaining the problem of overcapacity and the related aspiration for creating more unrestrained electricity consumers. The exchange illustrates the tensions between studying energy issues at the global scale and the national scale. While energy efficient appliances appeared self-evident to IEA experts as ways of mitigating global climate change, in the Ghanaian context they made little sense, because they exacerbated representatives' concerns regarding overcapacity. I thank Rice Global for their invitation to offer a summer class in Paris, which gave me the ability to connect with staff members at the IEA.

3. Many thanks to Cyrus Mody for reminding me of this history of electrification.

4. Perhaps it is fair to frame the Drive Electric Initiative as an electrification campaign in its own right, even though the literature on electric mobility does not often use the lens of electrification in analyzing the implementation and use of electric vehicles (see, for instance, Bergman et al. 2017; Skjølsvold et al. 2022). In general, the literature on electric cars focuses on policy development in countries such as Norway, Denmark, or the United Kingdom, where renewable energy storage has been an issue, or interrogates the recent expansion of electric vehicle manufacturing in China (for a critical approach, see Henderson 2020). There is also work that explores why electric cars became popular at different points in history without having a transformative and decisive effect on transport infrastructure (Eisler 2020). Questions of electrification are rarely coupled with the expansion of electric vehicle infrastructure.

5. For an account of the politics of electrification in Tanzania, see Phillips (2022). For broader electrification dynamics across the African continent, see Degani et al. (2020).

6. Yusuf's investment in electric mobility infrastructure recalls what historian Polly Hill described as the "lorry age" in Ghanaian history where cocoa farmers who benefited from the extractive policies of the colonial era purchased lorries to facilitate the movement of their products. For a close examination of this era, see Hill (1997) and Hart (2020).

7. Electric vehicle entrepreneurs in Ghana wondered if their initiatives were too Accra-centric and if the adoption of electric vehicles would create new mobility-focused inequities between Accra and the rest of the country. For an investigation of this condition, see Agbevivi (2025).

8. While some decision-makers advocated that import taxes could facilitate local assembly of electric vehicles in the country, others complained that such taxes prevented the broad proliferation of electric mobility.

9. Kuhudzai (2021b) later suggested that Wuling would become the ICE killer vehicle. For the cost and impact of electric vehicles in Ghana more broadly, see Ayetor et al. (2021, 2023) and Opoku et al. (2023).

10. For one such example, see Conzade et al. (2022). In an informal exchange, an energy professional from Ghana criticized this report for assuming that "Africa is a country" and not seeing the differences between the various nation-states.

EPILOGUE. **A Global Future of Energy**

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