Spatializing the Energy Transition. Toward a Meta-Reflection on the Notion of Energy Landscape

Sascha Roesler in conversation with Elke Beyer, Kim Förster and Daniela Russ

Conversation

Edited by Sascha Roesler

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Abstract

In 2022, urban researchers and architectural historians Sascha Roesler, Kim Förster and Elke Beyer launched the international "Network on Urban Energy Landscapes." The following discussion for the "Ardeth" edition, to which historical sociologist Daniela Russ was also invited, revolves around three central aspects:
a) firstly, the need to think about the energy transition in spatial terms and across different scales, i.e., from the smallest to the largest manifestations of the built environment, which the notion of "energy landscape" seeks to encompass;
b) secondly, the unprecedented challenges posed by the future energy transition and the epistemological limits of historical research;
c) and thirdly, the special position of cities as centers of energy consumption and the inevitability of networked energy hinterlands.

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1 *Framing: Energy and landscape*

Sascha Roesler: I would like to start with the question of possible framings of the concept of the *energy landscape*. This concept is comprised of the terms *energy* and *landscape* and we should talk about why we now need to consider these two terms in tandem.
As part of the research and teaching activities at my chair in recent years, we have been endeavoring to define the concept of energy landscape from both a historical and a future-oriented perspective. In 2019, we taught a seminar for graduate students entitled "The City as Energy Landscape" together with Lorenzo Fabian Stieger and curated an exhibition with the same title one year later.

Fig. 1 - View of the Exhibition "The City as Energy Landscape", Accademia di Architettura (Mendrisio), Università della Svizzera italiana, September 14 - October 30, 2020. © Katja Jug, IG jk_katja_jug.

If we look at the history of ecological design, we can see that landscape architects such as Ian McHarg (1969), Anne Whiston Spirn (1984) and Michael Hough (1984) and urban planners such as Ralph Knowles (1974), Vladimir Matus (1988) and Dean Hawkes (1996) were becoming increasingly aware of the urban dimension of energy.
While architecture has in recent decades focused primarily on the self-sufficiency of individual buildings, the energy landscape approach emphasizes energy conservation and generation on a larger scale. Hough (1984) referenced the term "energy landscape" in promoting an "an ecological view that encompasses the total urban landscape" (9).
In the context of the present challenges posed by climate change and the energy transition, the concept of the energy landscape is fundamental to rethinking the relationship between design and energy at different scales, integrating new technological systems and built structures with natural

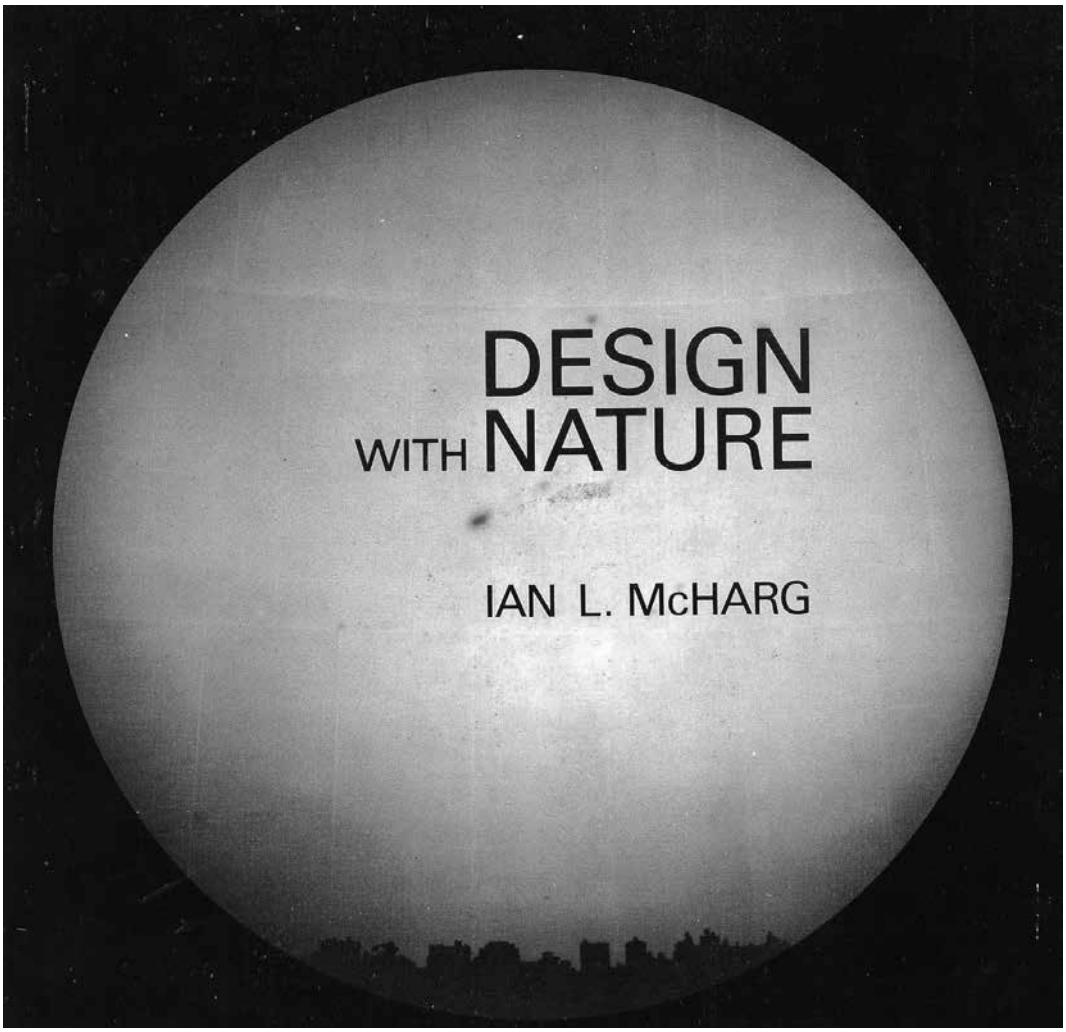

Fig. 2 - Cover of the book "Design with Nature" by Ian McHarg, 1969. © Natural History Press.

processes (Roesler, Kobi, Stieger, 2022). Viewed through the lens of land-climate dynamics, such an approach relies on the idea of the productive (rather than merely consumptive) urban environment, in which the built fabric, topography, soil, water bodies, green spaces and regional climatic conditions (determined by sun, wind, precipitation and seasonal temperatures) serve as potential parameters for energy production. We have termed this interplay between human-made energy infrastructures, urban fabric and natural processes in cities "energy-synergy" (Roesler, 2022).

Energy thinking and electrification

Daniela Russ: I come from the field of sociology, where neither *energy* nor *landscape* exist as theoretical concepts. Nevertheless, I believe that they go well together and tie in with the fundamental question of how the energetic and the material relate to each other. At the time of its in-

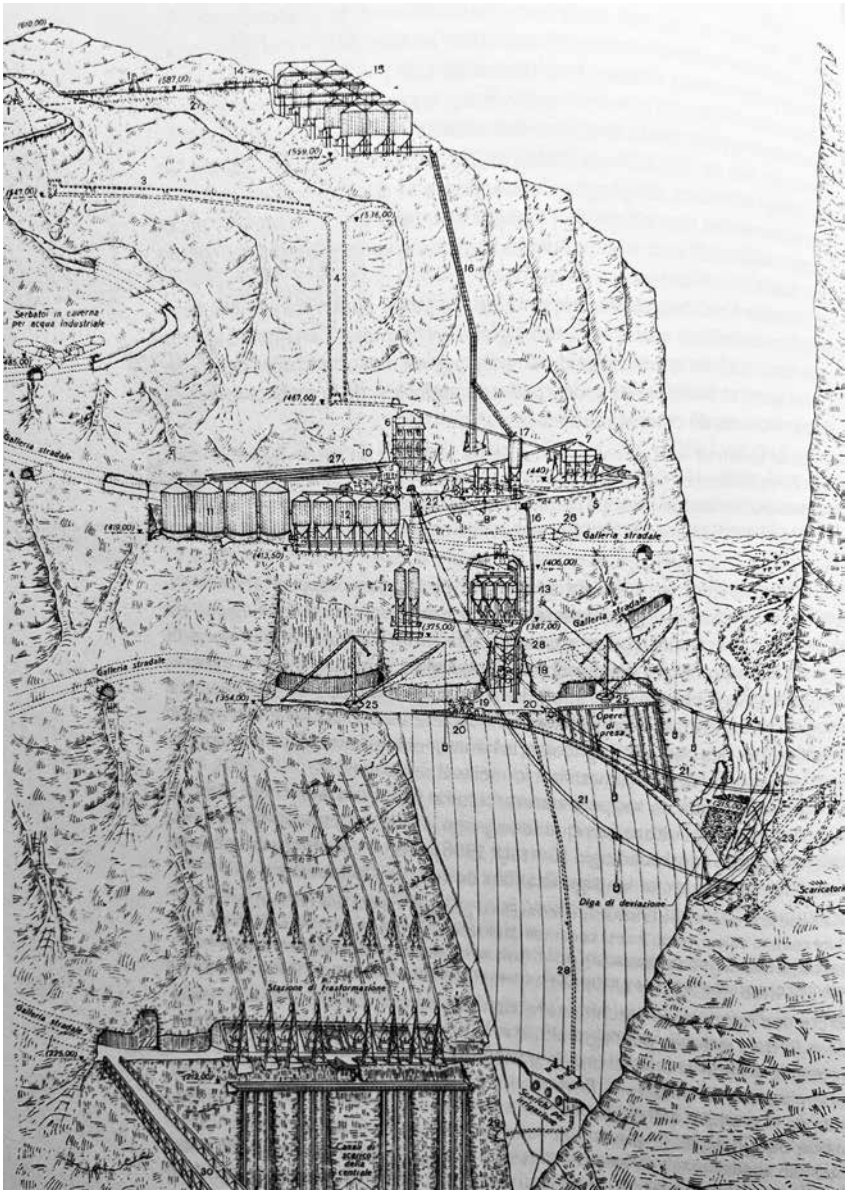

Fig. 3 - Vittorio Gregotti, illustration of the article "La forma del territorio", 1965. Source: Vittorio Gregotti (1965), *La Forma del territorio*, "Edilizia Moderna", nn. 87-88, p. 11.

ception in the early Nineteenth century, energy as a concept was directed against the mechanical worldview of moving bodies. In this respect, the concept of energy can be seen as a completely new form of materialism, which Anson Rabinbach (1990) termed "materialist idealism." It is striking that cement, for example, is discussed today within the framework of its energetic-material relationships, while historically, energy was conceived in opposition to such substance-based materiality. The idea that energy is the real material basis, that the world is materialist in a different way than previously assumed, was already prevalent among the

energeticists of the late Nineteenth century, like Aleksandr Bogdanov and Wilhelm Ostwald (1909). For them, energy relations were the only reality that mattered. Ecological economists like Nicholas Georgescu-Roegen criticize this energy reductionism: energy only ever comes in the form of a resource, it is always tied to a carrier, for example to coal, and beyond that, to an infrastructure (Georgescu-Roegen, 1971). In other words, energy thinking does not exist without material thinking. But it has taken a while to capture and formulate this idea so directly. The resistance of nature has historically been divided into energetic resistance and material resistance, and this division may continue to have an effect today.
In addition to the question of materiality, and this is my second point, I would like to emphasize the history of incorporating the energetic into the landscape.
This is particularly clear in the case of electricity, which was understood from the outset as a technology that, by being transmittable, could transform space. For Friedrich Engels, electrification entailed the possibility of overcoming the urban-rural divide.[1] Industry had initially been present in the countryside with water-powered factories before moving to the city with steam power. Electrification finally allowed it to be evenly distributed. It was about connecting industry with the landscape through these grids.
Those are my basic ideas for a more comprehensive history of energy: on the one hand, seeing energy as a certain kind of materiality and, on the other, the question of how this is manifested in the landscape.

1 - Letter from Friedrich Engels to Eduard Bernstein dated 27 February 1883 in K. Marx, F. Engels (1967), *Marx-Engels-Werke*, vol. 35 (January 1881-March 1883), Berlin, Dietz Verlag.

Kim Förster: The question of how *energy* and *landscape* can be conceptualized together is also a cultural issue. Recently, a group of scholars in the field of Energy Humanities emphasized the epistemology of thinking culturally about energy. Inspired by the American anthropologist Leslie White (1943), energy is now understood as permeating throughout all life. This also became the basis for examining the Twentieth century through the lens of *petrocultures* (Wilson, Carlson, Szeman, 2017). Energy resonates throughout all cultural forms of expression, not just literature and film, but also the built environment. The 1950s were a turning point that affected the entire material culture, right down to the scale of the building, the house, or the fireplace. The notion of energy landscapes places the architectural humanities at the center of an energy discourse that goes beyond the technologically feasible and the infrastructurally mediated (Calder, 2022; Förster, 2022).
On the other hand, also the idea of the landscape is shaped culturally. Landscape, as Lucius Burckhardt (2015) has shown, is a cultural concept with a wide variety of representations and perceptions that are increasingly being understood through an urban lens. André Corboz (1983) conceptualized *land*, or *territory*, as a palimpsest, although the historical traces of energy regimes did not receive much attention. One could say that metropolitanization in the Nineteenth century and suburbanization

in the post-war period of the Twentieth century now represent the actual core of our modern understanding of landscape.
Daniela, what you said about connecting industry with landscape is of course an important topic, conceived economically and ecologically in environmental history today (Cronon, 1991). One of the current focuses of my own research and teaching is the Hope Cement Works in the UK, which were founded in the 1920s to supply the North of England, and which in the 1940s were concerned with precisely this question of aesthetic placement within the newly established Peak District national park. An entire range of measures was taken to conceal these cement works, e.g., by Geoffrey Jellicoe, the doyen of British landscape architecture, who planned the planting of thousands of trees. And yet, this example actually shows that energy landscapes not only mediate between infrastructure networks and aesthetic regimes. From an environmental perspective, linking energy, material, and extraction issues is of central importance.

Elke Beyer: I think your reference, Kim, to the individual house is very important because it makes us think about how the home or the spaces in which we spend our day-to-day lives function in the context of larger energy landscapes. It's not just about the building envelope but also about the multi-scalar interfaces with electricity grids and heating networks that come together in a building. This is what we – along with David Bauer and our students at TU Berlin – investigated in the context of a research-oriented urban design studio on urban energy landscapes, building an understanding of historical energy transitions in the Berlin-Brandenburg region, present-day infrastructural transformation, and future scenarios.[2]

Relational landscapes and embodied energy

SR: As mentioned above, electrification is a process that bridges the gap between urban and rural areas, while at the same time having a dematerializing effect. What interests me in connection with the concept of energy landscapes is the question to what extent the local specificity of landscapes needs to be taken into account again. The current debate on the energy transition is forcing us to rethink the relationship between local resources and broader landscapes. How do you see this?

DR: I agree. Historically, electrification brings an abstract space into play to a much greater extent than steam power, for example. Electric current is not simply available in nature to be used; it requires human work to make a current flow through wires. But it also has to work with a certain landscape: with locally available fuels like peat, with waterfalls and rivers, or – from today's perspective – with local patterns of wind and solar power. Grids do not transcend this locality, but they mediate it in a certain way.

2 - Bauer, D. et al. (in print), *Power Flows and Transformation, Portraits of Berlin-Brandenburg Energy Spaces*, Berlin, Jovis.

EB: What makes the term energy landscape so productive is that it calls upon us to embrace a different understanding of landscape. Instead of seeing a supposedly self-contained, geographically defined unit, we are invited to develop a much more relational concept of landscape. The term *reciprocity* as applied by Jane Hutton (2020) to material movements is of course important here, because both infrastructure and the extraction of resources are mutually inscribed in landscapes and cities. Territoriality plays a major role if we imagine energy consumption and energy regimes as a system of relations that do not necessarily imply just one geographically defined landscape or region, but rather connect many and diverse locations with one another. This is certainly an argument for a differentiated understanding of infrastructural networks within urbanization processes. I also think that those geographical spaces that are seen as objects of transformation take on a different meaning when they are understood as part of the reciprocal transformation of different geographical spaces.
In addition, the scale of the landscape seems appropriate for developing an understanding of the damage ultimately caused by electricity consumption, something that is otherwise experienced as dematerialized or *black-boxed*. Looking at the landscape can help us visualize the extent of the changes on a scale to which our visual perception is accustomed. That is the reason why these impressive photos of open-cast mining areas appear more disturbing than a list of figures. The extent of the environmental degradation, or the extent of externalization and environmental injustice, becomes apparent through a human-eye view of the landscape, however mediated; an environmental degradation that can be found in many parts of the world and is directly linked to energy regimes and consumption in Europe and in urban centers in other countries. In this respect, it is important to include these near or distant landscapes as a field of action and to make it clear that this scale of action is inevitably present. The current practices of consuming energy have an enormous impact on planetary scale and this can be very much ignored, when it comes to our everyday comfort, daily habits and routines. This entire field should be opened up to active and creative intervention, through architecture, urban planning, and even product design, all of which tie in with the cultures of energy consumption and may trigger changes that result in effects at a landscape scale.

KF: After all, the notion of energy landscape is also about the politics of the landscape itself. The power lines, which span the entire territory go hand in hand with a fairly invisible grid. The question is how we must change our thinking when, for example, it comes to the redistribution of wind energy from the North Sea in different parts of Europe. These are issues where visibility plays a role and is also a political factor. Up until now, power generation has not taken place at home, i.e. on our doorsteps, and therefore also involves a completely different visibility policy.

The task of actively making social and environmental relations of energy infrastructure visible is therefore very important. In the Energy Humanities, this is understood as dismantling our energy unconsciousness. Architecture history took petroleum and cement for granted throughout the Twentieth century and, like the *road novel* or the *road movie* of the postwar decade, framed it heroically – and not in relation to fossil fuels and energy landscapes in general (Barber, 2022).
What Elke said concerns a politicized concept of the landscape, developed along the lines of extraction and consumption, similar to what Jane Hutton (2020) has compellingly expressed as "reciprocal landscapes." In her book, Hutton describes how – not only on a national but also on a global scale – various materials used in New York's parks over the last 200 years were supplied and used: from fertilizers to building materials, tropical timber for the High Line, steel from Pennsylvania as substructure for parklands, stones excavated and laid by prisoners. Very different aspects of an understanding of landscape come into play here, labor and degradation, as well as design and construction. These various reciprocal relationships are central to the concept of the energy landscape, both in the built and the extracted sense.

2 *Future studies on energy and society*

SR: I would now like to take a look at the various forms of knowledge about the future in the context of the unprecedented challenges posed by the energy transition. I see an area of tension between agile technological development on the one hand and the attempt to do justice to this development in our research on the other. What is the primary significance of research on energy in the humanities and more specifically in historical research today? I am concerned with the extent to which historical research on earlier energy transitions can make a significant contribution to shaping future energy landscapes. As argued by historian Dipesh Chakrabarty, the unprecedented character of the climate crisis "puts the future beyond the grasp of historical sensibility" (2009: 197).
In my opinion, we are currently experiencing a pivotal change in architectural theory, in which the category *future* is gradually taking on a dominant role, replacing that of the category *history*. It is about the future of buildings and cities, to which an incredible degree of relevance is attributed through rhetorical figures on net-zero emissions (such as "by 2050 we must have achieved this or that goal"). And of course certain new instruments, laboratories, etc., play a systematic role in the scientific anticipation of the future. In the context of these developments, the theoretical question of the *future* should be clearly posed.

DR: I agree that we can't *learn* from past energy transitions, at least not in the sense that they would offer us *tools* that we could use. To me, historical research is not about finding recipes, but about understanding the present in terms of how it developed out of the past: how did we get here?

But there is one particular respect in which I do find it interesting to study past energy transitions: the history of the Soviet electrification is important to me because it allows me to understand the present moment as a continuation of the past. The idea of a fully electrified world was already present in Soviet imaginings of modernity in the 1920s and 1930s. In this sense, it is actually very close to our own present. And from the perspective of this Soviet history of ideas, the extensive use of oil looks like a small detour, so to speak, one that was always limited and that everyone always knew would be limited. Rather than a series of transitions, we can see a single long arc of electrification. Historical research can show how old ideas are manifested in the new.

KF: We assume that electrification is necessary, that electricity is ultimately the form of energy of the future, especially in light of digitalization and its energy requirements. To achieve this, more electricity needs to be produced – with systems we don't have so far. I think that's the central question, to what extent can we actually imagine a future and what does that mean for the future of construction? To what extent building can actually be changed when we know that the construction industry invariably requires vast amounts of materials and energy. Are we looking at a building transition towards non-extractive architecture that revolves around regenerative and compostable solar materials that also bind carbon dioxide, even if only for a limited period of time? Or will this transition focus on non-demolition, reuse, maintenance and repair, as is currently being discussed? According to Vaclav Smil (2017) there are only points of overlap between the various energy systems that society has historically appropriated and that also affect the question of the future.
The promise associated with green technologies is of course also an issue that we need to consider historically. Why, despite knowing better, can we ultimately not look back on a success story? This is something I learned from the eco-projects of the IBA Berlin 1984/87, where the team under Margrit Kennedy at one point proposed that all new and retrofitted IBA projects be designed along environmentally friendly lines, which was then however rendered politically impossible (Förster, 2019). This is of course a counterfactual historical question.

EB: Looking at historical processes of change in energy regimes, it becomes very clear that they are characterized by conflicts over whose practices, concerns and alternative ideas of economic efficiency are considered legitimate – and whose are not. The historical study of which logic is packaged as inevitable, progressive, scientifically proven or simply common sense in certain situations by certain interest groups, for example, also has great potential for contributing to the denaturalization of such logics, both in retrospect and with a view to the future. It may make it possible for us to grasp "conflicting rationalities," to use a term from

Southern planning theory coined by Vanessa Watson and her colleagues (de Satgé, Watson, 2018).
Electrification is a really interesting example for understanding which actors were or are active in such conflicts, which forces they align with, and which strategies they deploy to bring about such comprehensive transformation processes. These range from the private sector to municipal and state actors and include active educational or propaganda material, so to speak, aimed at influencing potential consumers and encouraging and enabling them to use certain energy sources. Just think of the cookery books published by the manufacturers of electric cookers and other appliances since the interwar period, teaching housewives how to use such and such an electric cooker, which of course had to be manufactured, bought and plugged into a socket somewhere.
Considering potentially conflicting rationalities, one can also work strongly towards the future by trying to break open the black boxes of infrastructural arrangements, highlighting the conflicts of interest they may hide, for example in relation to energy regimes, in order to perhaps start intervening critically and in unexpected places.
Navigating across many fractures and lines of conflict appears to be unavoidable in the energy transition in general. But there are so many experiences that may remain singular and invisible – and bringing them together is the task of critical historical and contemporary urban research. So my ideal would be to be able to bring both perspectives – past and present transitions – together. Of course, it is not always possible to go into the full breadth and depth, to leap across different time periods while at the same time keeping an equally close eye on archives and current developments. But it is desirable to foster a conversation between these different fields.

SR: The built environment is already full of examples that epitomize the future. In my daily observations of technologies and the built environment, I see many developments that I believe are shaping or at least anticipating the future. Of course, our critical concepts that reflect these developments are not simply dictated by practice but should also be derived from it. So how do historical and empirical research relate to each other in this context, while also integrating a new type of future studies in architecture and urban planning?

DR: I think it has never been more important to reflect on the concepts than it is today, precisely because everything is changing so quickly. I also work from a sociological perspective on questions of ownership in a renewable energy system with all the components it entails: generation, storage, algorithms, etc. And I would say that the description of renewables as inherently decentralized and democratic that has been propagated since the 1970s is questionable to say the least. Instead, we should look at today's financial markets, including the ownership structure. There is now a very strong connection between asset managers and re-

newable energy (Brett, 2024). This is where I would say that sociological, historical, and architecture research is very much needed. I see a danger in what you have described, namely that the idea of a decarbonized future will become so dominant that people will focus solely on this goal. This risks suppressing a reflection that questions the new things that are being built here. That's how I see it with regard to the emerging energy system: we may no longer have the old energy companies, but instead other businesses that are just as opposed to democratically controlled energy production.

KF: The point you raise, Sascha, is the well-known contradiction between practice and theory that architecture is struggling with and which is currently being called into question both in the curricula and in architectural practices. I would prefer to see it as an opportunity to think more comprehensively about energy landscapes – not only to keep an eye on design or clients as the central players, but also, as Daniela described, to think democratically within the given possibilities. So what potential does the energy transition actually offer? I think this is also an urban question: Who owns this public or privatized electricity grid and who sets the prices in it? How is it measured and who still has access to it? Where are the users when it comes to ownership?

Energy landscapes of cities

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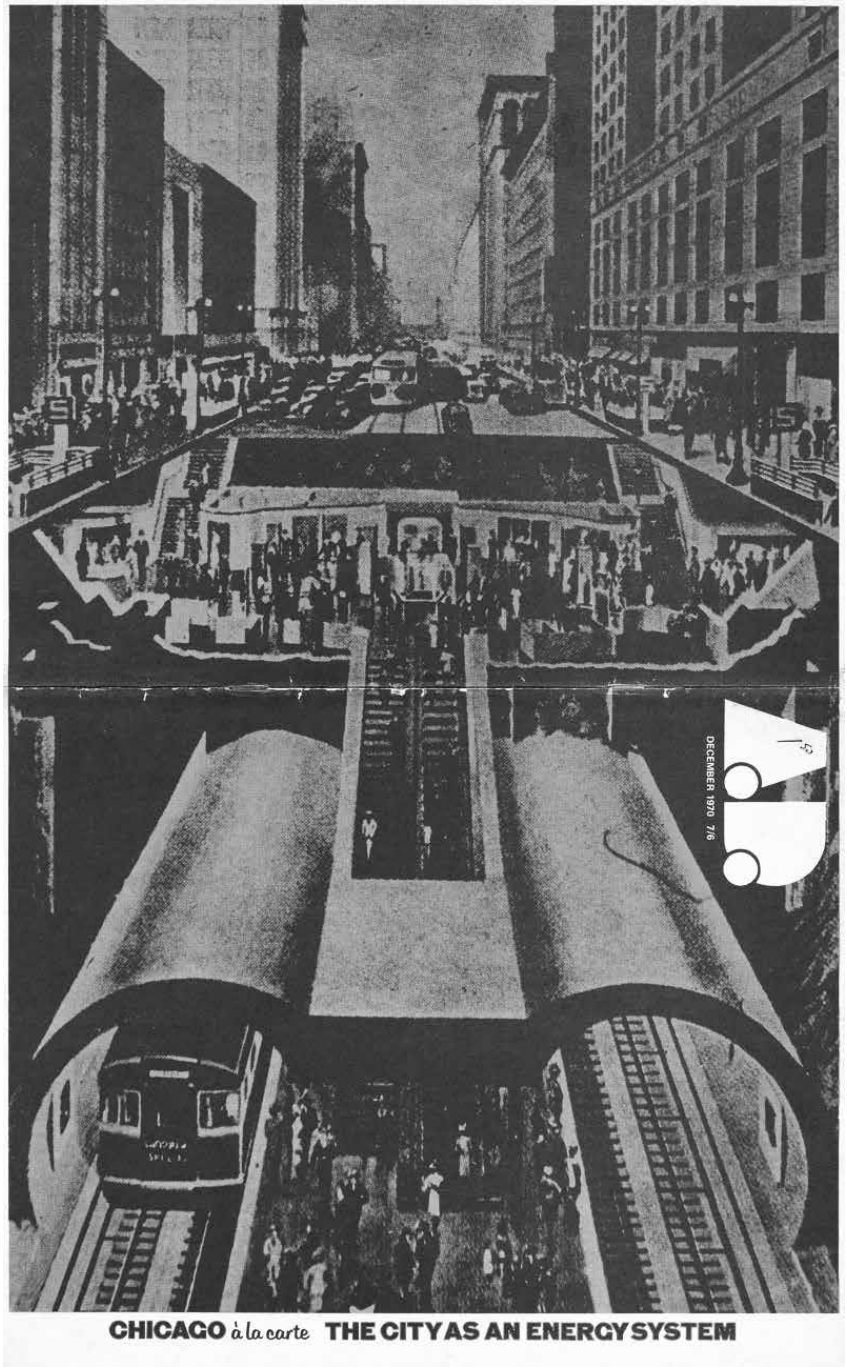
SR: As a last step, I would now like to talk about urban energy landscapes and the specific challenges of cities. As you know, around 80 per cent of the primary energy produced worldwide is consumed in cities. As dense structures, cities are the main consumers of energy. In my research, the question of how cities can be transformed into sites of production is a crucial one. They shouldn't just be energy consumers in the future, but also centers of production. Can the urban be seen as a blueprint for energy landscapes in general?

Urban renewal and repair

DR: If the city is thought of as an energy producer, it must also be thought of as a storage facility. This function is more difficult to realize. This is the systematic, not really expressed problem of the new energy grids. It is also linked to the unpredictable openness of the future; you never know how you will store it and for how long you will actually need it. I would also say that new spaces will emerge: whether that means storing hydrogen in salt caverns or something similar remains to be seen. That would be a completely different space which would then take on a very functional significance for an electricity grid. At the level of energy producers or grid stabilizers, I would say that the space will change.
EB: It's not just about creating completely new systems, but also about

Fig. 4 - AD special issue on "Chicago à la carte. The City as an Energy System", edited by Alvin Boyarsky, December 1970. © Alvin Boyarsky / AD.



maintaining, caring for and rebuilding existing systems with a critical understanding. This is where I see the great potential of the currently much-discussed concept of *repair*, or the idea of a reparative approach. In the context of the city, it makes sense to work with the concept of repair, because – rather than completely reinventing something – repair requires you to first understand how it really works, and what part you may want to improve. Enabling repair also means disclosing the sources and technologies, i.e., open source thinking, to which critical research can make a major contribution in the context of financial mechanisms or commoning models, for example. Repair relates to the question of who ultimately benefits from certain developments and who does not, and who has the opportunity to interact or make changes.

DR: It's difficult to think of converting the energy grids as type of a repair. But I still find it intriguing to think about what it could mean…

KF: There are very differently inflected terms for repair, as "The Great Repair" exhibition first shown at Akademie der Künste in Berlin in the fall of 2023 has highlighted.[3] Maintenance can also mean maintaining the existing socio-economic and political conditions.
A key question here is also to what extent it is actually possible to think and act differently in terms of energy transition in the existing building stock. In the well-known examples of the IBA Berlin 1984/87, the solar panels of Block 103 in Kreuzberg were state-of-the-art. They were owned collectively, but at the same time, they had to be operated by someone, similar to all the other eco-tech modules. The Social Democratic Berlin Senate had at the time been investing in job creation schemes, but apart from IBUS Architekten there just wasn't much solar engineering expertise yet. Moreover, at the same time, while aiming to be off-grid, they still needed a diesel generator as backup for energy bottlenecks. The example of Block 103 provides evidence for all the lines of conflict present in this careful urban renewal.

SR: The concept of repair is a processual one, which means that it is about continuous maintenance, but also conversion and further construction and so on. It is therefore also about the tension between the energy transition as goal and as process, between political goals and the day-to-day transformation of the city. Net zero emissions is the new overarching goal that is now being discussed worldwide. It's fascinating how the big cities are now proclaiming this as a goal; Munich for example wants to reach net zero emissions already by 2030. However, if we conceive the energy transition as a process, then the goal of net zero emissions can never be achieved.

DR: My impression is that it's just a carbon accounting term. It's perhaps most interesting in what it does not say: That a city would have to produce enough renewables, day and night, 24/7, in every millisecond to

3 - "The Great Repair" is a project curated by Arch+ at the Academy of the Arts, Berlin, ETH Zurich and University of Luxemburg.

achieve *gross zero*. This means that what is actually triggered is just the flow of money into some renewable asset, which then makes it net zero. I think that the *Net Zero City* is an interesting phenomenon, but I don't think that it's a theoretical term.

KF: I would also take a critical view of net zero as a political instrument. Even if reducing carbon emissions – sooner rather than later – is part of this vision, and achieving climate justice is the objective, the supposed ability to plan is calming rather than disturbing. At an architectural scale, however, existing concepts fall short of net zero or do not provide for it at all. And from a planetary perspective, we would need negative emissions: absorbing, sequestering or storing carbon on a huge scale, which seems impossible within the limited window of opportunity that remains.
To some extent, this echoes the criticism of the various certification systems that already exist today. Along with students, we carried out research on the 1980s energy projects in Milton Keynes as one of the places of origin of the British BREEAM certification scheme, comparable to the American LEED scheme, the Swiss Minergie and the German Passivhaus. The fact that the first energy certification scheme was introduced in the UK under the Thatcher government is actually indicative of the very mechanisms we are discussing here. The energy projects incorporated by the urban development corporation of Milton Keynes shows that the promise of solar savings on energy bills at the end of the year cannot be the promise of this homeowner subsidy. So the single-family home appears to be the critical flaw here. There have been attempts to build whole subdivisions heated by passive solar, but these have proved to be politically unfeasible.
In retrospect, this historical example shows that a wide range of different urban development policies were sought, including cooperative schemes, that were also related to land and ownership, while ultimately, the promise of energy use at block or settlement level was not fulfilled.
Net zero should offer completely different approaches today, beyond a construction program: tackling building and living in the here and now and promoting existing neighborhood facilities and infrastructures.

EB: I always try to convey to my students that it's great to look at the energy balance of a building when it's in operation. But it's better to also look at the energy balance in terms of the production of the materials and the energy that went into it, and what is ultimately sacrificed during demolition. Similarly, it is not enough to look at the energy balance of a city as a closed operation unit in a given short time span, because the question remains as to how these renewable energies are generated in the first place, what raw materials are needed to produce the technological systems, how they are operated, maintained and replaced, and what kind of interdependencies this creates. The concept of urban energy

landscapes, in a truly relational sense, also has the potential to generate a more comprehensive picture that is not yet reflected in the isolated energy and resource balances of buildings and cities.
When we talk about urban energy landscapes, it means that we are not only focusing on dense settlement areas, but also incorporating a different concept of urbanization that includes the hinterland when we talk about the urban. In other words, the term highlights that we no longer really have an alternative to the urban, only different forms and different intensities of use of territories.

District heating

DR: During my research, I realized that the Soviets had their own understanding of heat economy and heat in the city. You could call this technology district heating, and it was just as important as electrification. “Toplifikaciia” (figure 5) is one of the most interesting urban energy phenomena of the Soviet Union. The system was urban by necessity and did not supply the hinterland, because the heat could not be transported over a large area. This was possible because there were no property boundaries; everything belonged to the city or the state, which had eminent domain.

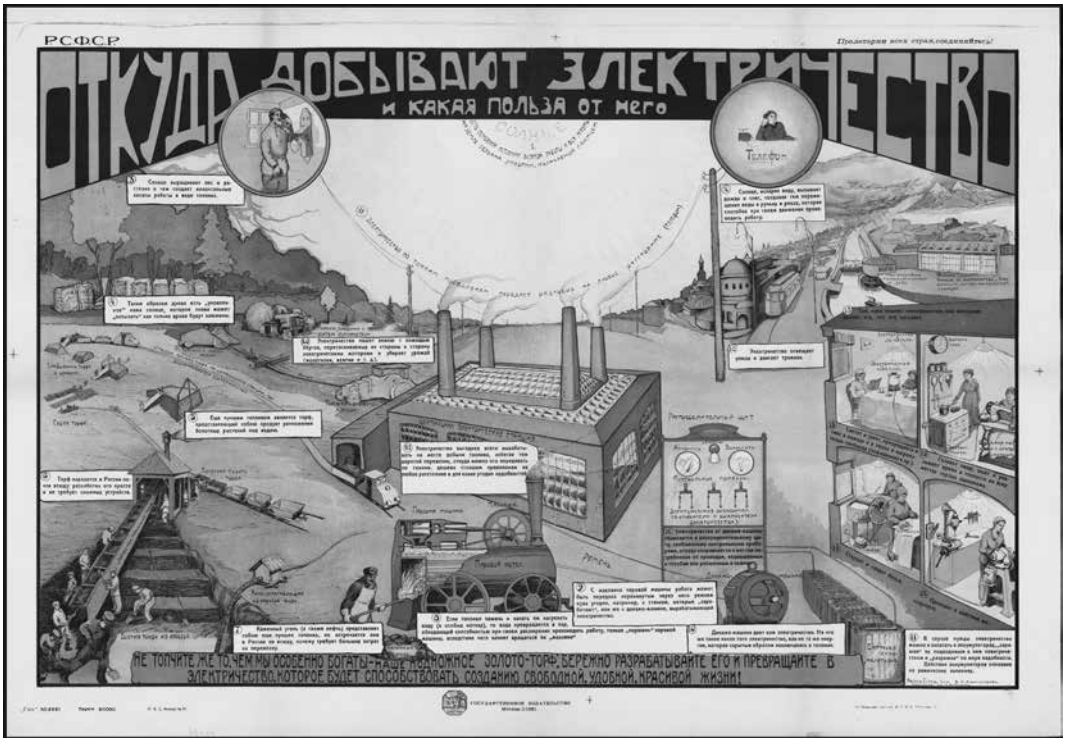


Fig. 5 - “Otkud dobyvaet elektrichestvo i kakaia pol’za ot nego [Where does electricity come from and what does it do for us?]”, Propaganda poster in favour of the electrification by artist I.M. Sakharova, Moscow 1921. © National Digital Library (NEB), Russia.

EB: However, modulation or rather the impossibility of modulation was often a central problem with these Soviet systems. The overall system worked on the basis that all heating devices in the apartments were always radiating at full capacity in order to consume the energy of burning coal in the heating plants, otherwise the system would overheat somewhere – thus establishing excessive energy consumption by design. Beyond the local infrastructure, I would also make the connection to the hinterland again by including the resources that were burned to heat the water that circulated in the heating systems.

DR: In the Soviet school of energy economics, which I am currently researching in more detail, there was an attempt to think very locally. Of course, not every town is situated near a coal deposit, but the scientists at the time started with charting locally available resources. That's how they came to use peat, for example. And this is where I see a certain difference to the idea of simply extracting resources at random sites. It was at least entertained as a theoretical idea, although it wasn't always politically feasible, and at some point, of course, the nearby energy resources ran out. Some engineers tried to work against the idea of a global energy hinterland, even if they didn't succeed or the systems weren't particularly efficient.

SR: District heating networks were an export hit for the Soviet Union. Soviet experts brought the technology to China and Eastern European countries. As far as I know, Warsaw has the second largest district heating system after Moscow; it is still the backbone of the city's energy network. We went to Warsaw with our students and analyzed the different facets of the energy landscape, including energy poverty and the idea of democratic access to energy. In this context, the ambivalence that technical solutions for the energy transition can harbor became clear to me. In Zurich, district heating is being promoted as part of the green energy transition; a district heating system is currently being built to which my own neighborhood is also connected. In Warsaw, on the other hand, district heating is part of the problem that needs to be solved in the coming decades. The Warsaw district heating system, which runs on coal and natural gas, is a highly inefficient system that has been privatized. It is quite clear that it will simply become obsolete at some point.
So I think we also need to analyze the immense ambivalence of these technical solutions. What does it mean to drive the energy transition in an existing city with existing infrastructure, like Warsaw, where a district heating system is already in place? And does the energy transition mean optimizing this system, like the huge underground and above-ground pipelines, or is a completely new system being designed for future Warsaw? I think that the question of how we can work with existing urban structures as a resource is an open one.

KF: One aspect of district heating is the energy base, as it is currently fueled by fossil fuels, and a switch to renewables. In Switzerland, waste heat from waste incineration plants is the preferred alternative. Co-processing also provides the fuel for kiln combustion in the cement industry, where it has been communicated and promoted as a supposedly environmentally friendly solution since the 1980s. The justification for this is based on the assumption that the waste is produced anyway and could generate a level of energy intensity comparable to fossil fuels. Of course, this does not eliminate the emissions, and in addition, highly toxic waste materials are co-processed. This will hopefully be different in an urban context, but again fuel substitution is approached as a technological fix for filter systems, while the question is, what kind of future imaginary is reproduced if we initially avoid waste, but then view it as a fuel and economize on it.

New energy communities

SR: There is a new development emerging today, known as "microgrids." Homeowners can create new types of electricity generation grids, thanks of course to the use of internet technologies, and in principle create something like their own community, beyond the opposition between private and public. They are technology-driven and offer possibilities that didn't exist in the 1970s and the 1980s. Interesting new forms of ownership are emerging, e.g., energy commons that are accessible to larger groups, but not to everyone. This would be another topic to discuss in connection with the urban energy transition.

Fig. 6 - Patrick Schnell, a participant in the Brooklyn Microgrid, with solar panels on his roof in Gowanus, New York 2017. © Kevin Hagen for "The New York Times".

DR: That's exactly the question I'm currently facing: what collectivization could mean – not just legally as ownership, but also as the democratization of the energy transition. After all, this example from Warsaw shows what a difference it makes whether or not people get to decide on a system. I would say that the establishment of energy systems was never a democratic process but was fundamentally always planned at a national or corporate level. This concerns the centralization of energy, as was the case in the Soviet Union, where a system was planned for everyone from the top down. What democratization might look like in practice is an open question for me.
At the moment, I think there are far too many demands for democratization, self-sufficiency and independence, which the new renewable technologies cannot fulfill. In this context, it is interesting to ask ourselves how to think about collectivization. I would suggest that we need to look beyond these small-scale solutions that pretend to be self-sufficient with a power plant on the balcony. It is easy to forget that nobody really disconnects from the grid – everybody needs backup plants and spare capacity. And even in the case of these small community projects, the microgrids, I would be surprised if they were self-sufficient every second of the year. In addition, looking beyond electricity production, small communities cannot fully take on the manufacture and repair of these devices themselves.

EB: I would largely agree with you there. But I still think it's important to take a closer look at grassroots approaches to see what potential is ultimately available. After all, the big operators are the ones who are going to install solar power on their sites: they are major players on the financial market and investors who are also involved. Ultimately, the question of how individuals or communities can be empowered to make decisions about their own energy consumption habits, mediated in some way by the systems, remains very important. How can this be implemented? Via geothermal probes installed in individual houses or via wind farms collectively owned by a village?

DR: Yes, but at least in Germany, I doubt that these projects make up a large share of renewable development.

EB: I share your skepticism, but we shouldn't give up on this vision for the future. Otherwise, what you're saying is: "Ok, we're basically leaving it to the same players who previously ran the energy industry on a large scale," and all you can do is shrug your shoulders in regret.

DR: My point is that we need to think about collectivization at a higher level, at the level of the energy system, and not just at the level of single wind farms operated by villages. Because somebody regulates the grid, somebody has to build the storage capacity, somebody owns the

algorithms on which everyone depends. And you can't be satisfied with wind farms if you really want to achieve democratization; you have to tackle the systemic issue, which is bigger. That would be a different kind of energy community. With these decentralized solutions, you give up a certain amount of control over the big power issues. And what might a larger collectivization look like that takes the systemic level into account?

KF: However, I am not quite sure where this would take place in real life, across Europe, at an urban and territorial scale. The case of the German "Energiewende" towards renewables, promoted by Herman Scheer (2022), has been discussed as energy democracy. Both Dominic Boyer and Ashely Dawson (2016) have recently revisited bottom-up energy initiatives. Where would you locate this kind of collectivization? Who would be in charge?

DR: Good question. Well, I can only tell you where to look. It is often not a piece of the grid located in the city that you can buy back. I don't think that would be possible in any way other than through political regulation. In any case, if there is a digital grid in the future, it would be important for the conditions, i.e., how the algorithms are used, how the scarce renewable energy is distributed, to also be decided democratically. I would say that there are basically no real political forms for this so far, except in national politics. And even that is of course too small in a certain sense, because almost no single European country will ever be energetically self-sufficient. I think that more research needs to be done in this direction.

SR: Nice closing words. Thank you all for these meta-reflections on the concept of the energy landscape!

Bios

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