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## Back to Intermittence, or Rediscovering Web-Materiality: An Artistic Quest for a Sustainable Internet Aesthetics

Diego Mantoan

### Abstract

Through the digital and public artwork, *Solar Protocol* (2020-ongoing), artists and engineers Tega Brain, Alex Nathanson, and Benedetta Piantella kickstarted a solar-powered server network that hosts a web page demonstrating how intermittent energy levels affect its very aesthetics and usability. This small-scale participatory experiment stimulates a wider reflection on the interconnection between economic, environmental, behavioral, and aesthetic features that shape the way the internet is produced and consumed in today's society. Far from being a mere matter of greening the internet's power supply, rather the artwork turns a spotlight on the implicit attitudes of web producers and consumers as developed by the attention economy. Despite a growing consciousness in the information technology (IT) community of the web's current nonsustainability, the role of the problem's aesthetic roots and behavioral consequences so far have been only faintly acknowledged. Leaning on the technological and cultural commentary offered by *Solar Protocol*, particularly its "natural" and participatory logic in the programming and powering of a digital infrastructure, the paper stresses

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the internet's resource problems on the supply side and perceptual problems on the demand side that combined give the distorted impression of an ever-growing, always available, instantaneously responding, and utterly immaterial web. Framing the ongoing debate on sustainability practices in the progressive digital community, and the behavioral challenges connected to the perception and use of the internet, and also the art-historical precedents to *Solar Protocol*, the paper argues that the artists' experimental work will have lasting influence on the way art activists seek creative solutions providing concrete answers to environmental sustainability, though firmly grounded in artistic grammar.

### Key Words

behavioral change; digital art; environmental sustainability; intermittence; internet aesthetics; public art; solar power; web design

### 1. This internet hardly "looks" sustainable

When starting in early 2020, their solar-powered server network that hosts a web page demonstrating how intermittent energy levels affect its very aesthetics and usability, artists and engineers Tega Brain, Alex Nathanson, and Benedetta Piantella perhaps did not expect to kickstart one of the most engaging and inspiring digital and public artworks of recent years in the activist community. It may not have been recognized yet by the wider art system as such, but this paper argues that their experimental work will have lasting influence on the way activists seek technical and creative solutions providing concrete answers firmly grounded in artistic grammar to environmental problems. No artwork, be it digital or analog, private or public, can save the world from burning, but a particularly good one may turn the spotlight on the behavioral and aesthetic implications that make today's internet utterly unsustainable, at the same time creating a project that feels necessary and resonates within the trajectory of art history. In order to sustain such a thesis, I herein frame the technological and intellectual field in which the project *Solar Protocol* (2020-ongoing) operates, and also pondering the interconnection between the economic, environmental, behavioral, and aesthetic features that shape the way the internet is produced and consumed in today's society.

First, however, a grossly exaggerated view on the sustainability of the internet must be addressed. Indeed,

pretending, as we do, that the World Wide Web, as is, can help in preventing global warming by keeping everyone connected at home and thus avoiding the impact of transportation is but a misleading utopia perhaps nurtured by our wishful thinking during the recent pandemic lockdowns. To the contrary, as I will show, accurate studies reveal—despite the difficulties in calculating the exact estimates—that the ecological impact of the server networks necessary to keep the internet constantly working at its highest possible performance rate, will in a matter of years exceed the pollution level of the aviation industry.[1] The problem may seem a mere matter of the way we power the internet, though in reality finding green energy sources will not be sufficient if at the same time we do not shift our attitude towards web supply and demand.[2]

In keeping with recent scholarly research in the field of environmental engineering and internet studies, this paper argues that a profound rethinking of the modes of production and use we make of the internet is urgently needed, connecting behavioral studies with design science.[3] Insofar, an artwork may serve the purpose of pinpointing the technical and cultural problems behind today's web, thus offering inspirational solutions that can help shift attitudes towards a more sustainable internet. [4] Indeed, advocates of eco-effective approaches claim that the sustainability problem of the internet implies the development of different business models, infrastructures, and, first and foremost, a different web aesthetics to the one that providers of online services, social networks, and entertainment have pushed users towards.[5] As I will argue, it is precisely the way in which *Solar Protocol* neatly knits together technological, social, political, and aesthetic aspects that fosters public reconnaissance of the pervasiveness with which the capitalist take on the modes of web production and consumption determine our view of the internet and consequently our behavior with and towards it, completely unaware of the great sustainability challenges implied.

There is, of course, a growing consciousness in the scholarly field and in the IT community, and also in the domain of art activism, towards tackling the mentioned problem, though the role of its aesthetic roots and behavioral consequences are but faintly acknowledged. [6] Hence, this paper offers an analysis that departs from the supposed ineluctability of a web structured around and embedded in capitalist society that is regulated by supply and demand, though resting on uneven

information distribution. Leaning on the reflections and solutions provided by *Solar Protocol*, particularly its “natural” logic in the programming and powering of a digital infrastructure, I will stress the resource problems on the supply side and the perceptual problems on the demand side that when combined give the distorted impression of an ever-growing, always available, instantaneously responding, and utterly immaterial internet.[7] Along the path of this analysis, a strain of different aspects will be focused on, starting with the emerging sustainability challenges caused by the peculiar trajectory the internet has taken over the last two decades. The attention will then be drawn towards several artistic precedents in thematizing web materiality and user behavior, such as presenting the context, novelty, and complexity of *Solar Protocol* from an art-historical point of view. Finally, the structural and behavioral shift towards a kind of natural web logic will be explored, in order to stress the necessity of a different aesthetic paradigm. Perhaps the only question this collaborative and participatory artwork leaves open is the unfortunate perpetuation of extractivism as a necessary side effect of digital evolution, given that solar batteries require rare metals. Nevertheless, I argue the collaborative work by Brain, Nathanson, and Piantella provides a clear and poetic proof of the lost sense of materiality of the web, in addition to a much-needed visionary response to the modes of production, use, and looks that can shape a truly sustainable internet.

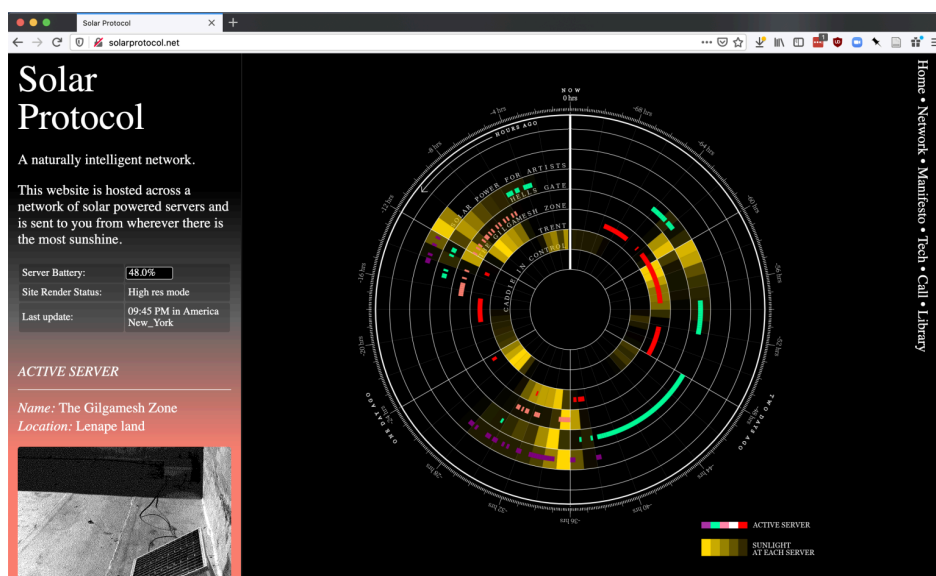


Fig.1: A screenshot of the Solar Protocol website (Picture and courtesy of the artists T.Brain and B.Piantella).

## 2. (Re)introducing the Internet and its sustainability challenges

In the early days of the internet, there were such things as queues and downs that constituted ordinary problems in the standard web experience, which materially and perceptually bound this incumbent technology—both its providers and users—to its still-limited capabilities. Precisely because of these limitations, in the 1990s an informal code of conduct, termed 'netiquette,' was common among internet surfers that implied a self-restrained behavior to avoid wasting bandwidth by retrieving redundant information from distant sources or causing capacity overload through spamming.[8] Unlike previous media that led to the communication revolution in the twentieth century, at its inception the material infrastructure and interactive nature of the internet implied the mutual collaboration between providers and users to smooth frictions that might hinder its speed and operability.[9] To get the best out of the web, for instance, choosing the right time of the day for internet access or using the connection over the weekend could sensibly improve the service, curbing the slowness and intermittence of peak hours.[10] National differences also mattered for the implications of digital media, but working capacity and business models in the new millennium took a global stance, at least in the Western hemisphere, turning the web into a powerful and continuous exoskeleton that superintends the ordinary ways in which individuals and society at large engage with information and relationships, political messages, and online consumption.[11] The web's cornucopian development caused it to soon lose sight of the interdependency between supplier and consumer regarding energy consumption, since information on the environmental costs of the internet are hardly shared between providers and users, such that the former constantly widen energy-devouring solutions, while the latter are encouraged to make even bigger use of energy-consuming services.[12]

The negative environmental impacts from the physical existence and use of the internet, plus the manufacturing processes involved, are thus because of the specific kind of development that the web has taken over the last two decades, particularly its business model that is comparable to the spread of petrol-powered cars in the previous century.[13] However, while the impact of digital economy is well documented in scholarly papers since the early 2000s, the critical issues of information acquisition and attitude formation so far did not find adequate space either in research or the public space.[14] As a dominant form of social organization, business enterprises led the

way in internet development by seizing first and foremost economic goals, only later, slowly and often insufficiently, enabling new practices of environmental sustainability by exploiting their role in the processes of belief formation, action steering, and outcome assessment.[15] It looks like there is a long way to go until businesses will standardize, monitor, and therefore increase accountability of energy consumption to allow the transformation of existing value chains and infrastructures, and enable changes in user attitudes towards the web and its integration in their daily practices.[16]

The shift that is needed appears to be cultural, that is, a change in mindset of business models and user behavior, to be achieved by transiting from a view set on eco-efficiency, such as those seizing mitigation or reduction of energy consumption, towards one defined by eco-effectiveness—which means redesigning and reprogramming infrastructures to avoid the use of energy.[17] On the part of enterprises, transformation will probably be led by acknowledging how the expansion of data centers and a web development exploiting the attention economy increase greenhouse gas emissions, though the intervention of political regulators is urgently needed to steer this process.[18] On the part of consumers, information flow on their personal energy-consuming behavior and the harm it causes could increase behavioral changes that have an impact on energy consumption, although they do not necessarily affect deeply rooted ideological stances on climate change and the environmental crisis.[19] In fact, culture is shaped by the internet mainly at the micro-level, usually by providing more mediated engagement with others and with information of everyday routines in personal life, and often feeding new digital divides, especially when reliable information, cultural diversity, and social isolation are at stake, rather than fostering systemic changes in society.[20]

Providing information alone is but a part of the solution, which means that artistic interventions in the field of internet sustainability would be quite ineffective if brandished as mere instruments to disseminate scientific outcomes.[21] Not by chance, over the last two decades a growing number of artists directed their interventions at society to foster the debate on the conditions for sustainable development also in web-related issues.[22] Particularly by recurring to practices of public and participatory art, they have attempted to involve new audiences in direct experiences that widen the scope of

sustainability to overcome attitudes grounded in patriarchy, colonialism, capitalism, and extractivism.[23] Comparably, the necessary shift in behavior with regard to internet sustainability must be culturally addressed by means of interventions, be they artistic or not, that help suppliers and users not just to visualize the related behavioral and design problems but, even more, to make them aesthetically perceptible and thus a source of direct experience.

In this sense, internet artists of the 1990s already delivered a broad critique of computationally administered lives and minds through conceptually sophisticated and socially conscious practices.[24] In the new millennium, the field of digital art further recognized that the shift from analog to digital media implied not just a change in technological aspects but, first and foremost, the development of practices embedded in digital infrastructures that, as such, had aesthetic and material consequences.[25] Indeed, the steady rise of financially accessible, digital technologies entangled the roles of producers and consumers, particularly regarding image making and information circulation, and implied the evolution of a perceptual attitude of materiality and affect that still holds together the agency of humans, technology, software, and objects.[26] Far from being immaterial, the digital art field drove towards a kind of "neomateriality," highlighting its objecthood as one that incorporates networked digital technologies and embeds data of humans and the environment, thus revealing how this coded materiality makes us perceive our world.[27]

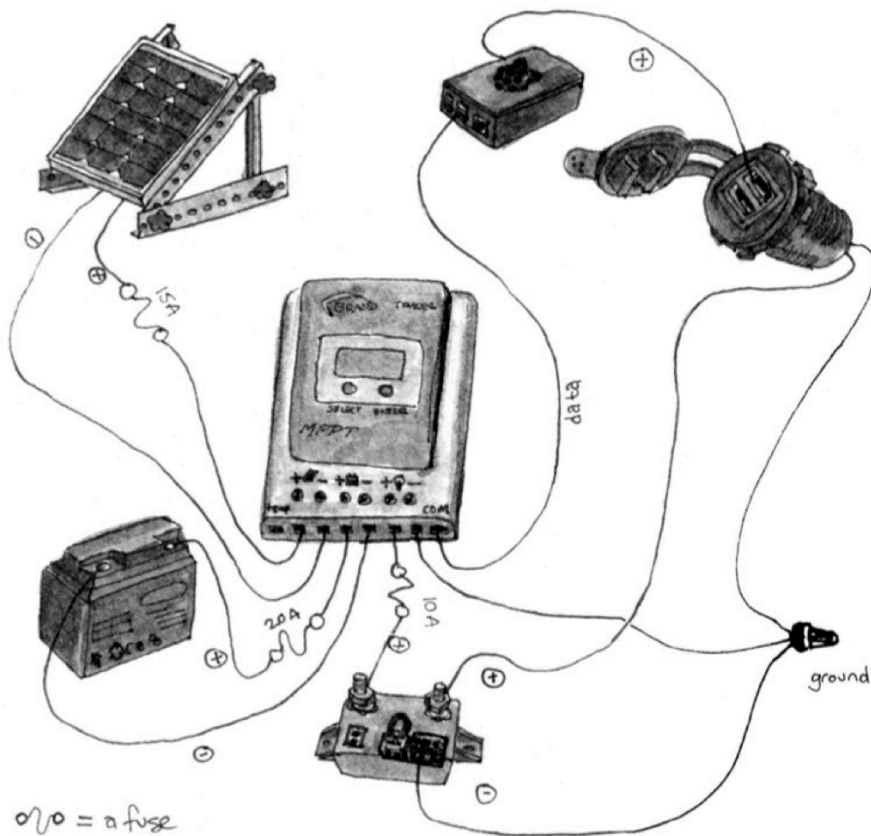


Fig.2: Image of a steward server setup from the instruction zine Solar Protocol, drawing by Anne Pasek (Picture and courtesy of the artists T.Brain and B.Piantella).

### 3. Addressing web-materiality and an earnest artistic proposal

Over the last two decades, artists did not stand still regarding the unravelling of the climate crisis and its sustainability challenges.[28] To the contrary, a growing number of interventions, collectives, and exhibitions addressed numerous issues both in local communities and global society, but voluntarily stayed on the fringe of the dominant culture and programmatically outside of the elite art market.[29] Analyzing engaged art practices has been on the rise even in scholarly writing, superseding a merely descriptive approach and interrogating practitioners to find how they could assist societal progress toward a sustainable future.[30] In this regard, the internet gained attention in the field of art activism, particularly as a means that could be envisioned as either problematic or supportive in the quest for sustainable development goals. In the 2010s, the Green Art Lab Alliance, one of the earliest worldwide consortia of progressive art collectives, started the systematic spread of online instruments such as [ressource0.com](http://ressource0.com) and the Creative Green Tools to measure organizational carbon footprints, thus mobilizing artists and sensitizing cultural operators on social and environmental issues.[31]



Although the alliance is aware of the impact information technology on CO<sup>2</sup> emissions, it still falls short of solutions that go beyond a bland mitigation strategy based on curbing current user behavior.[32]

To investigate the connection between art and networking systems in light of their sustainable production and use, it looks convenient to tackle the problem from the perspective of society's progressive loss of relationship with the materiality of the digital domain. What emerges after three decades of the internet is that its immaterial state announced as the definitive dematerialization of physical bodies rather looks as if solid matter had been liquified, hiding itself from sight like gases do, but nevertheless having an impact on the environment.[33] This aspect was recognized even before the birth of the World Wide Web, as the issue of a supposed technological immateriality existed in telecommunications since the field's very inception. French philosopher Jean-François Lyotard made this point in a historic exhibition, titled *Les Immatériaux*, at the Centre George Pompidou, Paris, in 1985, and insisted on how telecommunication artworks had called the traditional methods of representation into question, showing how artists were trying to make location in an online environment perceivable and attempting to again make physical the exchange of data. [34]

Since then, net art, digital art or post-internet art have often addressed the material space and transitory nature of the internet, such as with the Austrian group x-space, which devised *Ping – Die Metrik der Zeit* (1994), a telematic, spatial sound installation that emphasized the technical protocols underpinning the technology, thus revealing the spatial and material constraints of the nascent network.[35] Pieces such as Kari Altmann's *Hhellblauu* (2008-12) or her collaborative website *R-U-In?S* (2014) sought to reveal the insidiousness of the invisibility of technology and the effect it has on society through a banal presentation involving the users' active participation.[36] In recent years, the hacktivist duo of Russian/Belorussian artists *eeefff* set out to collectively feel and embody the disproportionality of the digital infrastructure, both from a social and economic perspective. By hacking institutional websites or organizing picnics in front of huge data centers, the duo lets the materiality of supposed purely digital dimensions emerge, shedding light onto the invisible infrastructure and labor that supports the glossy interfaces of modern web designs.[37]

Another radical act and, at the same time, one that seizes the internet's economic and structural form, has been the insistence of poet and artist Kenneth Goldsmith on the ways to resist capitalist web dominance by means of interventions spanning between the ready-made and noncompositional practices.[38] Three projects stand out in challenging problems of internet materiality and mediated power relations, making them aesthetically perceptible and publicly sharable by simply copying, transferring, or printing digital resources.[39] The first is the open repository, *UbuWeb*, developed since the late 1990s, which illegally stores hundreds of art-related films, videos, and materials, making them broadly available.[40] The second is the collaborative work, *Printing out the Internet* (2013), in which, with the help of web surfers, Goldsmith set out to print everything that had ever been published on the web to address its overwhelming size.[41] A combination of the first two projects is *Papers from Philosophical Transactions of the Royal Society* (2014), a direct attack made on the web-based scholarly repository jstor.org, which stores millions of academic papers at proprietary level, from which Goldsmith attempted to print out as much as he could, thus symbolically making knowledge public again.[42] Although he is now recognized in the elite art system as a poet laureate and conceptual artist, his clever artistic research and fringe activism shows how an individual act of spectacular defiance becomes a strong gesture of resilience for likeminded web users.

Superseding previous attempts at web mitigation and resilience, the artwork, *Solar Protocol*, explores the potential of inspiring behavioral change through artistic means regarding sustainable web design and internet power supply, thus aiming at a paradigm shift that is both aesthetic and structural through the adoption of a natural logic and of broad social cooperation. The project developed by Brain, Nathanson, and Piantella consists in a protocol—that is, a set of instructions, to speak with the grammar of conceptual art—that originated a network of steward servers across the globe, each consisting of a 50W solar power panel with a 32GB server box that together power a demonstrative website with a responsive design programmed to reflect the intermittent energy level provided by natural systems.[43] Without attempting to antagonize or spectacularize the current state of internet affairs, their work plainly stigmatizes the necessity to rethink global server networks in a democratic and sustainable way. Their project is based on the collective will to create an interconnected community

that accepts a different logic and consequent behavior, which is conceptually and technologically accomplished by means of a return to natural systems, as with the sun that shines during the day and vanishes at night. The artists further wrote a zine that delivers exact instructions on how to build one's own low-cost steward server and get connected to their solar-powered network, thus spreading the technological and ideological dimension of the artwork.[44] They make a point in demonstrating that society cannot rely on web solutions based on clean energy sources, but rather that it must embrace a different attitude based on the re-acceptance of intermittence and mutual empowerment.

The network is charged by solar panels leaning on a worldwide network of steward servers in multiple time zones to avoid blackouts, but the overall battery level may vary depending on weather conditions; this is reflected in the aesthetics of the mediatic transmission. [45] On the exemplary website, users can view the active server, related energy data, the steward from which it is managed, and climatic and meteorological conditions of the place where it is located. What is more, it dynamically responds to the charge level, at times obliterating the images, at other times transforming the color grade down to black and white, eventually going offline. It is a plastic demonstration that the web is material, resource dependent, and thus cannot be calibrated on the maximum consumption or peak-performance status that the attention economy requests, which so far have shaped internet development and perception. By stressing the materiality of any digital network, *Solar Protocol* tries to change the vision-metaphor on which the user's spatio-temporal understanding of the internet as a disembodied entity is based upon.[46] Furthermore, by frustrating the internet's supposedly impeccable speed and aesthetics, both intended as constructed social dimensions of efficiency, the demonstrative website stresses how current business models and design solutions offer an artificial idea of a frictionless and infinitely scalable internet.[47] Far from being disembodied, the building of the *Solar Protocol* network also highlighted how the internet is bound to situational challenges stemming from the web's materiality and geographical location, such as national borders, country-based IP address, data localization, access controls, and business models.[48] Eventually Brain, Nathanson, and Piantella experiment with a kind of internet logic and design practices that demonstrate the web's very dependency on the

materiality of bodies and artifacts set in a finite environment.[49] Since April 2023, the website hosts an exhibition reuniting artists and writers that explore the themes and questions central to the *Solar Protocol*, having gained the 2022 *Mozilla Creative Media Award*, thus expanding the scope of the project.[50]



Fig.3: Installation view of a steward server of Solar Protocol (Picture and courtesy of the artists T.Brain and B.Piantella).

#### **4. Energy as a physical and behavioral matter of web aesthetics**

Clearly, *Solar Protocol* does not offer a neat solution to the problem of the growing energy impacts of the internet, particularly the ones related to its actual infrastructure design and the kind of user behavior it fosters. Nor does it tackle the growing ecological problem concerned with the search for rare metals needed to power batteries, even solar ones, thus perpetuating humankind's extractivist attitude towards nature.

However, it is intended as a necessary aesthetic provocation to explore convincing ways of reducing infrastructural and design implications by changing web attitudes. At a technical level, this solar-powered server network can thus be seen as a valuable societal picklock for hands-on prototyping, design experimentation, and digital literacy. It is particularly directed towards the sensibility of scholars and activists who question the societal and technological status quo that is profoundly influenced by privately owned cloud companies, who encourage computing to be imagined as immaterial and infinitely scalable—referred to as ‘cornucopian paradigm’— forcing us to expect services that are instantaneous, continuously available, personal, ubiquitous, and thus unsustainable.[51]

Indeed, Brain, Nathanson, and Piantella insert themselves in an ongoing debate in the digital community, which is experimenting with natural logics and alternative methods relating to the energy impacts of online experiences and the digital infrastructures that support them, since increases in efficiency of data centers and cloud services lag behind the increased consumption rates of the attention-driven web economy. [52] The actual state should not be blamed onto user behavior alone, because recent web development has been optimizing services only for business and growth objectives, gluing consumers to the screen to achieve more interactions, attention, and transactions.[53] The situation is made worse by the fact that it is difficult to calculate the environmental impact of energy-intensive internet services and that, furthermore, the financial costs and energy consumption rates are largely invisible to the users.[54] The material effects of infrastructural use are even alien to the awareness of many designers and providers, since the underlying assumption is that of an abundant and relatively cheap internet that will constantly expand to meet future societal demand and extend the worldwide reach of data-intensive services. [55]

The project designed by Brain, Nathanson, and Piantella is thus an attempt to show how the cornucopian paradigm can be inverted by keeping together the issue of web materiality with its aesthetic dimension. The solar-powered server network they constructed goes in the direction of reconnecting the digital to the physical, from minerals and energy to the physical infrastructure that powers the internet, offering both an infrastructure solution and a design process that reflects urgent ecological needs.[56] In fact, the supported website does

exactly what today's internet business models do not, that is, it offers a tangible and transparent experience of the digital world and of its environmental implications. [57] In doing so, the artists follow high on the heels of several micro-scale examples in the progressive digital community, which experiment with contemporary designs based around low-power web or unavailability.[58] *Solar Protocol* thus offers an attempt to design with intermittence, imagining how this new attitude can shift expectations and re-choreograph rhythms of work, rest, and play to better match scarce energy conditions.[59] In the instruction zine for sharing the protocol, the artists clearly advocate the extension of this project far beyond its technological content:

Finally, energy is also aesthetic. It's a question of sensation: how far, how frequently, and how subtly, we communicate. And these questions are not disconnected from ecologies and politics. A transition in how we power our daily lives also implies that our lives will look and feel differently—at first, the shock of the new and then, with luck and dedicated organizing, shifting norms, pleasures, and expectations. Feeling towards different energy futures might be a way of engaging them more quickly. [60]

However, were *Solar Protocol* merely a technological proposal, it would lack the ability of vision and depth of imagination that function as the true creative stimuli of an artwork, in that it is meant as a cultural commentary activating local constituencies and fostering behavioral change. When Joseph Beuys started planting trees in Kassel, Germany, during the 1982 documenta exhibition, the situation with regard to society's environmentalist sensibility was comparable, since the participatory project of the German artist drew from the 1970s growing debate in the Western world about the need to change course to industrialization. The uniqueness of Beuys' artistic proposal, *7000 Eichen* (1982–1987), which re-forested the German town thanks to the collaboration of citizens, was characterized both by its conceptual and aesthetic dimension, being at once public, poetic, exemplary, and paradigmatic.[61] Similarly, the project by Brain, Nathanson, and Piantella is small-scaled and responds to the expectations of the progressive digital community, while also being firmly anchored in the grammar and aesthetics of paramount public artworks from the second half of the twentieth century onward, inspiring change in infrastructure design and user behavior toward the internet. Indeed, the artists are aware that their work is both aesthetic and political, as it offers a glimpse of how the internet could look and feel

like, if understood as materially bound and imagined as energy centered instead of immaterial and energy consuming, at the same time breaking the barriers of administrative or repressive control that are present in many nations around the world.[62] The future is thus imagined with less user surveillance and targeted advertising, more privacy and knowledge production, less time spent doom scrolling and more for in-person activities, a return to static websites and more energy-transparent software applications, and as more accessible and democratic.[63]

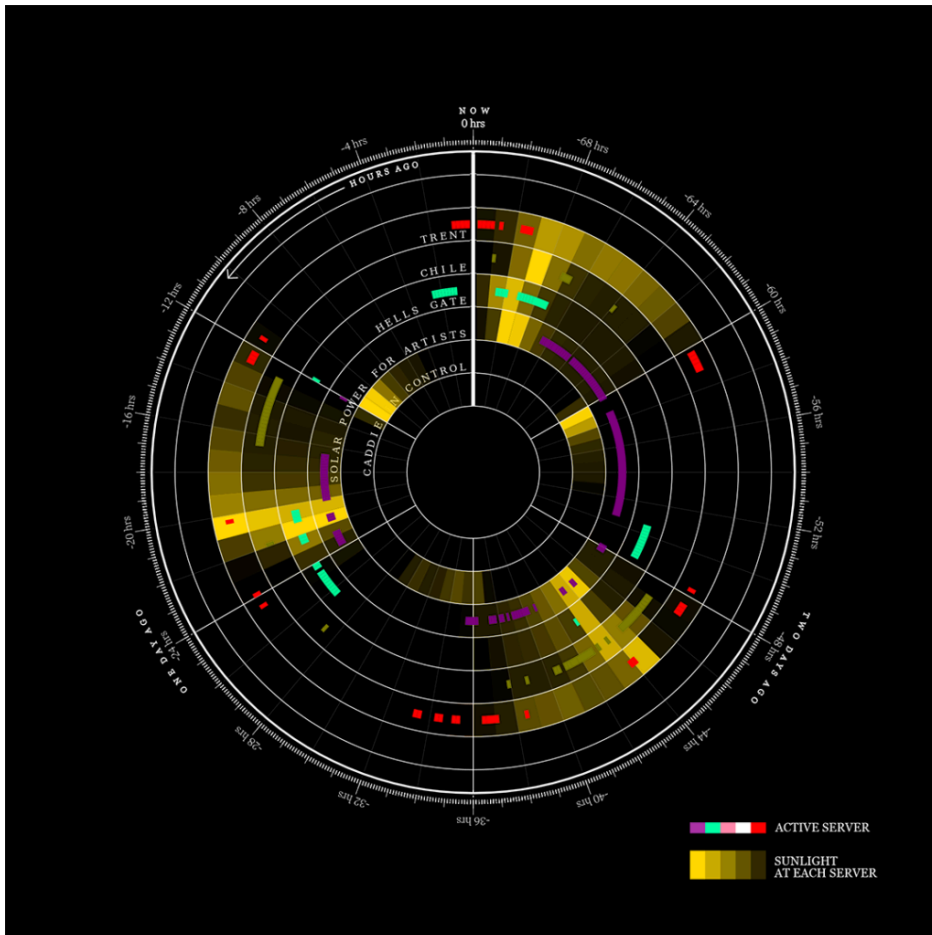


Fig.4: Clock diagram of the Solar Protocol showing its power supply over the last 72 hours (Picture and courtesy of the artists T.Brain and B.Piantella).

## 5. Changing the internet as a matter of aesthetic awareness

Very modestly, the creators of *Solar Protocol* decline to define their project as radically new because there are previous and ongoing experiments in the progressive digital community that aim at designing with similar constraints that lead to an aesthetics of low data and low-energy intensity, similar to what the internet looked like at its inception in the 1990s—that is, before the arrival of huge data centers, platform capitalism, and the attention economy.[64] However, designing with

intermittence because of the structural use of solar power, and overcoming its limits by means of steward servers set in multiple-time zones, *is* a relevant novelty that Brain, Nathanson, and Piantella acknowledge with welcome understatement, thus underlining the honesty and altruism that characterize it as an inspirational public artwork.[65] Adapting the design process to the intermittence of solar power emerges as a clever technological solution, but choosing to use the distribution of sunshine across the planet as a form of logic that determines where computational work is done embraces both a political and aesthetic dimension. Indeed, by automating decisions according to environmental dynamics, *Solar Protocol* explores a kind of “natural” intelligence, further leaning on social cooperation, thus radically opposing the artificial intelligence of current business models. The point is not simply to rely on technological solutions based on clean energy sources, but rather to adopt a different attitude toward the internet that gets rid of the attention economy and engages in an aesthetic and also political act to reshape our understanding of the web as a truly public venture.

The enthusiasm of the web’s capacity to expand the public sphere has long waned, since its dramatic expansion with social networks led to alienation and new forms of sectarianism rather than robust civic engagement.[66] Furthermore, humans’ limited attention space, as observed in engagement practices on the web, shaped the internet not as an open-ended place for the free exchange of ideas but rather as a public arena in which ideologies compete to dominate and seek political or ideological legitimation across media.[67] On the other side, its inherently interactive nature distinguishes the internet as a unique technology, as compared to all other communication technologies, thus opening alternative spaces and continuously expanding a dialectic of resistance and empowerment between the state, businesses, and society.[68] The internet itself is shaped by these social forces and relationships that allow a space and quest for freedom from political and market constraints, thus sensitizing toward the necessity of a truly sustainable web development.[69] In this sense, *Solar Protocol* carves a physical and digital niche in the web to create a space for the debate about changing the internet as a matter of aesthetic awareness with regard to its materiality, of poetic imagination with regard to its environmental redesigning, and finally of social cooperation with regard to the conditions of shared



engagement. Again, in the instruction zine for *Solar Protocol*, Brain, Nathanson, and Piantella highlight how the necessary behavioral shift, of both providers and consumers, can only be achieved if the internet is not just visualized but made aesthetically and materially perceptible:

Finally, the part that we find most poetic: you'll want to tilt your panel at approximately the same angle as the latitude of your part of the world. In Peterborough, Ontario, my latitude is 44.3°N, so my panel should sit a little shy of 45° off of the ground. If you're intense about things you can also modify the angle over the course of the year, adding 15 degrees in the winter, and subtracting 15 degrees in the summer. It's a reminder that the world isn't flat, [...] and that when we think about solar power, we're also thinking about our planetary condition.[70]

In order to be presented in a physical environment, the artists developed an exhibit version of *Solar Protocol* in 2021 that was also installed in Venice in 2022, on an Art Biennale year.[71] Venice is an emblematic city with regard to the kind of intermittent attitude that this artistic project is aiming at. In the lagoon, when the tide stands high above the street pavement, one cannot go on as usual. Nature reclaims its own time, and humans must try to adapt their pace, sometimes coming to a standstill. The Venetian exhibit of *Solar Protocol* presented the viewer with a large disc suspended in the Baroque Hall of the eighteenth-century Ca' Dolfin palace, onto which a circular diagram was projected showing the last seventy-two hours of the solar-powered server network's functioning. In doing so, interconnection and intermittence, which lie at the heart of this artistic project, found a plastic form and uttered their importance for a new and necessary way to make the internet sustainable.[72] The magnificent setting of Ca' Dolfin's ballroom operated as an ideal stage, with the wall mirrors amplifying the sunlight and thus allowing the overall illumination to be bolstered by the interaction of numerous elements. The suspended disk at the center of the room evoked the strength of the sun by means of a clock diagram, offering a sublime example of the paradigm shift towards intermittence that our society soon must reckon with. In its silent beauty and interconnected dimension, *Solar Protocol* is at one and the same time a creative experiment with technological means, a radical change in attitude, a material reminder of the web's earthliness, a paradigm shift in internet aesthetics, and a collective revolutionary action. And, because of all this, it is a much-needed public artwork.



Fig.5: Installation view of the exhibit version of Solar Protocol in the Baroque Hall of Ca' Dolfin palace in Venice, 2022, photo taken by the author (Courtesy of the artists T.Brain and B.Piantella).

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## Endnotes

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