A4AI ALLIANCE FOR AFFORDABLE INTERNET

FILLING THE GAP BETWEEN ENERGY AND INTERNET ACCESS

The case for action by Universal Service & Access Funds

A4AI Discussion Papers, Series 1 — October 2021

www.a4ai.org

WORLD WIDE WEB FOUNDATION

Acknowledgements

This paper has been written by Michael J Oghia and edited by Teddy Woodhouse. The author also wishes to thank Sylvia Cadena, Steve Song, Mike Jensen, and Nathalia Foditsch for their invaluable feedback and constructive critiques of this work.

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Suggested citation: Oghia, Michael J. (2021). 'Filling the Gap Between Energy and Internet Access: The case for action by Universal Service & Access Funds.' *A4AI Discussion Paper Series 1:2.* Alliance for Affordable Internet.

The **Alliance for Affordable Internet (A4AI)** is a global coalition working to drive down the cost of internet access in low- and middle-income countries through policy and regulatory reform. We bring together businesses, governments, and civil society actors from across the globe to deliver the policies needed to reduce the cost to connect and make universal, affordable internet access a reality for all.

The **World Wide Web Foundation** was established in 2009 by web inventor Sir Tim Berners-Lee and Rosemary Leith to advance the open web as a public good and a basic right. We are an independent, international organisation fighting for digital equality — a world where everyone can access the web and use it to improve their lives. The Foundation holds the secretariat of the Alliance for Affordable Internet.

Around the world, efforts to connect the unconnected continue despite the myriad challenges that exist from the ongoing Covid-19 pandemic to political instability. Often these efforts focus on expanding telecommunications infrastructure; working to improve the personal capacities and skills of new and existing internet users, including digital media literacy; and/or lobbying governments to create policy frameworks that enable the growth and development of the internet and address multiple digital divides.

Yet there seems to be a relationship that is often overlooked or simply relegated to a mention in passing in various reports, which constitutes a serious oversight: the link between energy and internet access. As mentioned in a 2020 article for *Branch Magazine*, just over half of all people in the world are connected to the internet (a number that rose in 2020 due to pandemic-related lockdowns), while more than 3.5 billion do not have access to reliable electricity. In addition, just under a billion do not have access to electricity at all — a figure that, according to the International Energy Agency (IEA), is increasing again after years of decline due to the Covid-19 pandemic. This reality, therefore, begged the question, "How do we expect people and communities who aren't even wired to electrical grids to participate online in languages they likely do not speak or with a device that, if they can access and afford, cannot even be charged properly?"

A question of energy and access emerges

This question is essentially a distillation of an ongoing discussion within internet development and policy circles, one that seemed to come to a head in November 2020 during the 15th Internet Governance Forum (IGF). 2020 marked the deadline that the Sustainable Development Agenda set to accomplish Sustainable Development Goal (SDG) 9, target C, which called on governments to increase access to information and communications technology (ICT) and strive to provide universal and affordable access to the internet in Least Developed Countries by 2020 — a goal that has experienced commendable success, but is far from being achieved.

In fact, there is still much work to be done — a conclusion reached by, among others, two workshops held in November 2020: one at the Africa IGF (WS 14) regarding electricity, digital inclusion, and the regulatory environment, and the other at the global IGF (WS 37) on the same topic. Achieving universal access will, in the words of the Connect Humanity initiative, require alternative infrastructure providers, new types of financing and business models, changes in policy, and much more. But as these two workshops made explicit, access to reliable energy should be seen as just as an important enabling factor.

These two workshops were ultimately what inspired this essay. It also was not the first time that the relationship between electricity, infrastructure, and digital inclusion were highlighted within the IGF ecosystem. The IGF's Policy Options for Connecting and Enabling the Next Billion(s) (CENB) intersessional programme, which ran from 2015-2018, underscored this relationship and even highlighted the importance of the relationship between energy, infrastructure development, and internet access during the CENB's Phase III workshop at IGF 2018 in Paris. The Internet Rights and Principles Coalition (IRPC), an IGF Dynamic Coalition, has also emphasised the link between energy, environmental sustainability, and the internet since at least IGF 2018 — a trend that extended through IGF 2019 in Berlin, IGF 2020 (held virtually), and some of the IGF's National and Regional Initiatives (NRIs), such as the 2020 European Dialogue on Internet Governance (EuroDIG) (also held virtually).

Additionally, there has been at least one IGF day zero (pre-event) session focusing on electricity and internet access (IGF 2019), and the Institute of Electrical and Electronics Engineers (IEEE) has been focusing on the links between electricity and connectivity for years with its programmes like Smart Villages along with events such as a day zero workshop at IGF 2017 in Geneva, held in collaboration with the World Economic Forum (WEF) and the International Telecommunication Union (ITU), which focused on achieving universal access. The relationship between reliable electricity and internet connectivity is also a reality that multiple members and communities within the IGF Dynamic Coalition on Community Connectivity (DC3) — which focuses on community networks — regularly face and is therefore a consistent thread within its discussions.

As this non-exhaustive list of examples demonstrate, this topic has a natural place within internet development and policy discussions. What was striking about the two workshops held in November 2020 (AfIGF WS 14 and IGF WS 37), however, was how little the conversation has evolved since more concerted investigations into the topic began in 2016/2017, even though the topic has never been more relevant.

One element central to bridging the digital divide is reducing the cost of internet-connected devices, especially among the poorest and most vulnerable — a central tenet of A4AI's advocacy work. But even the availability of proper, affordable devices is not a panacea. As Gisa Fuatai Purcell — the CEO of the Office of the Regulator of the Government of Samoa — stressed during WS 37 at IGF 2020, the need for sustainable energy sources such as solar power continue to be one of the most fundamental steps at enabling internet connectivity, particularly among small island developing states (SIDS).

How is it then that this obvious need continues to be minimised at best and ignored at worst among the wider internet development community?

The missing link in the policy agenda

As Kira Allmann and Mike Hazas noted in a 2019 submission to the Advisory Committee to the UN Human Rights Council, "The drive toward universal internet connectivity is rarely considered in relation to energy usage and climate change … [even though] reliable and sustainable energy is a precondition for internet access." Moreover, they continued:

> "Energy supply is [also] rarely explicitly considered or mentioned in policies focused on universal access. The issue of access to energy is especially salient for the communities that remain unconnected to the internet, as they are predominantly rural, located in the Global South, and economically disadvantaged. Around 20 percent of the world still lacks domestic electricity, so the aspirational goal of universal internet access needs to account for sustainable (often off-grid) energy solutions to power connectivity."

Their work presents a comprehensive, yet succinct overview of the problem, one that clearly captures the missing link: even though so much emphasis is placed on universal access within the SDGs and throughout sustainable development as a whole, the link between electricity and internet access is rarely seen as an interrelated problem beyond the most affected communities.

In response, A4AI has begun framing meaningful connectivity through the lens of sustainability, stressing that we must "recognise and reduce the carbon footprint of internet use so that we reach universal access without worsening the global climate emergency." Doing so will not only help the individuals and communities that infrastructure should ultimately serve but also work to ensure that broadband policy considers its impact on the natural world.

Aside from these examples, though, what is somewhat frustrating is that endeavours to make this link more explicit have been attempted in the past. One of the best examples comes from the World Bank's World Development Report 2016: Digital Dividends, a foundational document that focuses on sustainable development and infrastructure to date that also includes an extensive sectoral focus on energy. A key insight shared was

the observation that a "symbiotic relationship … exists between the development of [ICTs] and increasing energy access in Africa and other low-access areas."

The section's authors cited the common experience across sub-Saharan Africa in particular where mobile telecommunications towers require a local power supply, but reliable grid electricity is often unavailable. Since many communities in the surrounding areas therefore lack access to electricity as well, energy service companies in many parts of Africa have resulted in "oversizing the energy generation unit of a mobile tower in order to provide local consumers with access to electricity."

Although this challenge was rightfully highlighted in 2016, the problem continues to persist. Writing for the *Financial Times* as recently as late January 2021, in an article examining the race to update Africa's digital infrastructure, Joseph Cotterill explicitly cited the lack of a reliable grid power as "the biggest block on Africa's internet infrastructure boom." Not only is this harming pan-African human development goals as a whole, leaving millions without reliable digital infrastructure, but it ultimately hinders economic growth, job creation, and future prosperity as well. "Data centres are especially vulnerable," Cotterill wrote, adding that "when grid supply fails, back-up generation can blow out operating costs."

And according to the U.S.-based non-profit Energy for Growth Hub, "Without cheap and reliable power, African data centres can't be competitive, and won't get built." It is paramount to understand how infrastructure-heavy the digital economy is. "Data centres really epitomise this symbiotic role between the internet and power," Cotterill quoted Rose Mutiso, research director at the Energy for Growth Hub, as saying. Mutiso continued:

> "African utilities will need data infrastructure customers as much as the other way round. For instance, Kenya Power, the nation's main supplier, desperately needs large power users that have stable off-peak demand in order to diversify its base of customers … The big issue in Africa's power sector is the question of demand. Electricity supply issues mean recognising … that the internet is 'incredibly physical' and that it will require painstaking improvements in transmission and distribution, not just generation."

The examples offered above by *Digital Dividends* and Cotterill only further demonstrates (and affirms) Mutiso's rightful emphasis on the interconnected nature of energy and telecommunications development but also provides a prism in which we can identify solutions to some of the financing challenges that expanding rural energy services face.

As *Digital Dividends* noted, there are multiple obstacles to overcome when creating business-sustaining infrastructure in general and in lower-income countries in particular, which require "finance, local expertise, and innovative solutions." What it did not state, however, is that actually manifesting these requirements is challenging, in part, because the regulatory frameworks for internet provision and electricity are typically managed by different government agencies, while infrastructure is often deployed with different standards and requirements.

Thus, for those individuals or organisations working to supply their own electricity for the purpose of internet connectivity, the challenge is that one permit or a Renewable Energy Guarantees of Origin (REGO) scheme does not necessarily guarantee their ability to provide such connectivity — as the experience of the Bangladeshi renewable energy-based, peer-to-peer trading platform Solshare highlights.

Digital Dividends also underlined how "revenues from telecoms — customs duties on hardware, auctioning and managing spectrums, and value added tax (VAT) or sales taxes on services — have been one of the fastest growing sources of revenue in many developing countries." Yet, it also stressed that regulatory capture by powerful telecom firms may undermine this effort. In other cases, the report claimed, certain countries experience the opposite problem: "they [governments] have used the telecom sector as a 'cash cow,' taxing it so heavily as to impede its growth prospects."

It should come as no surprise, then, that the World Bank concluded that robust competition and private sector solutions to financing and managing infrastructure services using digital technologies hold the most promise. They offered an example of the German telecommunications firm Mobisol, which is supplying off-grid energy to villagers in Rwanda by combining solar energy technology with mobile phone-based loan payments. It joins a host of others, such as the East Africa-based Solar Sister or Microsoft's Airband ISP programme, in helping to facilitate the relationship between clean energy, technological capacity building, and entrepreneurship, particularly among women, and ultimately finance rural community development and promote democratisation since (electrical) power is a prerequisite for civic engagement in the 21st century.

The potential role of Universal Service & Access Funds

Beyond the infrequent mention or focus of internet development-related research, financing continues to be one of the main obstacles to both connecting the

unconnected by expanding telecommunications infrastructure *and* developing off-grid energy solutions. Is there a way then to potentially address both problems at once?

One idea initially entertained in 2017 while writing a chapter on community networking as a key enabler of "sustainable access" — the ability for any user to connect to the internet and then stay connected over time — focuses on a revamped role for universal service and access funds (USAFs). These are funds typically financed through mandatory contributions by mobile network operators and other telecommunications providers that constitute a key policy mechanism adopted by myriad local, national, and regional governments across the globe meant to enable universal service — characterised by telecommunications that is available, accessible, and affordable to everyone — and to increase access to telecommunications services in rural and remote areas.

This reimagining of USAFs includes expanding their scope to also incorporate energy-related components and considerations, while concurrently promoting decentralised energy systems, particularly for rural electrification, and community connectivity (as Carlos Rey-Moreno demonstrated in a report from the same year).

It is hardly a novel concept. A 2013 report from GSMA, the international industry body that represents the interests of mobile network operators, included focusing on "ongoing sustainability" such as power supplies and renewable energy among a list of USAF management best practices. This seems self-evident given that the lack of reliable/affordable energy results in much higher costs to existing mobile broadband services, especially considering that many mobile network operators (MNOs) estimate that supplying energy to their base stations is upwards of 50% or more of their operating costs, which are inevitably passed down to the consumer.

A few years later, A4AI emphasised in their 2015 report exploring USAFs in the context of broadband development initiatives that reliable energy is a critical supply-side prerequisite that, when combined with demand-side incentives, constitutes the overall "broadband ecosystem." In other words, although it was not the explicit focus, it is abundantly clear that electrification and telecommunications development go hand-in-hand, implying a mutually beneficial situation for all relevant stakeholders.

In the same spirit as Rey-Moreno's work mentioned above, the community networking community has long identified necessary policy changes that must occur to better promote rural and remote internet access, including enabling universal service and

access funds for community networks. As Erick Huerta, Peter Bloom, and Karla Velasco wrote in 2017:

> "To truly address the needs of unconnected populations, it is necessary to change perspectives and create the technical, economic, and regulatory bases of sustainability, in terms of public policy. In order to do that, it is important that the resources currently being used for universal service funds, which are available in many countries, be used not only to subsidise companies whose business model does not work in rural and remote areas, but also to create the necessary conditions that favour the approaches that work in these areas, such as [community networks]."

Innovative uses of USAFs around the world

Many policy recommendations as well as positive examples already exist around the world that can act as a suitable model highlighting the relationship between electrification and telecommunications development, particularly in South Asia and sub-Saharan Africa. In India, for instance, more than 2,200 solar-powered mobile communication towers were built by telecommunications operator VNL thanks to financing by the Government of India's Universal Service Obligation Fund (USOF) to create "the world's largest green mobile communication network," while in Pakistan, base stations funded by its USAF must use renewable energy. Pivoting to Africa, renewable energy and solar power projects are already funded through Zambia's USAF, while the energy sector contributes to Senegal's USAF given the synergies that exist between energy and ICTs and their subsequent impact on inclusion and economic growth.

Table 1. Example USAF policies with electricity implications.

INDIA	SENEGAL
With funding support from the country's Universal Service Obligation Fund (USOF), operator VNL built more than 2,200 solar-powered mobile communications base station towers.	The energy sector also contributes to the Universal Service & Access Fund in Senegal, raising potential revenue for the sector as a whole and inclusive access.
PAKISTAN	**ZAMBIA**
The country's USAF includes rules that base stations funded by it must use renewable energy.	The country's USAF has funded renewable energy and solar power projects.

In addition to their pioneering approaches, these examples are encouraging from a policy perspective for two key reasons:

1. The first is that the funding allocation rules were likely altered to cover electricity provision and how the recipients of the funds need to account for how the electricity is generated and used.
2. The second is that the electricity provision programmes covered under the USAF does not directly overlap with the electricity provision by the country's grid providers due to operating under two different sets of rules as well as different ministerial oversight and sectoral portfolios.

The latter can be especially problematic because it inherently implies the necessity of cross-departmental communication and cooperation that could be easily hindered by rigid hierarchies, intragovernmental competition, and/or complex bureaucracy that may prove challenging for many countries to overcome. Therefore, it suggests that these policy obstacles were harmonised before this provision could take effect — as the ITU report explaining Senegal's USAF programme linked above exemplifies. It also speaks to the potential of piloting energy-related USAF programmes in countries with integrated utility regulators such as the Public Utilities Regulatory Authority (PURA) in The Gambia.

Integrating USAF funding for telecommunications-driven electrification could also be incorporated into national broadband plans — akin to how Canada connected all of its rural educational systems funded by its Universal Broadband Fund — while research from the ITU has proposed USAFs as a way to fund renewable energy to sustain the delivery of rural telecom networks, promote digital inclusion, and, by extension, ultimately enhance meaningful connectivity and sustainable access. This is especially relevant since, according to the IEA, around two-thirds of countries in sub-Saharan Africa have integrated off-grid systems into their framework for energy access support since 2020 due to the Covid-19 pandemic, suggesting that policy changes in support of new solutions are ripe for the making. As A4AI analysis reveals, however, national broadband plans underwhelm in their inclusion of energy issues, with most plans giving only a cursory mention to the plan with no meaningful targets.

In line with the example from Zambia, another recommendation could include adding environmental sustainability considerations to universal service and access funds — i.e., any USAF money used to expand connectivity should also come attached with environmental accountability conditions and/or requirements to use renewable energy sources.

Lastly, USAF financing along with mechanisms like tax incentives could help facilitate and support expanded opportunities for public-private partnerships in support of rural development and low-income communities, especially where there is hesitation by the private sector to make capital investments.

Financing rural development in the face of market failure

There is ample precedent to suggest that a bit of holistic thinking and creativity can solve long-standing problems with existing development policy and finance mechanisms. It was necessary before the Covid-19 pandemic, but is particularly imperative now since, according to the IEA, the pandemic has both decreased the flow of new investments and increased the cost of capital in developing economies. Furthermore, the potential to expand USAFs to include energy-related considerations clearly exists. Yet, it seems that the political will necessary to realise it is not the only lacking factor. There are three key challenges that also pose a barrier, including:

Table 2. Barriers to USAF innovation.	
1	Legacy issues arising from, among other things, **separate regulatory environments**, separate markets, separate regulators, and in many cases, separate infrastructure all contribute to implementation challenges.
2	The fact that the electricity market in many countries is still owned or at least controlled by the state. This offers **little incentive to liberalise or innovate**, especially among powerful and established incumbents, and is therefore a major hindrance.
3	**Market failures**, which continue to be one of the greatest barriers to rural and remote access.

Regarding the third, and as the Tony Blair Institute for Global Change (TBIGC) affirmed, the deployment of the appropriate technologies to address rural and remote access will not be solved until governments and regulators begin to address the significant challenges in making the economics work.

The TBIGC's assertions, gleaned after they hosted a series of expert roundtables, accurately reflects the experience of individuals on the ground who, time and again, lament the barriers they face, which often cite financial and sustainability factors as the top hindrances. As one member of an Internet Engineering Task Force (IETF) working group frustratingly shared:

> “Based on some of our experiences trying to work with communities to solve their own connectivity/content problems, there is relatively no money to be made for organisations … this is a fundamental problem … without external funding none of these organisations can sustainably deploy or maintain their infrastructure. There are outliers, but that depends on the community's purchasing power. Unless markets are opened up for new entrants, which is again correlated to money, sustainable connectivity is never going to happen.”

This holds true despite the fact that it reflects a key recommendation hidden deep within the 2012 State of Broadband report by the UN’s Broadband Commission, which calls on the UN, intergovernmental organisations (IGOs), international financial institutions, and multilateral development banks such as the World Bank to “finance national digital connectivity initiatives, and electricity generation, transmission, and distribution vital for digital service provision” as an Immediate Action of the Commission’s Agenda for Action. An important admission in the 2019 State of Broadband report further built on the 2012 report’s initial recommendation.

That admission affirmed that “access to renewable sources of energy remains a challenge for mobile operators, and this is an area that will require support and attention, and where governments also have a role to play in facilitating access to alternative sources of energy.” Considering that UN Energy is investigating how to increase collaboration among UN agencies as well as utilising its various partnerships and programmes — such as but certainly not limited to the IEA, International Renewable Energy Agency (IRENA), Climate Technology Centre & Network (CTCN), Southern African Development Community’s (SADC) Centre for Renewable Energy and Energy Efficiency (SACREEE), and the Sustainable Energy for All (SEforAll) initiative — to focus on multi-sectoral and multi-layered responses, it seems that there is encouraging movement in this space. Still, though, without robust, long-term financing, it remains to be seen how sustainable such efforts will be.

Given the necessity and reality on the ground, it seems that drawing on USAFs to help catalyse this needed support is a logical solution, particularly in the face of post-Covid recovery effort and both the needs and opportunities it is creating. However, **USAFs should not be seen as panacea, but as an additional catalysing instrument to meeting the challenges of connecting the next billion as well as realising the Sustainable Development Agenda.** For instance, even if USAFs are successful in providing energy support to connectivity infrastructure, there are additional needs of

the public for charge points, such as UNIDO's energy kiosk model, which could also be fostered via start-up funds or public-private partnerships.

The case of Nigeria's USAF also sets a good example of what this could look like in practice. According to Mike Jensen — a South African ICT expert currently working as the Association for Progressive Communications' (APC) internet access specialist — as with other national USAF schemes, the Nigerian USAF has not considered supporting energy supply in the funding of mobile service towers. This leaves operators to cover this cost. Consequently, the operators may not find it economic to provide service to these remote locations because of the low levels of traffic, Jensen stressed, which are also in-line with market analyses conducted by GSMA's Green Power for Mobile programme. This further demonstrates why USAF mechanisms can offer mutually beneficial finance solutions that assist telecommunications operators, utility providers, and most importantly, the communities they serve.

If the USAF can be transformed into a mechanism that meets mutual challenges of both the energy and telecommunications sectors, it may well open the proverbial door for other finance mechanisms to support the intersection of the two as well. This seems especially true if accompanied by badly needed institutional reform, as a report from the TBIGC noted about the relationship between USAFs and incumbents: "[USAFs] were not designed to subsidise incumbents, yet are often used this way instead of being applied to develop a broader ecosystem of actors."

Developing and empowering such a broad ecosystem of actors seems critical to realizing the Sustainable Development Goals (SDGs) as they relate to energy, infrastructure, and connectivity (e.g., SDGs 7, 9, and 11). As such, an important milestone to strive for includes shifting the perspective to one where local operators working to fill the coverage and usage gaps left by national operators are seen as *complementary* instead of competition by national operators — a solution advanced by APC specifically in response to the Covid-19 pandemic and ongoing changes in the telecommunications sector. This could also include complementary actions from the government such as reducing high import duties on solar power equipment to alleviate the economic burden, especially for local actors, and/or creating policies that incentivise the use of energy distribution grids where available as passive infrastructure for speeding the deployment of connectivity.

Increasing the opportunity for collaboration on and cross-pollination of this idea is also vital, so that operators in both the energy and telecommunications fields can work together. As the *Digital Dividends* report demonstrated, companies across Africa and

South Asia are leveraging ICTs and sensors utilising cellular networks through various financing models mainly realised through public-private partnerships or other market-based mechanisms. Yet, there is unfortunately no mention of the innovative potential of USAFs as a financing mechanism.

Conclusion: bridging the policy divide

As we continue to push for new and innovative ways to connect the unconnected as well as drive digital infrastructure to become sustainable as a whole, financing one of the biggest prerequisites for (and enablers of) internet access — energy — seems both reasonable and mutually beneficial.

The aforementioned financing experiments pioneered by the governments of India, Zambia, Pakistan, and Senegal can help fill in the missing links with innovative USAF policy and provide instructive examples for other telecoms, energy, and development ministries around the world. By seeing energy and ICT development as two interrelated components of the larger and more holistic infrastructure design (in-line with many established "dig once" policies), it may also lead to reduced cost and duplication while spurring innovation — analogous to how the Government of New Mexico in the United States is investigating how to update fibre-optic infrastructure during road construction to maximise efficiency and cost while minimising disruption and redundancy. The IEA affirmed as much as well, writing: "Holistic national access plans that consider other sustainable development goals as well as climate mitigation and adaptation needs, can combine the many priorities in developing countries."

Returning to Cotterill's article in the *Financial Times*, he emphasised that the race to build and upgrade our digital future will depend on politics and collaboration just as much as it will on technology. Undoubtedly, navigating the complex politics and contentious context underpinning USAF mechanisms and wider broadband policy is a challenge. Existing constraints on USAFs and how USAF variations manifest country-by-country will influence how these recommendations work in practice compared to their example in theory.

With the myriad obstacles to sustainable development and universal access to electricity and internet access, however, the true challenge is for us to work together, across stakeholder groups, to make this a reality for the sake of our infrastructure, our communities, and our planet.