

Renewable Energy and the United Nations:

A GREEN SPARK FOR PEACE IN SOUTH SUDAN

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The Powering
Peace Initiative

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COVER
UNMISS Force Commander, Lieutenant-General
Shailesh Tinakar, recently visited Terekeka in
Central Equatoria, South Sudan, to get a
first-hand view on the security situation here.
Gregorio Cunha/UNMISS

Report designed by Dena Verdesca

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ABOUT POWERING PEACE

Powering Peace is a joint research initiative of the Stimson Center and Energy Peace Partners, which aims to explore cleaner and more efficient energy options for multinational field operations in fragile states. The Stimson Center, a Washington, D.C.-based research and policy center, has led studies and research on peace operations since its founding 30 years ago, and works to protect people, preserve the planet, and promote security and prosperity. Energy Peace Partners is a U.S.-based organization that works to leverage climate and finance solutions to support peace in places affected by violent conflict.

The Powering Peace initiative envisions a broad policy shift within the United Nations (UN) system and among its member states to adopt renewable energy in field operations for both short-term and long-term benefits. As part of a shorter-term effort, the initiative aims to help the UN embrace more efficient and cost-saving technologies, and shift to a greater use of renewable energy in support of missions. That is more urgent now within the context of the UN Secretariat's 10-year Climate Action Plan to source 80 percent of electricity from renewable energy by 2030. The initiative also seeks to identify impacts of and improvements in current practice, such as reducing the expense or insecurity associated with long fuel convoys or corruption. As part of a longer-term effort, the initiative aims to help the UN better integrate climate solutions in crisis-affected areas as part of the way it does business, an effort that can support peacebuilding and fulfill the organization's ambition to achieve universal global access to energy under the UN's Sustainable Development Goals.

Powering Peace examines the extent to which the footprints of international humanitarian and peace operations can be leveraged to introduce and extend the benefits of renewable energy to communities in fragile states. The project includes the use of reports and case studies as a research tool to identify innovative practices, incentives, and disincentives facing field missions, as well as opportunities for greater efficiency and peacebuilding. Our first report, *Renewable Energy and UN Peacekeeping: Untapped Potential in the Democratic Republic of the Congo*, was published in September 2019. Our second report, *Shifting Power: Transitioning to Renewable Energy in United Nations Peace Operations*, was published in January 2021. Our third report, *From Renewable Energy to Peacebuilding in Mali: MINUSMA's Opportunity to Bridge the Gap*, was published in June 2021. Our fourth report, *Powering Ahead: The United Nations and Somalia's Renewable Energy Opportunity*, was published in March 2022.

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The views expressed in this paper are solely those of the authors and do not represent the views or the official position of any organization/institution.

ABOUT THE POWERING PEACE TEAM



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EXECUTIVE SUMMARY

South Sudan's future – and relief from its cycle of conflict – is linked to its reliance on fossil fuels, with limited but possible options for charting a new course. The world's newest country gained independence in 2011 amid international fanfare, yet the celebrations were short-lived, with the outbreak of civil war in late 2013 bringing devastating consequences for the population. South Sudan's energy sector is deeply embedded in the dynamics of the conflict, from the economy's near total dependence on oil production and the accompanying patronage systems to the reliance on imported diesel for access to electricity. Creative solutions could help South Sudan break this cycle, and in at least one area – renewable energy – unique opportunities exist for the government and its international and national partners to support the development of a new, more sustainable, and widely accessible electricity infrastructure.

This report looks at the question of electricity access in relationship to South Sudan's conflict and the unique options to help harness renewable energy as a tool for peace and development across the country. South Sudan is the least electrified country in the world; according to the World Bank, only 7.2 percent of the population has access to electricity. The recent civil war destroyed most of the existing limited electricity infrastructure, including the few projects that had been developed in the immediate pre- and post-independence periods. In Juba, there has been some modest progress in expanding electrification in the capital, but effectively nowhere else. Despite being an oil-producing state, South Sudan has no domestic refining capacity. Virtually all access to electricity comes from generators that rely on imported diesel. This energy dependence requires hard currency, which is a drain on the government's limited cash reserves. To reach end users, the distribution of diesel fuel and other goods must pass through dozens of checkpoints manned by various armed groups across the country, adding costs for security and access. The result is that this reliance on diesel fuel, and by extension the access to electricity, is a core component of the country's fossil-fuel dependency and economy. A weak economy and volatile currency further hampers investment in electricity projects, creating a situation where there is little progress in advancing energy access in South Sudan, and little reason to expect the status quo to change.

One possibility for South Sudan's electricity sector is to work with the energy transition objectives of the United Nations (UN) Secretariat, which present new and unique opportunities to unlock a series of clean energy projects across the country. This approach is also a creative way to support peacebuilding. Since 2005, the UN has had a peacekeeping mission in what is now South Sudan, with the current iteration, the UN Mission in South Sudan (UNMISS), deployed since independence in 2011. The mission is one of the largest in the world, with an annual budget of \$1.12 billion as of July 2022. With a presence across most of the country, UNMISS is almost entirely dependent on diesel generators for power, spending approximately \$32 million per year on diesel for the generators alone, and representing roughly 20 percent of total electricity consumption in the country. In support of the climate goals set out in the UN Secretariat Climate Action Plan (UNSCAP), the mission has stepped up its efforts to look at renewable-energy solutions for its field bases. UNMISS aims to partner with private sector solar developers through power purchase agreements (PPAs), contracts that, through a mission's commitment to purchase energy at an agreed price and term, enable project developers to finance and build power plants. This approach leverages the purchasing power of the UN and could potentially unlock new projects in South Sudan. For example, the mission recently issued a request for information for a PPA-driven solar project in Malakal to meet its own power requirements, with the potential to eventually expand to cover other off-takers, including local communities. The mission has also initiated a pilot solar project for its Topping base in Juba. UNMISS is looking to replicate these projects elsewhere where possible. In Rumbek, for example, the mission is initiating discussions to connect to the grid through a new government-led electrification project, but it is not yet clear how much of this project would include renewable energy.

Ideally the local population would also benefit from such projects as they come on line, but at the very least such projects should be able to serve local communities following the eventual departure of UNMISS and the transition of the UN configuration in South Sudan. The wider international community and national government must become partners to take full advantage of such arrangements.



UNMISS Patrol in Pigi County, Jonglei State. *Priyanka Chowdhury*

INTRODUCTION

South Sudan has been trapped in a cycle of conflict for decades and remains among the most fragile and underdeveloped countries in the world. Prior to gaining its independence from Sudan in 2011, South Sudan fought two long civil wars against governments in Khartoum, which ended with the 2005 Comprehensive Peace Agreement (CPA). South Sudan's creation was facilitated, in part, by its massive oil wealth. Upon the country's independence in July 2011, the UN Mission in South Sudan (UNMISS) was established – taking over from the previous UN Mission in Sudan (UNMIS) – to spearhead the international community's support for the world's newest country. A new civil war broke out in South Sudan in December 2013, and led to the destruction of nascent infrastructure and the reversal of economic, governance, and developmental gains across the country, as well as the deaths of several hundred thousand people and the displacement of approximately 4 million people.¹ The decision by UNMISS to open the gates of its bases throughout the country to provide shelter to civilians at the risk of physical violence led to the mission becoming the direct custodian of hundreds of thousands of people.² Furthermore, South Sudan is increasingly affected by the impacts of climate change, which further aggravates drivers of conflict and has contributed to the massive displacement of communities.

South Sudan is the world's least electrified country, where only 7.2 percent of the population has access to electricity, according to the World Bank.³ What electricity does exist comes mostly from generators powered by imported diesel or, intermittently, from local grids in Juba and a few larger cities. There is little momentum, impetus, or resources to expand electricity access – and infrastructural development in general – across the country. South Sudan's electricity sector is a hostage of a combination of factors including its flagging economy, dysfunctional governance and mismanagement, and seemingly intractable armed conflict. Moreover, the dependency on diesel means that access to electricity is highly vulnerable to fluctuations in global energy prices and disruptions in the fuel supply chain, both of which are currently unstable and beyond the control of the Government of South Sudan (GoSS).

Within South Sudan, UNMISS self-generates its own electricity to power mission operations, and reportedly represents a staggering 20 percent of the country's total electricity consumption.⁴ As with other UN peace operations, UNMISS operations depend heavily on diesel generators for power, and the mission manages its own fuel supply chain, complete with costly and challenging logistics for resupply across the country. The goals laid out in the 2019 UN Secretariat Climate Action Plan (UNSCAP) and the 2022 Environmental Policy for Peacekeeping Operations and Field-Based Special Political Missions – including for the Secretariat to source 80 percent of its energy from renewables by 2030 – offer clear targets and concrete entry points for renewable-energy transitions within the mission.

For the UN to have any hope of successfully meeting these new goals, field missions like UNMISS must dramatically shift their energy practices and adopt new systems and approaches to embrace and rapidly integrate renewable-energy solutions. This will require the mission to work with the private sector in a manner that missions are not used to. Options for increasing UNMISS's renewable-energy usage creates new opportunities, with significant potential benefits. A renewable transition will improve the mission's environmental footprint, provide economic savings over time, and reduce convoy-related security requirements. Developing project models that can also support the local energy sector can maximize these positive impacts for South Sudanese by reducing the country's near-total reliance on fossil fuels, and creating new peace dividends across the country.

CONTEXT

The Second Sudanese Civil War and the Comprehensive Peace Agreement

South Sudan gained its independence in 2011 following almost five decades of near constant war (from 1956–1972 and 1983–2005), led by southern elites who chafed at Khartoum’s exclusionary and exploitative approach to governance over then-Greater Sudan. The discovery of oil in the south in the late 1970s introduced a new layer of complexity.⁵ The second war ended in 2005 when Khartoum and the Sudan People’s Liberation Movement (SPLM) – the dominant southern rebel group – signed the internationally backed Comprehensive Peace Agreement (CPA). The CPA created an SPLM-led regional government in Juba, stipulated a 50-50 revenue-sharing arrangement between Khartoum and Juba for the south’s oil reserves, and paved the way for independence, following a landslide referendum in January 2011. In the six years between the signing of the CPA and South Sudan’s formal independence in July 2011, the SPLM-led regional government received almost \$13 billion in oil revenue.⁶ Over the same period, the international community spent an estimated \$5 billion in development aid in South Sudan.⁷

From Independence until 2013

For the first two years after gaining independence, South Sudan and its leadership enjoyed a honeymoon period. UNMISS, which succeeded an earlier peacekeeping mission established to support the CPA, was established on July 9, 2011 – the date South Sudan gained its independence – with an initial mandate to (1) support peace consolidation, (2) support the government in exercising its responsibilities for conflict prevention, mitigation, and resolution, (3) protect civilians, and (4) support the government in developing its capacity to provide security, establish the rule of law, and strengthen the security and justice sectors.⁸ The mandate, orientation, and composition of the mission shifted dramatically following the outbreak of the civil war in December 2013.

Under the SPLM-led GoSS, the new country’s hopes and economic vision were largely pinned on its oil wealth. Global oil prices reached all-time highs in the initial years after independence, leading to a brief statistical anomaly in which South Sudan qualified as a middle-income country based on its per capita GDP, despite being among the least developed countries in the world.⁹ The new petro-dollars “supplied a slush fund for patronage politics and personal enrichment that the elite squabbled over.”¹⁰ Little of the newfound wealth trickled down to South Sudan’s population at large, in terms of poverty reduction and development. The

country enjoyed immense international goodwill through this period, as well as financial and technical assistance in support of building the institutions of the new state. The United Kingdom, the United States, Norway, the European Union, and other international donors invested heavily in this agenda.¹¹

As the least electrified country in the world, South Sudan’s energy sector is complex and closely tied to the cycle of conflict, and the country’s cursed dependence on oil.

Negotiations between Sudan and the newly independent South Sudan across a range of issues affected by the separation took place under an African-Union-led mediation process, with oil among the key sticking points. South Sudan no longer had to abide by the CPA-era requirement to share 50 percent of its oil revenue with Khartoum, but it was still dependent on the pipeline that ran from its oil fields through Sudan to the Red Sea to export its oil. To compensate for its lost oil revenue, Khartoum demanded very high pipeline transit fees for southern oil. In late January 2012, following months of negotiations between Juba and Khartoum, the GoSS made the extraordinary decision to voluntarily shut down its entire oil production to avoid paying Sudan. The pipeline

remained closed for some 14 months, and the abrupt halt to South Sudan's oil revenue hit the country's fledgling domestic economy hard.

South Sudanese Civil War and Present Situation

As the oil revenue dried up, South Sudan's internal fault lines began to emerge, and the fragile peace shattered on December 15, 2013, when clashes in Juba broke out between military factions loyal to President Salva Kiir and former Vice President Riek Machar, after tensions had been simmering for months. Initially the fighting mostly fell along ethnic lines, pitting the ethnic constituencies of Kiir and Machar – the Dinka and Nuer, respectively, which are the two largest ethnic groups in the country – against one another. The Sudan People's Liberation Army (SPLA) forces that defected to support Machar and his other new recruits eventually came to be known as the SPLA In Opposition (SPLA-IO). Some of the most intense fighting coalesced around the country's oil fields in the Greater Upper Nile region.

As the fighting tore through the country, civilians were increasingly targeted based solely on their ethnicity. In this context, UNMISS's presence and protection of civilians mandate took on a new significance. On the first night of the fighting in 2013, a trickle of people began arriving at the gates of the two UNMISS compounds in Juba. The influx of internally displaced persons (IDPs) arriving at UNMISS bases soon became a flood. Within days, there were tens of thousands of IDPs seeking refuge at the UNMISS compounds in Juba, Bentiu, Malakal, Bor, Melut, Nassir, and Wau as the fighting spread across the country.¹² In what is understood as a watershed decision by the UN, UNMISS opened its gates and offered temporary sanctuary to the IDPs, acting on the basis of its mandate to protect civilians under threat of physical violence. In effect, UNMISS became the de facto authority over several new vast settlements. The new settlements were quickly designated protection of civilians (PoC) sites to distinguish them from typical IDP camps.¹³

Peace talks under the regional Intergovernmental Authority on Development culminated in an agreement, the Agreement on the Resolution of the Conflict in the Republic of South Sudan (ARCSS), in August 2015. The warring sides made stilted efforts to implement aspects of the agreement, including a return to Juba for the exiled Machar and the SPLA-IO. However, this was short-lived; in July 2016, confrontations between the government factions and the SPLA-IO forces erupted again; first in Juba, then spreading to other parts of the country, this time including the country's southernmost Equatoria region, which had up to that point been spared from most of the violence.

South Sudan's population of IDPs and refugees grew further and the humanitarian crisis deepened. The number of warring parties increased as the conflict further fragmented and bled into new territory, mutating into multiple concurrent conflicts rather than one civil war between two clearly defined sides. Peace negotiations resumed in Addis Ababa between the warring factions, eventually producing a new agreement, the Revitalized-ARCSS (R-ARCSS) in September 2018. Though the 2018 deal ostensibly reconciled the two main belligerents – Kiir and Machar – under the auspices of a new unity government, the agreement did not include all of the warring factions.¹⁴

In principle, the R-ARCSS has continued to hold, at least in Juba, though conflict has continued across much of the rest of the country, driven by many of the same factors that lay at the heart of the civil war. In addition, the overall implementation process of various key components of the peace agreement has faltered. Significant outstanding points of contention include the failure to fully implement measures related to demobilizing the vast armed factions that have participated in the conflict, and organizing elections. An absence of the rule of law and functioning institutions persists. At the same time, a significant uptick in so-called "intercommunal" violence, driven largely by political actors, has surfaced across the country, exacerbated by the creation of new centers of power under the 2018 deal and new incentives to fight over territory.

Economic and Development Challenges

The fighting that began in 2013 destroyed many of the modest developmental gains made during the CPA and post-independence periods. A shortage of recent and comprehensive data sets makes it difficult to accurately quantify the impact of the conflict on South Sudan's developmental progress over the last decade. However, what is clear is that infrastructure remains critically lacking. In key cities such as Malakal and Bentiu, which were repeatedly attacked by the warring parties, destruction has been near-absolute. The vast majority of the economy remains reliant on pastoralism and small-scale agriculture, which is highly vulnerable to both conflict and environmental shocks.¹⁵

The conflict has severely disrupted domestic economic activity, making its population heavily reliant on imports of basic foodstuffs, fuel, and manufactured items, as well as on emergency relief. South Sudan has only one tarmacked highway connecting it to a neighboring country, the Nimule highway between Juba and Uganda, which was constructed during the CPA interim period. Transport conditions have become even more challenging, as this road and many others, as well as the arterial Nile waterway, became highly insecure, hosting a multitude of different checkpoints and blockades by armed groups. This in turn has exacerbated food insecurity and dramatically increased market prices and the cost of humanitarian distribution.¹⁶

The fighting that began in 2013 destroyed many of the modest developmental gains made during the CPA and post-independence periods.

Hyperinflation has compounded South Sudan's economic challenges, triggered by dwindling oil revenues that reduced the availability of previously abundant U.S. dollars (USD). The government initially pegged its national currency, the South Sudanese pound (SSP), to the USD, which could be used to pay for key commodities for the import-dependent country. As the official supply of dollars fell, the price of dollars on the black market rose and the price of goods also increased.¹⁷ In 2015, the national currency was floated, leading to rapid depreciation and rendering food and other imports even more unaffordable.¹⁸ At the same time, the sharp drop in oil revenues and production since 2013 led the government to finance its deficits by borrowing from the Central Bank and by printing money, which further contributed to inflation. In the two-year period between December 2015 and December 2017, the official consumer price index rose by a staggering 1,100 percent.¹⁹ From 2016 to 2017 the rate of inflation was 187.85 percent. Since then, the inflation rate has calmed somewhat; from 2021 to 2022, the inflation rate decreased to a still-high 16 percent.²⁰ Among other concerns, high inflation has perpetuated the country's dependence on international aid. Official development assistance, which averages around 1.5 billion USD annually, is estimated to be around three times the size of South Sudan's national budget.²¹

Oil Dependency

South Sudan possesses the third-largest known oil reserves in Africa, after Nigeria and Angola.²² At independence in 2011, 98 percent of South Sudan's annual budget came from oil revenues. The country's oil production peaked at over 300,000 barrels per day at independence, but has since decreased to half that, in part due to the conflict. The GoSS projects that oil production will continue to halve roughly every five years.²³ In December 2013, the average price of Brent crude oil was just over \$110 per barrel; global prices began to drop sharply in mid-2014, averaging around \$50 per barrel through 2015 to 2017. Prices have increased since, with recent spikes caused by the Russian invasion of Ukraine, which brought the price of Brent crude to around \$90 per barrel in September 2022, with further increases following an OPEC+ deal in early October 2022.²⁴

However, the specific Dar blend of crude oil from South Sudan's Upper Nile fields trades at a discount on the international market because of its lower quality. Furthermore, the Juba government must pay other costs (for example, profit-sharing and processing fees) to the oil companies in addition to expensive pipeline transit fees to Khartoum. These fees have remained static, making them disproportionately high during times when oil prices have fallen.²⁵ As such, while oil production remains the government's primary source of revenue, it has brought in relatively little income since 2014.

Although the constitution mandates that 5 percent of oil revenues should be disbursed to oil-producing states and counties around South Sudan, little appears to have reached those locations.²⁶ Much of the remaining oil revenue is highly susceptible to diversion before it reaches the national budget. GoSS expenditure reports are typically late and incomplete, and the GoSS did not even publish a budget for the 2020-2021 financial year.²⁷ South Sudan's state-owned oil company, Nilepet, is mandated to manage every aspect of South Sudan's oil supply chain: extracting, selling, and exporting oil, while also re-importing and distributing refined products such as diesel and petrol.²⁸ Nilepet is reported to regularly receive tens of millions of dollars in oil revenues from oil-producing companies and the government, but these allocations are seldom disclosed and have never been audited.²⁹ According to Global Witness, Nilepet is largely controlled by loyalists of President Kiir and the head of the country's notorious National Security Service, and bankrolls parts of South Sudan's military and war effort. Through Nilepet, salaries for "ghost workers" and kickback deals for contractors add up to billions of dollars of oil revenues that are diverted.³⁰

Beginning in 2012 as a consequence of the voluntary closure of its oil production, the GoSS began taking out large cash loans from international banks, in exchange for the future production of oil. The Sentry reported on South Sudan's "letters of credit" corruption scandal, whereby between 2012 and 2015 the GoSS received a credit line – in the form of letters of credit – of nearly 1 billion USD from Qatar National Bank and CfC Stanbic Bank in Kenya to support efforts to import much-needed fuel, food, and medicine.³¹ In reality, multimillion-dollar contracts were awarded to foreign companies, shell companies, and middlemen. Businesses with connections to the ruling elites – including President Kiir's own family – were among those that received contracts under the program, while essential pharmaceuticals, fuel, and food were not delivered. Nilepet was reported to be a conduit for some \$300 million of nontransparent letters of credit intended for fuel purchases under the program.³² Since then, lower global oil prices meant that more oil production was needed to pay off the same amount of debt, further depleting the country's bank balance for future years.³³

Since 2020, the International Monetary Fund (IMF) has released hundreds of millions of dollars in budgetary support to South Sudan to help shore up its national finances. In the short to medium term, this IMF funding, alongside climbing oil prices (in part a response to the war in Ukraine) has given South Sudan a degree of financial reprieve. However, in the long term, declining oil production, limited foreign reserves, and massive high-risk debts, mean that the country's financial outlook remains bleak.³⁴

South Sudan's security sector will be particularly impacted by dwindling oil production and revenues. The country's elites are already facing the early stages of a downturn in the country's oil-dominated economy. Since the 2005 CPA, South Sudan's oil revenues have facilitated the absorption of various militias and rebel groups into formal security structures, and sustained its vast military and civil service payroll. However, the net reduction in oil funds has begun to impose significant financial limitations on the sprawling formal and informal security sector and the ability of elites to buy off opponents, with worrying implications for the future.³⁵

Growing Impacts of Climate Change

South Sudan is highly climate-vulnerable and continues to be severely impacted by environmental shocks, in part due to climate change, as a majority of the population (about 95 percent) depend on climate-sensitive livelihood systems whose reliability and productivity are changing under the local impacts of climate change. Localized destruction associated with conflict (see case studies below) has contributed to and compounded this vulnerability by keeping communities on the precipice of renewed conflict, especially where there are existing tensions, and amplifying ongoing conflicts over natural resources. Like many underdeveloped countries, South Sudan contributes very little to global greenhouse gas emissions, and yet it is among the most disproportionately affected by climate change. South Sudan had its worst flooding on record in 2021, impacting more than 835,000 people.³⁶ The floods were preceded by three years of record highs in rainfall, as well as surface flows from neighboring countries, that caused rivers to overflow and inundate the largely low-lying terrain. The flooding of farmland prevented people from cultivating, decimating subsistence farming and greatly exacerbating food insecurity. At the same time, livestock grazing areas have also been constricted by the floodwater, causing the deaths of an estimated 800,000 livestock.³⁷ In some areas, the floodwaters have still not receded. According to the UN High Commissioner for Refugees (UNHCR), the impacts have been most dire in the Greater Upper Nile region, where thousands of people have been displaced and others survive on mud islands, further isolating the region's already remote rural communities.³⁸ In early 2021, swarms of desert locusts, which had for months been ravaging crops and grazing land across the Horn of Africa, crossed into South Sudan, further compounding food insecurity.³⁹

Decades of deforestation and desertification have degraded vegetation coverage across the country. In recent years, these patterns have likely escalated as a result of conflict. Illegal logging of South Sudan's teak forests has become a key source of income for some of the country's armed factions in the recent civil war.⁴⁰ More pervasively, firewood cutting and charcoal production have critically reduced tree cover.⁴¹

Firewood and charcoal remain the primary fuel for cooking across South Sudan, where the use of kerosene is almost nonexistent, because – unlike many other African governments – the GoSS does not subsidise kerosene imports, and kerosene stoves are very expensive to buy.⁴² While the production of and trade in charcoal is widespread, the sector is entirely unregulated, has become highly militarized as soldiers use it to supplement their income, and has escalated competition and conflict over land.⁴³ The conflict has also shaped the landscape in other ways. The creation of PoC sites and ad hoc IDP camps housing large populations of displaced and vulnerable people has led to the stripping of vegetation in areas of up to 10 kilometers in radius around these locations.⁴⁴ Insurgent warfare may also have impacted land coverage in the country, as land is cleared at times to increase visibility. Looking forward, as displaced people return from neighboring countries and begin to resettle in South Sudan, there will be further impact on the landscape.⁴⁵

Firewood and charcoal remain the primary fuel for cooking across South Sudan.

Finally, according to the Sudd Institute, oil production and conflict around the oil fields throughout the many phases of war have resulted in significant environmental pollution, through air pollution, blockage of water courses, contamination of surface and groundwater, polluted agriculture and pasture lands, and losses of livestock, wildlife, plant species, and habitat. Of particular concern is the prevalence of toxic “produced water,” a combination of water naturally trapped with petroleum deposits and water injected into the wells to facilitate the extraction of oil from the wells. The resulting water is supposed to be treated before being released into the environment but has become the most ubiquitous source of pollutants in South Sudan. Direct causal evidence remains limited, but research links this pollution to a variety of severe human health issues.⁴⁶

SOUTH SUDAN'S ENERGY SECTOR

Amid this highly turbulent context, there has been limited progress toward a more stable and developed South Sudan. At the same time, the effects of climate change and environmental degradation are being keenly felt. The World Bank estimates that only 7.2 percent of the population of South Sudan has access to electricity,⁴⁷ and disaggregates this figure between urban communities (13.9 percent with access) and rural communities (5.6 percent with access), which further highlights that even in South Sudan's cities and towns, electrical infrastructure remains minimal.⁴⁸ Of the country's limited electricity generation, UNMISS is estimated to account for around 20 percent of total consumption; this is remarkable, and highlights the decisive role that one large international field operation could play in transforming the energy sector in a context like South Sudan. As UNMISS and other large international and national institutions in South Sudan work to transition their own sizable energy footprints to renewable energy, they may also hold the keys to unlocking electrification for South Sudanese communities, mitigating the deeply entrenched and complex conflict ecosystem, and stabilizing the natural environment within and beyond the country's borders. This will have significant implications in meeting the country's ambition of its nationally determined contribution as signatory to the Paris Agreement, under the UN Framework Convention on Climate Change.

Current State of the Electricity Sector

In 2015, the GoSS drafted a National Electricity Bill, which would ostensibly provide for the establishment of a regulatory framework for the generation, transmission, supply, distribution, export, and import of electricity, as well as for system operation and related matters.⁴⁹ The framework covers rural electrification as well as the country's urban centers. However, proposed revisions to the bill have hamstrung progress, and to date the bill remains stuck in Parliament and has not been ratified. As such, South Sudan's electrification process has moved forward without a formal legal framework to govern it.

In practice, South Sudan's electrical infrastructure comprises a city electrical grid in Juba, as well as a handful of other localized grid systems in the other state capitals, supplemented by many thousands of diesel generators used at the household level and by businesses and large institutions. During the Second Civil War (1983-2005), Juba's electricity was supplied by a 5 megawatt (MW) diesel-powered power station, which increased to 12 MW following

The World Bank estimates that only 7.2 percent of the population of South Sudan has access to electricity.

the signing of the CPA in 2005. After the CPA, the GoSS purchased new generators to power the Juba city grid, but these generators broke down in 2012 and were rendered inoperable due to the lack of spare parts and fuel, leading to the shutdown of the power station and city grid in Juba in 2015.⁵⁰ After a renovation, electricity production for the Juba grid resumed in 2019. Since then, it has been run by the Juba Electric Distribution Company (JEDCO), which is a consortium combining the South Sudan Energy Corporation (SSEC) – the national utilities company linked to the GoSS Ministry of Energy and Dams – and Ezra, an Eritrean-owned company. The rehabilitation of the Juba grid was a joint effort; Ezra constructed the Juba power plant in Nesitu, on the outskirts of Juba, which currently produces 33 MW of power from diesel generators, while the electrical distribution transmission lines were funded by the African Development Bank (AfDB) and handed over to JEDCO. Ezra purchases diesel to run the power station and maintains the power station.⁵¹ Indeed, the cost to consumers for electricity from the Juba grid is the most expensive in East Africa, at \$0.44 per kilowatt hour (kWh) for commercial users and \$0.316-0.336 per kWh for domestic customers, as of September 2022.⁵² (By way of comparison, reporting from May 2021 found that neighboring Kenya's cost per kWh was \$0.092 and Uganda's was \$0.07.⁵³)

South Sudan's weak currency proves a challenge in this regard. JEDCO sells power to consumers on the grid, charging in SSP. At the same time, JEDCO pays Ezra in USD for the electricity produced. The Central Bank of South Sudan is supposed to set aside \$3 million every month that JEDCO can exchange for SSP to pay Ezra. In the event that the Central Bank does not have sufficient dollars set aside for this, JEDCO has to exchange its SSP for dollars on the black market, where it is charged a higher rate.⁵⁴ This occurred in early 2021, when Ezra threatened to shut down the Juba grid because the GoSS had failed to pay the company in full in USD for more than 15 months.⁵⁵ According to a quarterly report from the Ministry of Energy and Dams, JEDCO sold the SSP equivalent of \$24,712,776 through the Juba grid to consumers in the city between April and July 2022. Notably for this research, UNMISS is at present in the early stages of exploring a pilot to connect to the JEDCO grid.

South Sudan's electricity sector is almost entirely reliant on diesel, (and) all diesel used in the country has to be imported.

There are a small number of localized grid systems elsewhere in the country that are operational to varying extents, including:

- **Malakal.** Prior to 2013, Malakal – one of the three former regional capitals of South Sudan – was the site of a relatively well-connected grid system supplied by diesel-powered generators, covering around 40 percent of the town.⁵⁶ However, this grid was destroyed in the civil war, as Malakal town was repeatedly attacked and retaken by the government and opposition forces.
- **Renk.** Through a pre-independence arrangement, Renk remains connected to Sudan's grid, receiving power from the Roseires Dam in Damazin through a power interconnection sale agreement. In addition, a South Sudanese engineering firm, KANO, constructed a 30-km Renk-Birka-Ajab overhead transmission line in 2010, for the purpose of agricultural irrigation.⁵⁷
- **Melut.** As a community development project, Melut receives power from the Paloch oil field power plant, and has more than 40 km of grid network within the town.⁵⁸
- **Kodok Town.** Bordering Sudan's South Kordofan province, Kodok Town has a 12-km grid network previously served by diesel generators. It is not currently operational as a result of the conflict.⁵⁹
- **Wau.** Wau previously had a local electrical grid, which is not currently operating because costs were too high and because the infrastructure needs rehabilitation. Trinity Energy is working on the rehabilitation required to restore the grid to operation
- **Bor.** In 2007, the Egyptian government sponsored the construction of a power plant in Bor, but by 2012 this had ceased operating because of high costs. Since 2018, power has been generated intermittently.⁶⁰
- **Equatoria.** In the Equatoria region, the U.S. Agency for International Development supported the development of minigrids in the towns of Yei, Yambio, Maridi, and Kapoeta, though this process appears to have stalled and the limited infrastructure that was completed is no longer operational as a result of the 2013 conflict.

Private Sector Electrical Provision

South Sudan's electricity sector is almost entirely reliant on diesel, which powers household generators, the Juba city grid, and almost everything else in between. Despite being a major oil producer, South Sudan at present lacks the capability to refine diesel from domestically produced oil, and therefore all diesel used in the country has to be imported. Plans to develop diesel refineries at several oil fields around the country have been discussed for several years, but progress has stalled due to the ongoing conflict. In Bentiu, a diesel refinery operated by Nilepet is

apparently the closest to being commercially operational. A persistent obstacle is the lack of transport infrastructure to move diesel from Bentiu to Juba and elsewhere around the country, as there is no direct road connection, and the Nile River route would need dredging and remains highly insecure.⁶¹ Other diesel refinery developments have been initiated, such as in Melut, though progress was halted in 2015 as a result of the conflict, and has not resumed. South Sudan's Dar-blend crude oil is also expensive to refine, and diesel refined from it would not necessarily be competitive with the price of imported diesel.⁶² Notably also, South Sudan's oil production in itself requires massive amounts of energy, adding further pressure to consume huge volumes of diesel.

For these reasons, South Sudan continues to rely on imported diesel to run its generators and meet its other energy needs. In general, diesel imported from the Gulf countries is procured in Mombasa, Kenya, by South Sudanese government agencies, and then trucked overland through Uganda and up to South Sudan at the Nimule border crossing, the only port of entry through which fuel is supposed to enter the country.⁶³ Imported fuel is recorded and taxed by GoSS customs officials in Nimule.

Until 2018, Nilepet subsidized fuel sold in South Sudan, with diesel prices fixed at 22 SSP per liter. While in theory this made diesel very affordable for consumers, in practice it led to the ballooning of the diesel black market. Fuel was purchased and imported by Nilepet using USD, then sold at the subsidized prices to traders. These traders in turn sold fuel at a highly escalated price to consumers, who would often have to queue for hours outside of fuel stations.⁶⁴ After the Nilepet subsidies were removed and private-sector traders were allowed to import fuel, South Sudan's fuel market became unregulated and consumer prices rose in line with market value. Since then, the number of new diesel import and trading companies of all sizes – a mix of South Sudanese and foreign-owned – has exploded in South Sudan. One larger fuel importing company suggested that there were at least 60 different companies in the highly competitive sector, though it was difficult to be sure because the sector remains disorganized.⁶⁵

UNMISS and several large humanitarian agencies in South Sudan obtain their diesel through a separate route. They rely on their own supply chains to procure diesel and are exempted from paying taxes to the GoSS when the fuel enters the country.⁶⁶ For UNMISS, this arrangement is codified in the status of forces agreement signed with the government, which recognizes “the right of UNMISS, as well as of contractors, to import ... free of duty, taxes, fees and charges and free of other prohibitions and restrictions, equipment, provisions, supplies, fuel, materials and other goods ... which are for the exclusive and official use of UNMISS”⁶⁷

Regional Electricity Connection

The GoSS has concluded several agreements with neighboring countries to buy and transmit electricity across its borders into certain parts of the country, though these arrangements are currently limited to border-adjacent towns. As previously mentioned, Renk town currently receives power from Sudan's Roseires Dam in Damazin, and there are plans to extend the transmission lines down to Malakal in the future.⁶⁸ As of May 2022, there is a memorandum of understanding (MOU) with Ethiopian Electric Power, Ethiopia's state-owned power company, to sell 100 MW from the Grand Renaissance dam to South Sudan for the next three years, with plans to expand imports to 400 MW eventually.⁶⁹ An agreement to purchase electricity from Uganda is apparently now in the advanced stages, with a feasibility study in process at northern Uganda's Karuma Dam, which is currently still under construction.⁷⁰ However, the full implementation of any of these agreements will require South Sudan to construct and maintain a sizeable regional or national grid if these agreements are to connect more than just border towns to neighboring power supplies, a prospect that seems unlikely in the near term.

Renewable Energy Potential

South Sudan has considerable potential for renewable-energy development. At a basic level, the lack of existing energy services and infrastructure provides a relatively clean slate to begin developing renewable-energy systems. The benefits of distributed renewable-energy minigrids are particularly compelling, as they eliminate the need to construct and expand a traditional centralized grid and circumvent the cost and transport challenges of depending on diesel for power.

South Sudan has strong solar power potential, and consistently receives about eight or more hours of sunshine daily, providing an estimated solar energy capacity of 436 W per m² per year, according to the Sudd Institute.⁷¹ This solar sunshine duration meets the threshold required to produce high quality electricity. Likewise, wind energy density ranges between 285 W and 380 W per m², which similarly meets the required threshold for energy generation.⁷² There is also believed to be potential for geothermal energy generation in Eastern Equatoria State, though this is yet to be extensively explored.⁷³

Indeed, demand for solar energy in Juba is growing. According to a representative from the Ministry of Energy and Dams, a project is underway to develop solar electricity production in Nesitu, Juba, which will provide an additional 20 MW for the Juba grid, though public information about the nature of this contract remains unclear.⁷⁴ In late October, the Under Secretary of the Ministry of Environment announced, via Twitter, the construction and approval of two new solar projects just outside of Juba, of 30 MW and 24 MW, respectively.⁷⁵ Aptech Africa also announced the completion of a new 12 MW solar project near Juba, built on behalf of Ezra.⁷⁶ The Sudd Institute also found that an increasing number of households in Juba have started using small solar-energy systems.⁷⁷

South Sudan hosts a long stretch of the White Nile, making it potentially suitable for hydroelectric power generation. In the post-CPA period, electrification plans centered around the construction of several Chinese-led megadams in Eastern Equatoria, projects that never materialized.⁷⁸ Before 2013, plans were also underway to develop a hydroelectric power plant in Fula, near Nimule on the border with Uganda, which was anticipated to generate 42 MW of power for Juba. As of 2012, it was hoped that the hydroelectric plant would generate an additional 300 MW for South Sudan.⁷⁹ All of these proposed projects have been on indefinite hold due to the specter of renewed conflict.⁸⁰ Dam construction and hydroelectric development demand massive upfront financial investment, which has remained elusive and would take at least a decade to complete.⁸¹

There are a handful of solar companies that operate in South Sudan, mostly headquartered in Juba. These include regional companies, such as Aptech Africa (out of Uganda) and Go Solar (out of Kenya). SunGate Solar, headquartered in Wau, is one of the few operational South Sudanese solar companies. SunGate recently commissioned a small solar minigrid in Wanyjok, Northern Bahr el Ghazal, which it believes to be the first solar minigrid operating in the country.⁸² South Sudan's solar sector is still nascent, and these companies mostly function as engineering, procurement, and construction companies – meaning that they procure and install solar systems for paying customers. This contrasts with the trend in other similar markets in the region and across Africa, where solar minigrid companies finance and build larger systems that they own and operate, and from which they sell the energy to consumers.

South Sudan's energy sector is held hostage to the same problematic forces that shape every other aspect of the country's society and economy: a weak currency with acute vulnerability to international fluctuations; dysfunctional governance, corruption, and mismanagement; pervasive and seemingly intractable conflict and violence; and flagging oil production and revenues. Given the political deadlock in the country, there is little reason to expect change or progress in the energy sector to be driven by the government. When considering and

advocating for South Sudan's electricity sector to shift toward more renewable-energy sources, policymakers must anticipate challenges associated with the sector's turbulence, opacity, and, in particular, the vested interests in maintaining the diesel-dependent status quo.

External Fluctuations and Currency Issues

As South Sudan's electricity production relies almost exclusively on imported diesel, the country's energy sector is highly exposed to shocks or fluctuations in global energy prices, which are entirely beyond its control and unstable. At a direct level, fluctuations in the cost of imported diesel have immediate impacts on both state-backed and private electricity access to diesel in sufficient volumes, and ultimately on electricity generation and access. At the same time, the electricity sector is indirectly impacted, in that South Sudan's economy is heavily reliant on hard currency from oil revenues to purchase diesel and other imports, and these revenues are also dependent on global energy prices.

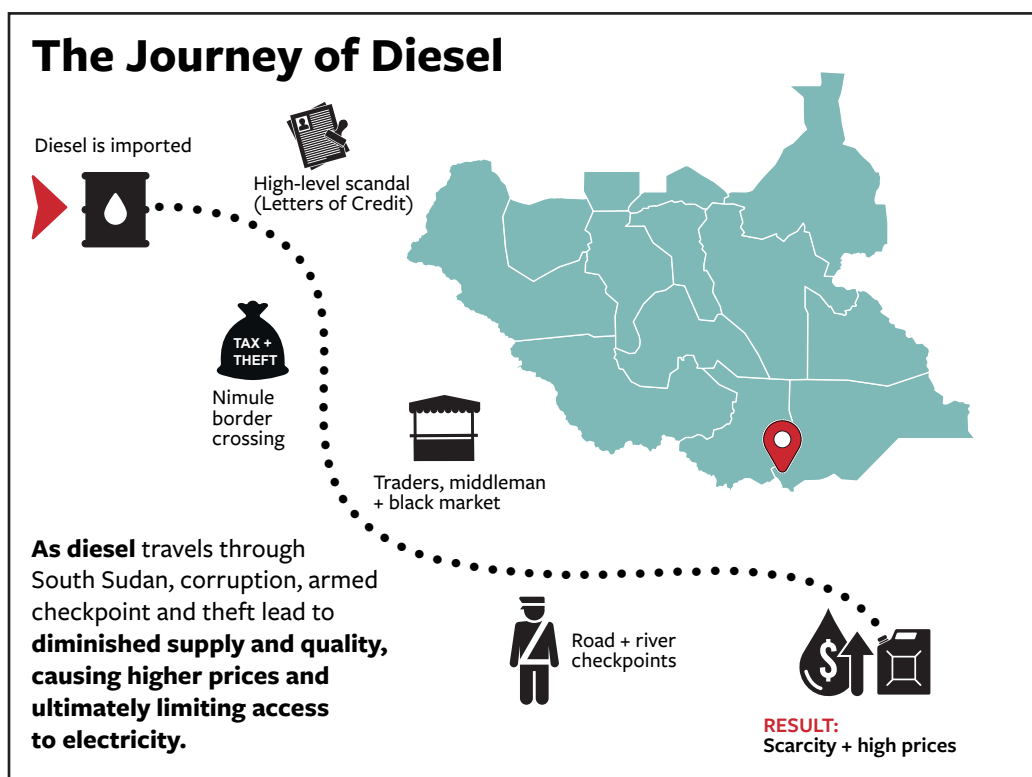
Most pressingly at the time of writing, Russia's invasion of Ukraine in February 2022 has had severe ripple effects on global energy prices, and these have been keenly felt in South Sudan. A representative for the Ministry of Energy and Dams noted that, at the start of 2022, diesel cost around \$1 per liter to import, whereas by August 2022 it cost around \$1.50.⁸³ At the same time, the price of Brent crude oil increased by around \$20 since the beginning of 2022 to October 2022, with the Dar blend typically trading at a few dollars' discount.⁸⁴ Although the increased export prices are good for government coffers, this benefit is offset by increases in the prices of imported fuel, which are keenly felt by the everyday consumer and by the middlemen who require diesel for electricity generation.

Fragmented Government

South Sudan's diesel-dependent domestic electricity sector is murky and lacking in coherence. This can be seen from the involvement of various components of the GoSS and the private sector involved in diesel and electricity provision. The fragmented and divergent interests within the GoSS – whereby some are in favor of a shift to more renewable energy, while some profit from the diesel-reliant status quo – complicate any efforts to move the country away from its dependence on diesel-powered electricity, despite the low levels of energy generation.

Officially, all fuel entering the country should come through the Nimule border point, where it is declared, and taxes should be paid to the GoSS. However, South Sudan's lengthy porous borders mean that a proportion of diesel is brought into the country illegally and informally (and untaxed). The volumes are unquantifiable, though the scale is believed to be relatively minor compared to the volume of diesel brought in through Nimule.⁸⁵ In fact, through collusion and corruption involving local customs officials, a large proportion of fuel coming through Nimule is not fully declared or taxed, with local officials, private-sector players, and other actors profiting instead.⁸⁶ Although the CIA estimates that South Sudan imports 1.2 billion liters of fuel per year, GoSS customs has claimed that only around 1.4 million liters is declared and taxed at the Nimule border.⁸⁷

While the country's diesel-import sector consists of scores of different companies, it – along with other aspects of the electricity sector – is dominated by one company, Trinity Energy Ltd.⁸⁸ Trinity Energy is ostensibly a private company, but is widely believed to be closely linked to members of the GoSS, though these linkages remain opaque. Trinity Energy's contract to rehabilitate the electrical grid in Wau has seen little progress since being signed in 2019, hampered by a failure of communication and technical consensus between the company and the relevant national and local authorities, which is indicative of the disjointed approach of the government and private-sector partners within this sector.⁸⁹



Checkpoint Economy

Further downstream, other ways in which South Sudan's fragmented and competing authorities profit heavily from diesel supply chains countrywide can be seen. Our research in Bentiu, Malakal, and Wau,⁹⁰ along with research conducted by the Danish Institute for International Studies (DIIS), found that the prevalence of road and river checkpoints across the country permits both government and opposition military forces to profit from the transport of diesel and other key commodities around the country. South Sudan's "checkpoint economy" is fluid, shaped by wider conflict dynamics and territorial control shifts between the warring parties, and has grown dramatically since 2011. Many checkpoints operated by the government are in reality manned by a multiplicity of different units and actors associated formally or informally with the state security apparatus. Payment at checkpoints is often accompanied by varying degrees of harassment by the actors in charge. While some checkpoints are officially mandated by the government, in reality the distinction between "official" checkpoints and unofficial checkpoints is often unclear, and receipts or formal documentation are seldom offered following payment.⁹¹

Along the 192-kilometer tarmac road between Nimule and Juba, the country's main import supply route for diesel and other goods, year-round taxation of traffic by some 15 different checkpoints was reported to provide the single-most important stream of checkpoint revenues in the entire country.⁹² The number and composition of these checkpoints is determined by local security dynamics, by rivalry between different administrative levels within the government over the profits that can be extracted along the road, and by rebel groups and communities excluded from these rents.⁹³ The checkpoints along road and river routes between Juba and South Sudan's more heavily-contested areas, especially in Greater Upper Nile, are indicative of the insecurity and ethnic dimensions of the conflict. Our research in Bentiu and Malakal, in particular, revealed the high level of risk for those involved in transporting and trading diesel around the country.⁹⁴ Outbreaks of violence or shifts in the conflict dynamics immediately impinge on the ability of diesel distributors to transport diesel to places like Malakal and Bentiu, acutely impacting access to and prices for diesel and, therefore, electricity.⁹⁵

Many checkpoints serve as a means to supplement deflated, delayed, or nonexistent salaries for soldiers, and provide a means to maintain the army's presence across the country on the basis of "decentralized self-financing." At some checkpoints, tax collection also appears to be driven by wealth-seeking on the part of commanders, with anecdotes suggesting that checkpoint taxes seem to travel up the "food chain," with commanders and generals pocketing a disproportionate amount of the revenues collected at the road or along the river.⁹⁶ The DIIS research argues that checkpoints have formed an exceedingly important self-help strategy for agents of the "official" government at a time in which more and more state resources are funneled directly to unofficial militia or security units loyal to specific elite individuals at the expense of the regular armed forces and civil service.⁹⁷ The DIIS research concluded that checkpoints likely form the biggest non-oil source of cash for government agents and security forces.

The transport and trade sector, of which diesel is a major component, is therefore thoroughly implicated in financing conflict actors.

By extension, it argues that the transport and trade sector, of which diesel is a major component, is therefore thoroughly implicated in financing conflict actors. It should be noted that humanitarian agencies, including parts of the UN system such as the World Food Programme, are not exempted from these "informal" checkpoint taxes when transporting goods (including fuel) around the country, even if they are officially exempt from duties at the Nimule border.⁹⁸

Dwindling Oil Revenues

According to the Armed Conflict Location & Event Data Project (ACLED), South Sudan is among the first of Africa's oil-producing nations to experience a curtailment of its oil production and revenues; as explained earlier in this report, these stem from interruptions caused both by political decisions and armed conflicts. ACLED argues that these shutdowns "have shortened the productive lifespan of South Sudan's oil fields, and have increased the cost and desirability of doing business with South Sudan's complex oil network⁹⁹. This will deter investment needed to raise production from existing oil fields, and likewise deter particularly expensive and risky exploration activity that will be required to find new oil fields."¹⁰⁰ Moreover, even without the war, ACLED poses that South Sudan would likely have been among the first casualties of a global energy transition as a result of its relatively poor-quality Brent crude oil and its history of political volatility.

This matters for South Sudan on many levels, not least because the current leadership had used its petro-dollars mainly to buy off rivals and build up a sprawling military infrastructure. Oil has allowed the South Sudanese elite to operate largely autonomously from the general public, obviating the necessity to rely on the public for taxation income.¹⁰¹ But, with ever declining oil revenues in recent years, the country's ruling elite increasingly has to utilize other forms of reward, such as appointments to state governorships and other lucrative subnational positions, to maintain the cooperation of groups and actors.¹⁰²

Across the country, the ongoing or impending reduction of oil revenues has already driven a "reorganization of conflicts around non-oil resources (including land, gold, and teak)."¹⁰³ While further research is required on this emerging set of dynamics, a number of new patterns are identifiable. For instance, within the checkpoint economy, the DIIS research estimates that road and river checkpoints have multiplied by some 300 percent countrywide since 2011, which is attributed in part to the effect of plummeting oil revenues and the ensuing increase in efforts to raise non-oil revenues, as well as the wider economic crisis and increasing levels of poverty since independence.¹⁰⁴ Another illustration of this shift was observed in Wau, where political leaders have begun

appropriating large pieces of land and leasing them out as compounds, complete with diesel-powered generators, to nongovernmental organizations (NGOs) to base their operations, effectively feeding into this emerging form of local conflict economy.¹⁰⁵

More broadly, the role of NGOs and the international community may become ever more relevant, in a context where the support they provide to South Sudan will continue to outstrip South Sudan's domestic revenue generation from oil. In this light, the stance that the UN and other large agencies and institutions take vis-à-vis South Sudan's energy sector and other aspects of its evolving economy and politics as its oil revenues diminish further, will be even more crucial.



UNMISS visit to Warrap state. Zen Yin, UNMISS

CASE STUDIES

Malakal¹⁰⁶

Malakal, the capital of Upper Nile state, was one of the cities worst hit by the 2013 conflict. Before the war, more than 700,000 people lived in this town, comprising coexisting communities of Dinka, Nuer, Shilluk, and other groups. The conflict quickly split communities along ethnic lines, and tens of thousands had to flee for their lives to neighboring Ethiopia and Sudan or to the UNMISS base approximately four kilometers from the town, which became host to a major PoC site. As a regional capital close to one of the country's oil-producing areas, Malakal has been the site of some of the most intense and recurrent fighting since 2013 as the warring parties contested territorial control of the area. Amid the violence, much of the town's limited infrastructure, including its electrical grid, has been destroyed. To date, Malakal's displaced population and the (re)development of the town have remained hostage to the dynamics of the war. Despite the 2018 peace agreement, several militant factions have continued to fight for control across Upper Nile state. In particular, fighting over territorial control and ownership on the east bank of the Nile remains a key stumbling block to peace in the state.

The PoC site's population has hovered between 25,000-50,000 since 2013, though this is constantly in flux as the waxing and waning of conflict in the wider area drives successive waves of returns and re-displacement. Besides security concerns and destruction as a direct outcome of the fighting, communities in the PoC site are reluctant to return to their home areas because of flooding and the lack of basic services. In this context, the critical need to protect civilians remains, and UNMISS has not been able to reclassify the Malakal PoC site as an IDP camp (under government authority), as it has been able to do elsewhere in the country.¹⁰⁷ Even the PoC site itself has seen violence and destruction; militia groups have attacked the camp, and within the site, resident communities aligned to rival factions in the conflict have clashed. As recently as August 2022, an estimated 20,000 people in Upper Nile were displaced again by conflict, including several thousand who moved into the Malakal PoC site, escaping clashes between factions loyal to SPLA-IO commander Simon Gatwech, Shilluk leader Johnson Olonyi, the GoSS military (which was rebranded, following the R-ARCSS, as the South Sudan People's Defence Force, or SSPDF, instead of the SPLA), and some other unidentified armed groups.¹⁰⁸



A commercial power generator supplying clubs, shops and houses in Malakal IDP camp. *Peter Bath Nyol.*

Energy Infrastructure

Malakal had a functioning local grid prior to South Sudan's independence, providing the town and residents with affordable power. After the CPA, the town expanded significantly, as people who fled during the second civil war returned. The grid did not cover the new suburbs, and it was difficult to maintain an adequate supply of diesel to accommodate the increased demand on the grid, resulting in frequent power cuts. As a result, people began to rely on small diesel-powered generators to access electricity. With

the eruption of conflict in 2013, generators were looted or deliberately vandalized as the town changed hands between government forces and the SPLA-IO. When the violence abated somewhat in late 2016, traders – mostly from Sudan – imported new generators into Malakal. Local businesses then sold electricity to clubs, phone charging centers, and households who could afford it. Diesel reaches Malakal both from Juba via the Nile, and from Sudan via Renk. Meanwhile, some families with means have been able to purchase their own small-scale solar systems. Humanitarian organizations, some businesses, and government offices in Malakal have access to electricity, mostly relying on diesel generators as well as some personal solar home systems. The Malakal teaching

hospital, currently operated by Medecins Sans Frontieres (MSF) and the International Medical Corps, has limited access to electricity through a combination of solar panels and diesel generators. The hospital will soon be receiving a new 50 kW solar system, funded by the International Organization for Migration (IOM) via Peace Renewable Energy Credits (P-RECs) earned from the IOM's 700 kW solar plant at Malakal Humanitarian Hub.¹⁰⁹

UNMISS relies on diesel generators for its own requirements in the Malakal base, while also receiving power from the Humanitarian Hub solar plant. Within the UNMISS PoC site, the majority of residents do not have regular access to electricity. Instead, they rely on small kiosks in the market areas of the site to charge their phones from small generators for a fee.

Checkpoints

The Nile River transport route for fuel and other goods to Malakal is littered with checkpoints at which passing boats, including barges carrying fuel, have to pay fees and sometimes in-kind fuel to the armed officers manning the checkpoints. The checkpoints move, multiply, and change hands frequently, reflecting the shifting territorial control of the warring parties, and therefore fall prey to the ongoing fighting between the SSPDF, the SPLA-IO, and other armed factions. The river route is periodically blocked entirely, starving Malakal of fuel and other vital goods. Between Malakal and Juba there are some 38 checkpoints, all of which must be paid an amount ranging from 100,000 SSP to 1 million SSP (equivalent to between \$154 and \$1,540 in September 2022). As of September 2022, 17 of these were controlled by the government forces, two by Shilluk Agwelek forces, and the remainder by a mix of forces loyal to Machar's SPLA-IO faction and other armed groups. As of September 2022, there were around 10 checkpoints between Renk and Malakal along the river. These charged roughly 5,000 SSP (around \$8) from World Food Programme humanitarian barges, whereas from commercial barges carrying fuel and other consumer goods they demanded at least 100,000 SSP (around \$154).

Even UNMISS barges with UNMISS force protection are held up at checkpoints. In August 2022, a Tristar fuel barge supplying UNMISS in Malakal was detained and held hostage by the Shilluk Agwelek forces for nearly one day in Tonga, Upper Nile, despite the presence of a contingent of peacekeepers onboard. There remain ongoing attempts by various forces along the Nile to extort fuel and food items from the UN.

The checkpoint fees, coupled with the ever-declining value of the SSP and rising fuel prices globally, have pushed local diesel prices extraordinarily high for ordinary consumers and public services such as health care providers in Malakal. In the last year alone, local prices for diesel have more than doubled. For example, a 200-liter drum of diesel is sold to vendors by wholesalers for 450,000 SSP (equivalent to just under \$800 in September 2022). The vendors in town and at the POC site sell a 5-liter container of diesel for 12,000 SSP (\$19). Local generator operators sell electricity to consumers for their shops, homes, and cafes. A house with one TV and electric bulbs is charged 1,500 SSP (\$2.30) for a morning's use (from 8 a.m. to 12 p.m.). The generator is switched off for a few hours before it is turned on again in the evening from 4 p.m. to 9:30 p.m. Phone charging centers are charged between 1,500 and 2,000 SSP per day.

The checkpoint fees, coupled with the ever-declining value of the SSP and rising fuel prices globally, have pushed local diesel prices extraordinarily high for ordinary consumers and public services such as health care providers in Malakal.

Wau¹¹⁰

Wau, the capital of Western Bahr el Ghazal State, is the second-largest city in South Sudan, home to mixed South Sudanese communities as well as a business community from across East Africa. The current conflict in Wau began in 2012, when the Fertit youth from Wau county resisted an administrative order by then governor Rizik Zakaria Hassan (now National Minister of Wildlife and Tourism) to move the county headquarters. In December 2013, the broader national conflict spilled into this area, eventually triggering rebellion of some local forces including the Fertit youth, and resulting in local tensions and armed confrontation between the SPLA-IO and government forces. Targeted violence against civilians led UNMISS to establish a PoC site at its Wau base in 2016. During successive waves of conflict, local infrastructure, including generators, were looted and destroyed, and illegal logging and charcoal burning by the armed factions increased. The 2018 R-ARCSS helped to de-escalate conflict in the area, though some political tensions persist. In 2021 UNMISS reclassified the Wau PoC site as an IDP camp, though the majority of its residents have remained, citing continued insecurity and destruction of livelihoods as preventing returns to their home areas. As of September 2022, SPLA-IO forces continue to control the vast majority of Wau county.

Electrical infrastructure in Wau is currently limited. The large Naivasha IDP camp has no public electricity access for communities, other than a few solar streetlights that are reportedly mostly broken. There is a power station along the Jur River east of Wau town that belongs to the SSEC, installed in 1983. Intermittent fuel supply and a lack of spare parts has resulted in limited energy supply in previous decades, and in 2011 the power station ceased operating entirely as a result of supply problems. In 2019, Trinity Energy signed an MOU with the Ministry of Energy and Dams to rehabilitate and upgrade the Wau power station. To date, the power station has not yet resumed operation, facing continued problems due to a lack of spare parts, key construction materials, and a lack of technical consensus between the company and relevant national and local authorities. According to the SSEC, only between 20 percent and 30 percent of the town is connected to the (nonfunctioning) grid.

Since 2011, local residents, businesses, and NGOs have relied on generators as well as some small solar home systems, though these sources of power are only affordable to a small minority. The two local hospitals, government offices, and security bases can only afford to run diesel generators for a few hours per day. The majority of schools have no supply of electricity. During the recent conflict, insecurity on the Juba-Rumbek-Wau road, checkpoints controlled by multiple different security forces, and the poor condition of the road (which is often impassable during the rainy season), have all hindered the transportation of diesel to Wau. In early 2022, a liter of fuel cost 480 SSP at the fuel station and 800 SSP on the black market. As of August 2022, the prices of fuel have roughly doubled, ranging from 1,000 to 1,200 SSP (\$1.54 to \$1.85) at the fuel stations, while black market prices range from 1,400 to 1,500 SSP (\$2.15 to \$2.30).

Bentiu¹¹¹

When the war began in December 2013, violence spread to Bentiu in Unity State almost immediately, bringing with it some of the worst destruction in the country. People who were living across Unity State were displaced to the UNMISS PoC site in Bentiu. The fighting razed homes, roads, schools, health facilities, government buildings, and businesses. Livelihoods of most people were wiped out as livestock were looted, and farmland, fishing facilities, and transport routes were destroyed. Forests were burned and water sources contaminated. UNMISS reclassified the Bentiu PoC site as an IDP camp in 2021. However, the returns of the IDP communities to their home areas have been limited and challenging. In August 2021, Unity State experienced the worst floods since the 1960s, which re-displaced people who had returned to their home areas and newly displaced many more. The flooding also raised concerns about the contamination of floodwater from the Bentiu oil fields. Bentiu's IDP camp is currently South Sudan's largest, housing more than 120,000 people. Insecurity persists in the Bentiu area, as actors on both the government and opposition sides drive political tensions, including by mobilizing armed youth



Bentiu power station, destroyed in the civil war. *Thudan Gai Majiok*

to attack rival communities, while gang criminality and a high prevalence of weapons are chronic.

Bentiu's energy infrastructure has been directly impacted by the conflict. In 2008 a power station was constructed in Bentiu with the support of Chinese oil company GPOC to supply Bentiu town with electricity. When the conflict began in 2013, the generators were looted and the station was destroyed. No plans to rebuild the power station have been announced. People in Bentiu depend entirely on diesel generators operated by traders. The hospital relies on its own generators, while the office of the state governor has been equipped with solar panels that supply power, but there is

no electricity for other local government offices. The military bases do not have electricity. A small minority of households, considered to be relatively affluent, have purchased small solar panels for their homes. In the vast IDP camp, diesel generators are operated in the markets by local traders and supply shops, businesses, and phone-charging kiosks. UNMISS has installed some solar lights in communal facilities, though these are vulnerable to looting. Otherwise, people rely on flashlights and their phones for light.

Diesel reaches Bentiu through a range of means – from Juba and smuggled across the border by traders from Sudan, as well as from people who work for oil companies in Unity and Heglig. The whole road running north from Bentiu through the Unity oil fields is dotted with military barracks. The fuel market is reportedly dominated by powerful actors from both South Sudan and Sudan, who are politically or militarily well connected. Bentiu's diesel supply chains were described as challenging as a result of the lack of road infrastructure, extremely expensive, and involving high risk for those involved. Checkpoints along both the Juba and Sudanese supply routes are manned by armed actors who demand large fees. When the diesel traders finally get their cargo to Bentiu, they are then also heavily taxed by both the state and county governments. For example, a diesel trader described that there are multiple checkpoints between Pankuach and Rotriak, and multiple checkpoints between the Unity oil fields and the UNMISS western gate, each of which demands 35,000 SSP (around \$54) for vehicles transporting diesel to cover "security clearance." All of this affects pricing for the consumer; as of August 2022, 1 liter of diesel cost 1,300 SSP (about \$2) in Bentiu. The price of diesel changes constantly, depending on the availability. If it is scarce in the market, a liter increases to 1,500 SSP (about \$2.30).

UNITED NATIONS OPERATIONS

Against this backdrop sits UNMISS, by far the largest single producer and consumer of electricity in South Sudan, with an estimated total generation capacity of 110.4 MW as of July 2019. The UNMISS-operated electricity infrastructure currently operates in parallel to all other commercial and private infrastructure in South Sudan, and UNMISS receives its own dedicated supply of fuel that is not subject to government taxation, in line with the 2011 Status of Forces Agreement. The efforts within UNMISS to transition to renewable energy must be situated within the broader energy situation in the country. This UNMISS transition represents a unique opportunity to support renewable energy in South Sudan that could also be leveraged to support increased local energy access.

The UN Secretariat is responsible for approximately 60 percent of the total greenhouse gas emissions of the entire UN system, and within the Secretariat the majority of emissions come from the five largest peacekeeping operations deployed in Africa, including UNMISS. The Secretariat has, in recent years, taken several steps to try to reduce the environmental footprint of its missions, including through the announcement, in September 2019, of the UN Secretariat Climate Action Plan 2020-2030 (UNSCAP) and the Environmental Policy for the UN Secretariat.¹¹² UNSCAP established eight Secretariat-wide targets for climate action on carbon emissions,

electricity consumption, renewable energy, air travel, events, climate neutrality, operational efficiencies, and sustainable development co-benefits. In parallel, the Environmental Policy set out five guiding principles for the mainstreaming of environmental sustainability considerations into Secretariat activities. More detailed directives to peacekeeping operations and field-based special political missions on the implementation of UNSCAP and the Environmental Policy were issued in April 2022.¹¹³ Indicators of mission performance on environmental and climate action are tracked through the online UN Environment Application (eAPP) platform, which replaced the former mission environmental action plans.

Although UNMISS is making progress on its climate action indicators, it is far from meeting its targets. Under UNSCAP, 40 percent of electricity sourced by the Secretariat, which includes all peacekeeping operations, should be generated from renewable sources by 2025, and 80 percent by 2030. As of July 2022, only 5.7 percent of electricity consumed by UNMISS came from renewable sources (i.e., solar); the remainder came from diesel generators. A year earlier, the renewable figure was 2 percent. The mission lacks a comprehensive plan to achieve the UNSCAP targets, though it promulgated an energy-infrastructure management plan in 2019 (which contributes to the achievement of the targets) to improve the way it produces and uses electricity and to accelerate its transition to renewable energy. The absence of a comprehensive plan appears to be due to ongoing staffing limitations and the need to focus on crisis response and other urgent operational priorities. In spite of this, UNMISS has improved its eAPP key performance indicators and is making progress on the UNSCAP targets as part of the annual budget process.

A broader shift to renewable energy by UNMISS could significantly reduce its greenhouse gas emissions in line with the UNSCAP targets, reduce air pollution, and decrease the risk of soil contamination. It would also likely result in overall cost savings, particularly given recent increases in energy prices, given the time and resources currently required to acquire and maintain diesel generators and to procure and transport fuel by road, barge,

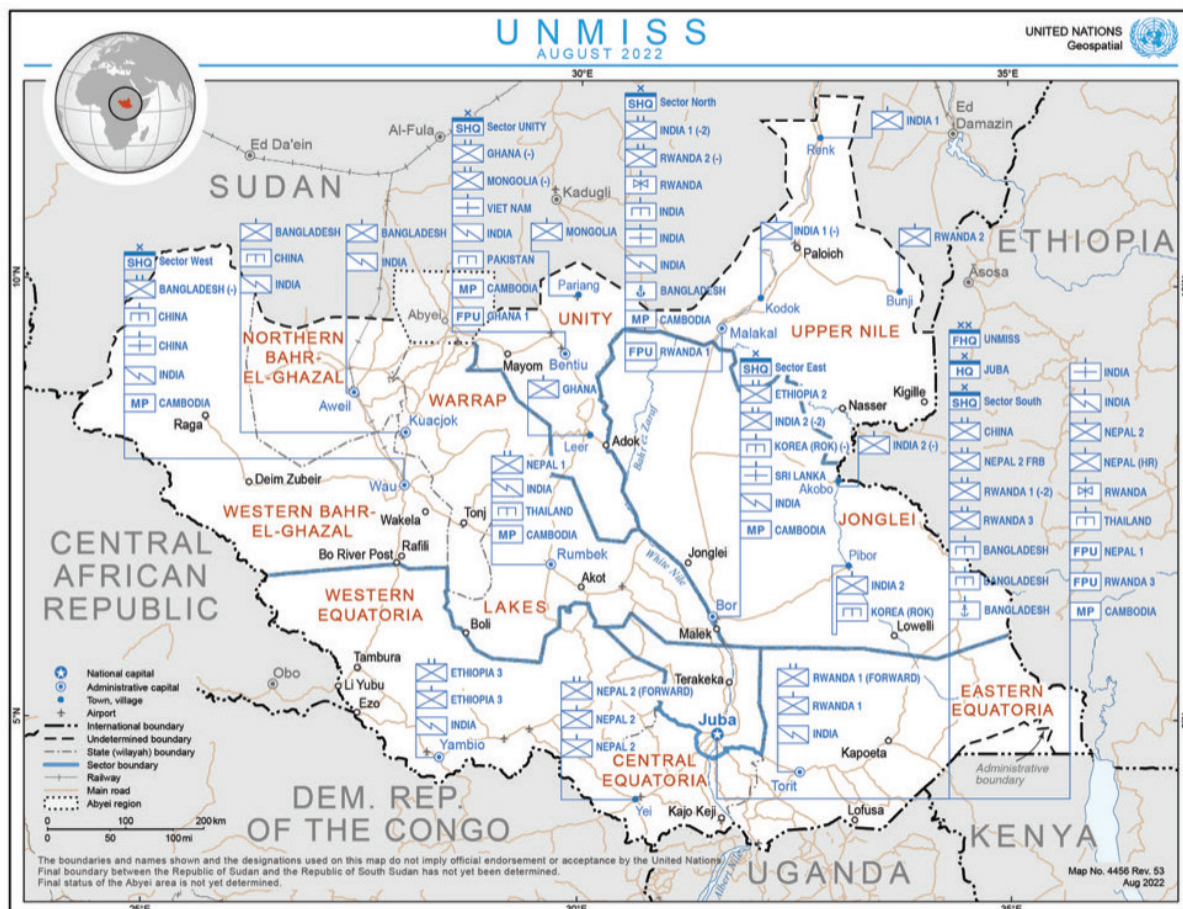
This UNMISS transition represents a unique opportunity to support renewable energy in South Sudan that could also be leveraged to support increased local energy access.

and helicopter to the various UNMISS bases throughout the country. It could also support the longer-term development of South Sudan by catalyzing new renewable-energy projects and providing renewable-energy infrastructure that could be handed over to local communities as part of the eventual drawdown of the mission.

Overview of the UN Presence in South Sudan

The UN presence in South Sudan consists of UNMISS alongside a UN country team comprising staff from the Secretariat and 13 agencies, funds, and programs.¹¹⁴ The head of UNMISS is the Special Representative of the Secretary-General (SRSG) for South Sudan. The SRSG is supported by two deputies, one of whom is triple-hatted as resident coordinator of the UN country team and as humanitarian coordinator. The current UNMISS mandate, consists of four activities: (1) protection of civilians; (2) creating the conditions conducive to the delivery of humanitarian assistance; (3) supporting the implementation of the R-ARCSS revitalized agreement and the peace process; and (4) monitoring, investigating, and reporting on violations of international humanitarian law and violations and abuses of human rights¹¹⁵. The resolution also requests UNMISS to engage at the earliest possible stage on integrated planning and coordination on transitions (i.e., the eventual drawdown of the mission and the reconfiguration of the UN presence in South Sudan) with the resident coordinator and the UN country team, other agencies, funds, and programs, the host State, and other national stakeholders including civil society.

UNMISS represents the overwhelming majority of UN personnel in South Sudan. This includes roughly 2,600 international and national staff (two-thirds of all UN staff based in the country), 451 UN volunteers, and an authorized uniformed component of 17,000 military personnel, 2,013 police personnel, and 88 government-



Map of UNMISS Deployments and troop compositions across South Sudan

provided corrections personnel. UNMISS is headquartered at UN House in Juba; its footprint consists of 10 field offices, two team sites, six (military) company operating bases, and between three and six temporary operating bases, depending on operational requirements.¹¹⁶ It is the second-largest peacekeeping operation (after MONUSCO), and the second most expensive (after MINUSMA), with an approved budget of \$1.117 billion for the 2022-23 fiscal year.¹¹⁷

Key Players in the Mission

Within UNMISS, several organizational units play leading roles in areas related to climate security and renewable energy. These include the Civil Affairs Division, which, along with UNDP, co-chairs the UNMISS-UN country team climate security working group. A new climate security advisor – with a dual reporting line through the political and human resource units within the Mission – was recruited in August 2022 to advise senior UN leadership in South Sudan on emerging and current risks to peace and security stemming from natural resources and climate change. This position, administered by UNDP, is funded through voluntary contributions by the Government of Ireland, and is the second such position in a UN mission (the first was in Somalia.)

Other relevant organizational units fall within the mission support component of UNMISS, which is led by the director of mission support, who reports directly to the head of mission. At mission headquarters in Juba, the Business Analytics and Compliance Section is responsible, inter alia, for ensuring mission compliance with environmental and occupational safety and health policies, guidelines, and best practices, among other functions. The provision of electricity through UN-owned generators and solar panels is the responsibility of the Engineering Section, which includes a specialized environmental engineering team expected to cover all environmental operations for the whole mission. The Engineering Section, with the support of this specialized team, takes the lead on developing renewable-energy projects for inclusion in mission budget requests to the General Assembly as part of the annual budgeting process. The Field Technology Section has also implemented various solar projects to power its equipment. The coordination of support issues with military and police equipment and the quarterly verification of contingent-owned equipment, including generators, is the responsibility of the Mission Support Center. Various units in the supply chain management pillar, including the Procurement Section, also play key roles with regard to electricity generation and renewable energy. Outside of mission headquarters, each of the UNMISS field offices include forward-deployed mission support staff, including field engineers.

Existing UNMISS Power Landscape

Approximately 94 percent of total UNMISS electricity requirements as of July 2022 are provided through diesel generators, with a total capacity of approximately 107.8 MW, and another 2.6 MW provided by solar plants in Juba (serving UN House) and Wau. During the 2021-22 fiscal year, generators consumed 28.0 million liters of diesel, representing 55 percent of total diesel consumption by the mission, with the remainder used primarily for vehicles and transport. Diesel, which is supplied by a contractor, Tristar, is transported by road or by barge (as in the case of Malakal) to field offices under UNMISS military escort, or flown by fixed wing (as in the case of Bentiu) or rotary-wing aircraft when necessary, depending on local conditions. Most roads in South Sudan are unusable during the rainy season, which generally runs from April through November. Diesel supply to smaller and more remote team sites, company operating bases, and temporary operating bases is done primarily by air. Altogether, fuel transport in UNMISS represented 350.5 flying hours (2.11 percent of the total) and 434,266 liters of jet A-1 fuel (2.52 percent of the total) during the 2021-22 financial period.

UN-Owned Equipment

Electricity requirements for UNMISS staff and co-located UN country team personnel are met through UN-owned equipment (UNOE) with a total installed capacity of more than 19 MW. UNMISS does not currently purchase electricity from external sources. Requirements in the largest UNMISS sites are met by powerhouses with synchronized generator sets that generally operate at 65 percent of rated capacity. Prime power generators are supplemented by backup power generators. Altogether, UNMISS has 154 prime power generators, with ratings ranging from 100 kVA to 500 kVA, and 46 backup generators, with ratings ranging from 5 kVA to 250 kVA. UNOE generators are equipped with meters and sensors to facilitate the measurement of energy and fuel consumption data, and the mission is working to connect its generators into its field remote-infrastructure monitoring system to allow for remote real-time monitoring.

Approximately 10 percent of UNOE capacity is provided through solar plants in Juba and Wau, with capacities of 1 MW and 1.25 MW, respectively. The equipment for these plants was procured through global systems contracts managed from UN Headquarters beginning in 2016. However, the process of getting both plants operational was drawn out, with significant delays necessitating several course corrections and some equipment write-offs. The obstacles included UNHQ contracts that were not adapted to local conditions; the mission's lack of familiarity with the design and implementation of solar projects; compatibility issues with some equipment in the systems contracts for solar panels and batteries, or interface equipment that was required but not included in the contracts; and installation or maintenance not included in the systems contracts. Adequate power storage was also a consideration, with one UN staff member underlined the importance of having sufficient battery capacity to avoid wasting generated electricity.

A broader challenge reported by UN staff is the fact that planning and procurement for renewable-energy projects for the main electricity supply, which often require multiple years to recoup capital expenditures, does not fit comfortably within existing annual budget processes. The purchase of renewable-energy equipment in missions for the main electricity supply (as opposed to projects such as solar water heaters, solar-powered water pumps, and solar panels for field technology projects not managed by the Engineering Section) is often an opportunistic activity undertaken if there are unspent balances at the end of the fiscal year, but such piecemeal approaches create implementation challenges and are generally unable to make a significant impact on overall renewable capacity. Another challenge is the lack of coordination with the UN country team on renewable-energy projects. Separately from UNMISS, the IOM built a solar power plant for its humanitarian hub in Malakal, Upper Nile State, which it completed in 2020 after a five-year process. Because this effort was not coordinated with UNMISS, the opportunity to “piggyback” on the procurement contract was missed.

Contingent-Owned Equipment

Electricity requirements for military and police contingents are met through contingent-owned equipment (COE) with an estimated total capacity of 100 MW. COE generators are deployed and reimbursed either as major equipment to meet the main power requirements of military and police units, or as self-sustainment capacity to meet the requirements of observation posts and small subunits.¹¹⁸ The quantity and capacity of generators deployed by each unit is specified in an MOU negotiated between the UN and the relevant troop- or police-contributing country. A 2021 audit of fuel management in UNMISS by the UN Office of Internal Oversight Services (OIOS) found that generators deployed by military and police contingents were not synchronized, did not run efficiently, and were mostly run at very low load.¹¹⁹ These observations were echoed by UN staff in South Sudan and in New York interviewed for this report, who also described the COE generators deployed in UNMISS as of poor quality and in poor condition. They noted that the quantity and capacity of generators deployed

by contingents far exceed their actual requirements, and contingents typically run their operable generators continuously regardless of electricity demand. In addition, UNMISS troop- and police-contributing countries have no requirement for deployed energy or fuel consumption meters with their generators. An energy-generation assessment completed in the first quarter of 2022 measured an average peak load of less than 9 percent for COE generators in Juba, Wau, Malakal, and Bor. As running generator sets for extended periods at less than 30 percent load can damage equipment, the practice of generator underloading by contingents only serves to exacerbate challenges related to COE operability.

The PPA approach is an increasingly popular model for renewable projects around the world . . . [and] the [UN] Secretariat is beginning to embrace the PPA model to reduce its reliance on diesel generators

The 2017 edition of the COE manual – which sets out the policies, standards, and rates of reimbursement for COE – was the first to introduce renewable-energy and hybrid generators as categories of approved major equipment. However, uptake of these options has been limited across all peacekeeping operations. In UNMISS, Bangladesh is the only troop- or police-contributing country to have deployed contingent-owned renewable capacity in the form of a small 10-kilowatt-peak solar-photovoltaic system to supplement diesel generators as part of its construction engineering company based at the Tamping camp in Juba. The United States, through its Global Peace Operations Initiative security assistance program, is currently working to provide the Nepalese battalion deployed in Rumbek with hybrid solar-photovoltaic generators. As part of this project, meters are being installed on the existing diesel generators deployed by the battalion in order to collect baseline data against which to measure the impact of the switch to hybrid generators. The procurement and deployment of the Nepalese generators is expected to be completed in December 2023.

The Power Purchase Agreement Model

UNMISS recognizes that to date its approach to increase its renewable-energy usage will fall far short of UNSCAP targets. As such, it is looking to establish solar power purchase agreements (PPAs), with the first planned for Malakal. PPAs represent an alternative to the default process of designing, building, and maintaining UNOE solar capacity. Here, the UN engages in an agreement with a commercial provider to procure electricity at a set price, with a minimum percentage guaranteed to come from renewable-energy sources. In such an agreement, the commercial provider is responsible for the design, financing, procurement, construction, operation, and maintenance of the solar plant, while the UN serves as a guaranteed off-taker and customer for electricity for a minimum period of time to ensure that the commercial provider is able to recoup its initial investment costs. The PPA approach is an increasingly popular model for renewable projects around the world and was first pursued by the UN for its peace operations in Baidoa, Somalia.¹²⁰ Although most UNMISS staff interviewed were unaware of the Baidoa project, the Secretariat is beginning to embrace the PPA model to reduce its reliance on diesel generators.

In June 2022, the UN published a request for information (RFI) for potential energy service providers who could build and maintain a renewable-energy plant to meet the full electricity requirements of the Malakal base for a period of five years, with a possible further extension of five years. This would be an “inside-the-fence” project given that the UNMISS Malakal base has sufficient space to house a solar plant. In general, an inside-the-fence approach is also attractive for other reasons, including security considerations. The RFI specified that the project is envisioned not only to meet the electricity requirements of the UNMISS base, but to also build the local

workforce and to potentially serve the energy needs of the local community following the withdrawal of UNMISS. However, the RFI explicitly did not frame the project as one that would also provide power to Malakal town and local communities. While welcoming that scenario, because of the considerations indicated below (among others), the RFI left it entirely up to the renewable-energy developer to figure out such an extension, including the regulatory, licensing, and financing aspects. While that approach is understandable given that UNMISS's mandate does not extend to local electrification, this framing makes it highly unlikely that a developer on its own would piggyback on the UNMISS project to expand and extend the power project to Malakal town and local communities. The RFI closed in August 2022. Although the mission had been pessimistic about the number of vendors that would respond given the challenges of building and maintaining a solar plant in Malakal, 18 vendors – many with direct experience in fragile and conflict-affected states – submitted information, suggesting that there was more interest and capacity than expected.

Because the envisioned Malakal PPA will be an inside-the-fence project, it will avoid one of the largest challenges experienced in concluding the first PPA in a peace operation, in Somalia: the need to secure agreement from the government regarding land use. This, however, could make the process of eventually connecting the solar plant to the local grid more challenging, as the Malakal base is located approximately four kilometers from Malakal town. Other challenges include arcane bureaucratic requirements. Representatives of one renewable-energy company that has worked in South Sudan indicated that the government has instituted a requirement that any foreign entity that generates more than 1 MW and wishes to distribute electricity must obtain a license from the Ministry of Electricity and Dams. Although the process of obtaining a license is not clear, any foreign entity is required to have a local minority partner. In at least one case, this led to a request for additional payments to move the process forward.¹²¹ Similar to Powering Peace research findings from other fragile settings, navigating the regulatory requirements in South Sudan is a challenge for commercial project developers.

UNMISS is not obligated to act on any of the responses to the RFI, though the mission has indicated, including to the General Assembly, its intention of moving ahead with a PPA in Malakal beginning in the 2022-23 fiscal year,¹²² with potentially more to follow in other sites, including Juba. In the interim, there are steps that the mission can take to increase the efficiency of electricity generation in Malakal before a PPA is in place. More than 2,600 UN staff and uniformed personnel are based in Malakal, the second-largest mission presence after Juba. The entirety of UNMISS electricity requirements in Malakal are currently met through diesel generators. The UNOE powerhouse in Malakal has a total installed capacity of 2.4 MW, with a maximum usable peak (at 65 percent load) of 1.56 MW and a peak power demand of 0.9 MW. An assessment in early 2022 estimated the total daily energy consumption between 30 MWh and 40 MWh, and that 0.44 MW in additional capacity was required in the powerhouse to connect the military and police contingents in Malakal to the UNOE grid, which could be accomplished through the addition of two synchronized 500 kilovolt-amp (kVA) generators. In addition, an upgrade and rehabilitation of the low-voltage electrical distribution system and an extension of power lines and switches to the contingent camps would be required. The cost of the necessary upgrades is estimated at \$150,000 and the cost of the connections is estimated at \$50,000; these costs are far below the estimated annual savings of \$640,000 from providing military and police contingent electricity requirements through UNOE.

AREAS OF OPPORTUNITY FOR THE UNITED NATIONS

As indicated in previous Powering Peace reports,¹²³ it is extremely difficult to implement the cultural changes required to bring about major reforms and policy initiatives in the Secretariat. However, there are several areas of opportunity for UNMISS – and the broader UN – to make progress on renewable energy that do not require major changes to existing administrative frameworks.

Closing the Data Gaps for Decision-Making

UNMISS lacks the baseline data required to make informed management, budget, and procurement decisions. Although the mission has made significant progress in improving data collection for UNOE equipment, including generators, it still has a major blind spot with regard to COE. As a result, UNMISS does not know its actual electricity requirements, whether at the site level or the mission level. The requirement to develop site energy plans, recommended by the 2017 COE Working Group and approved by the General Assembly, remains unimplemented in UNMISS. Site energy plans are intended to ensure the appropriate sizing of generators to meet variable demand requirements and avoid the lowload operation of diesel generators. The 2017 edition of the COE Manual included a higher rate of reimbursement to contingents who deployed generators based on the ratings and roles established in the International Organization for Standardization (ISO) 8528 standards for diesel generators. As part of the new reimbursement option, site energy assessments are required to ensure that COE is deployed and operated in compliance with site energy plans.¹²⁴ To date, troop- and police-contributing countries have not taken advantage of the ISO 8528 reimbursement rates and have continued deploying generators under the pre-2017 arrangements. In the absence of site energy assessments and the development of site energy plans, contingents deploy COE based on outdated force generation standards¹²⁵ rather than on actual operational requirements. The UNMISS Mission Support Division estimates the average electricity requirements and generator loads of contingents based on snapshot observations.

UNMISS also has challenges accounting for the fuel provided to military and police contingents for their generators. Under existing mission support and COE arrangements, peacekeeping missions are responsible for providing fuel, oil, and lubricants to military and police contingents. UNMISS provides fuel to military and police contingents based on bulk fuel requests, which are supposed to include consumption reports of the bulk fuel previously provided. As troop- and police-contributing countries have not deployed energy and fuel consumption meters with some of their diesel generators, UNMISS relies on manual reports submitted by contingents, which vary greatly in detail. As indicated in the 2021 OIOS audit, a review of 93 bulk fuel requests found that only four were adequately supported; in most of the rest, the hourly consumption rates fluctuated dramatically from month to month or were not reported.

In the past, the Secretariat and several member states have attempted to address usage and fuel consumption by generators and other fuel-consuming equipment by proposing to include functioning meters in the specifications for COE. The issue, however, is that equipment that does not meet specifications during quarterly COE verification exercises are not eligible for reimbursement, and troop- and police-contributing countries argue, justifiably so, that equipment without a functioning meter is still able to contribute to the achievement of mandated activities. As such, the COE Working Group – which meets every three years to review policies, standards, and rates of reimbursement for COE – has not previously been able to resolve this issue. One way to square the circle, at least where generators are concerned, is for the Secretariat to simply procure and install meters at UN expense.

Beyond the challenges of accounting for the actual consumption of fuel for generators, the mission faces the challenge of accounting for the actual cost of generating electricity using its current complement of generators. Cost accounting in the mission remains focused on groups, categories, and objects of expenditure in the budget and therefore does not easily allow missions to capture the costs of activities, whether they be mandated tasks or mission support tasks such as the transport of diesel to remote team sites. As such, the mission can report on the total amount spent on the purchase of fuel, but it is unable to easily ascertain the total cost per kilowatt-hour of electricity from diesel. This shortcoming is not specific to UNMISS, but affects all UN peace operations. In 2019, the mission estimated its average levelized cost of electricity at \$0.654 per kWh, though this varied from \$0.31 in Yambio to \$1.85 in Wau. The cost figures in these calculations, however, covered only the billing rate for fuel procurement but not associated costs such as the flight hours and jet fuel required for flying diesel to operating bases and team sites. UNMISS, and other missions, should more systematically work to track the associated costs of operating diesel generators so the UN has a better understanding of the total cost of ownership of these generators.

Shifting from Procurement to Supply-Chain Mindsets

Several UN staff who were interviewed expressed concerns about whether the existing approach to procurement would allow UNMISS to conclude a contract with a vendor that is able to deliver on a PPA. UN procurement is based on four principles: (1) best value for money; (2) fairness, integrity, and transparency; (3) effective international competition; and (4) the interest of the UN¹²⁶. Several UN staff expressed concern that the principle of best value for money appears to be interpreted as the lowest-cost bid, and pointed to a high rate of contract failure as evidence of the shortcomings of such an approach. Many also noted that the UN still has not been able to shift from a focus on acquisition cost to an assessment of total cost of ownership, and that existing approaches may not allow the procurement process to capture all of the associated costs of continuing to rely on diesel generators – including the cost of transporting diesel – in order to accurately compare them to the costs of a solar PPA. Altogether, the inability of the procurement process to sufficiently consider factors other than up-front acquisition cost disadvantages options that are more costeffective in the long term, and also leads to waste and delays when contracts fail.

If the UN were to have a better understanding of the total cost of ownership of diesel generators, it would be able to undertake more informed cost-benefit exercises to decide between different options for meeting electricity requirements, including from renewable sources. This shift away from acquisition cost to total cost of ownership, along with the inclusion of a more balanced understanding of the types of risks involved in concluding contracts in support of activities in the field, would be an important step to better apply the principle of best value for money in peace operations. Similarly, the Secretariat and member states should recognize that considerations such as environmental impact, greenhouse gas emissions, and the reputation of the UN on climate action should be included in the interpretation of the principle of the interest of the UN.

In addition, the UN should move to make PPA-type arrangements standard rather than defaulting to in-house capacity. This should be done by updating guidance, including on mission startup, by developing templates for statements of work that missions can draw upon and customize for their specific requirements, and by adopting guidelines and criteria by which to evaluate the ability of commercial providers to be able to deliver in the types of locations served. Of course, even in locations where missions are purchasing electricity through PPAs, they can – and should – maintain UNOE backups in case of a disruption in supply from commercial providers.

Energy-efficiency standards are not discussed here, but should be a core practice in procurement. While the generation of electricity from renewable sources of energy using PPAs is highly important, this is not enough without energy-efficiency standards. The application of such standards in the procurement of equipment and appliances in UNMISS should be an integral part of any renewable-energy transition plan.

Assessing Costs and Benefits of UNOE vs. PPA

The current UNOE-exclusive approach to renewable-energy projects is difficult to scale under existing Secretariat administrative arrangements. PPAs provide the only realistic option for achieving the UNSCAP targets in UNMISS, subject to confirmation of the availability of qualified investors and their interest in using a peacekeeping mission as a long-term funding source. Three years have elapsed since UNSCAP was launched, and yet missions such as UNMISS are not close to achieving the ambitious targets that were set in spite of continuous efforts within available resources. The 2025 targets are just a couple of years away. Broad adoption of the PPA model appears to be the only feasible way in which the mission can make significant progress toward the renewable-energy and greenhouse-gas emissions targets. The existing approach of developing UNOE projects is simply not scalable quickly enough given the absence of the requisite expertise and capacity at the mission level and the limitations of UN procurement and budgetary processes, despite improvements that have been made in recent years, such as the development of a new turnkey systems contract for solar renewable-energy solutions, which should become operational in 2023. In contrast, PPA models do not require missions to have technical expertise for procurement, installation, operation, or maintenance, and allow missions to offload the up-front risks of developing renewable-energy projects to an external company. However, there are some limitations to the PPA model, as the UN is at the mercy of the market with regard to where, when, and how to implement renewable-energy projects, and must relinquish control over project planning and timelines to the contractor. The annual mandate and budget processes for peace operations also carry inherent risks for commercial providers, which require longer-term guarantees to ensure profitability. Some other UN organizations are addressing these types of risk through longer-term financing arrangements, such as the Green Financing Facility used by UNHCR, but there is nothing comparable for peace operations.

The UN should adopt a standard approach in which UNOE solutions should be pursued primarily for small-scale requirements, such as for smaller team sites, or locations where there is insufficient market interest. In all other situations, missions should default to PPA arrangements when available and feasible. In the case of UNMISS, implementation of such an arrangement would require the conclusion of PPAs in a number of larger cities in addition to Malakal, such as Bor, Bentiu, and Wau; Juba has the largest UNMISS footprint, but may be eligible to connect to the local grid, and the mission has already undertaken efforts in this sense. An appropriate level of already deployed UNOE diesel generators, including the capacity required to support initial mission startup, can be retained to maintain a backup capacity after the conclusion of a PPA. Excess UNOE capacity can be transferred to other missions that may need them or to the UN reserve at the Global Service Center (GSC) in Brindisi, Italy, in line with existing property disposal procedures. In theory, missions located in communities with existing renewable-energy generation options should consider obtaining at least some electricity locally in a manner that can support those companies in scaling up their operations without negatively affecting the ability of the local population to purchase electricity. In practice, there is not yet an option anywhere in South Sudan, though new solar projects could soon be connected to the Juba grid. Moreover, the willingness of UNMISS to purchase local renewable energy could help spur new investment and speed up projects in other state capitals, driven in part by the potential of UNMISS as an anchor client.¹²⁷

PPAs provide the only realistic option for achieving the UNSCAP targets in UNMISS, subject to confirmation of the availability of qualified investors and their interest in using a peacekeeping mission as a long-term funding source.

Of course, the determination of mission-level and site-specific energy plans, the development of UNOE projects, and the solicitation and evaluation of PPAs and other commercial arrangements requires some specialized expertise that may not already be present in missions such as UNMISS. Although it may be tempting to establish such capacity at the mission-level, missions are primarily focused on crisis management and meeting immediate requirements. It may therefore be difficult for missions to ensure that any additional positions in the supply chain management pillar will be dedicated to such requirements. Instead, the Secretariat should make sure that there is sufficient expertise on renewable energy in both the Logistics Division and Procurement Division of the Office of Supply Chain Management at Headquarters. In addition, missions should make greater use of the capacity of the GSC, which is supported by the Rapid Environmental and Climate Technical Assistance (REACT) facility, a partnership with the UN Office for Project Services and funded from mission budgets as a cross-cutting initiative, to support the assessment and design of renewable-energy solutions. Currently, missions have to request support from the GSC and REACT; in fact, UNMISS did so and hosted a technical assessment visit in the first half of 2022. To date, UNMISS has been very satisfied with support provided by the GSC and REACT. These centralized capacities should be adequately resourced to be able to support all missions more proactively in developing road maps toward the achievement of UNSCAP targets.

As part of the development of these road maps, and as part of the normal development and review of mission support concepts, missions should also more systematically assess the feasibility and cost-effectiveness of all types of renewable energy, not just solar. The UN often defaults to existing approaches; although the overall uptake of renewable energy is low, nearly all of it has been from photovoltaic solar panels. The viability of other solutions, such as wind power and hydroelectric generators, should also be assessed based on criteria such as generation potential, legal and logistical challenges, impact on local communities, and environmental impact.

Reconsidering Dependence on COE

COE diesel generators are by far the largest source of electricity-generation capacity in UNMISS and, as such, it may be tempting to look at ways of further incentivizing the deployment of renewable or hybrid solutions for COE. In fact, the 2017 COE Working Group introduced both renewable and hybrid solutions into the COE system, including significant reimbursement premiums over “legacy” diesel generators. However, these new provisions have been largely ignored by troop- and police-contributing countries. The fact that the UN is responsible for supplying petroleum, oil, and lubricants to contingents creates a strong disincentive for countries to shift from diesel generators. Indeed, the structure of the existing COE framework does not make COE a realistic option for increasing the amount of electricity generated through renewable or hybrid sources. The existing COE system is intended to compensate troop- and police-contributing countries for the use of major equipment that is already in inventory, with monthly reimbursement rates to contributing countries that are calculated from standardized generic fair-market values and estimated useful lifespans for each category of equipment. The system is not intended to subsidize the cost of procuring entirely new equipment that is not already in inventory, as the acquisition cost theoretically cannot be fully recouped by contributing countries unless the equipment is deployed in a peace operation for the entirety of its estimated useful life and is continuously verified to be fully operational during quarterly verification inspections.

For the upcoming 2023 COE Working Group, the Secretariat and several member states have proposed measures to better incentivize the deployment of renewable and hybrid systems. While these may help to spur the deployment of renewable and hybrid systems, member states should be cautious of approving approaches that run counter to the reimbursement methodology that underpins the current COE framework. An alternative approach within the existing framework could be to remove hybrid systems from the standard major equipment list and instead treat them as special-case equipment until more troop- and police-contributing countries have such equipment

in inventory and until the deployment of such equipment is sufficiently commonplace in peace operations. In the meantime, the reliance on COE generators can be addressed by shifting electricity-generation responsibilities for military and police contingents to civilian-run grids, which would be powered either by PPAs or UNOE. Major equipment COE generators would only be required for two scenarios: (1) to meet electricity requirements in temporary operating bases or other locations where the UNMISS mission support division is unable to provide electricity, and (2) to provide backup in case of disruption to the main electricity supply. This may also obviate the requirement for contingents to deploy self-sustainment electrical capacity in most circumstances.

In fact, the 2021 OIOS audit and the 2022 REACT assessments both identified the centralization of electricity generation as ways to significantly increase the efficiency of electricity generation across the mission. It would also have the benefit of avoiding the problem of COE generators being run at low load, and, by significantly reducing the diesel requirement among military and police contingents, it would also reduce the risk of fuel misappropriation. Currently, the primary UNMISS locations, except for Malakal, have sufficient capacity in the UNOE powerhouses to meet both civilian and uniformed electricity requirements; the deployment of an additional 2x 500 kVA synchronized UNOE generator would be sufficient to meet the additional requirement in Malakal, though rehabilitation, upgrade, and expansion of the low-voltage distribution grid to cover the troop- and police-contributing country camps would also be required.

Implementation of this approach does not require any changes to the COE framework, but would require a few adjustments in existing processes. For example, the Office of Military Affairs and the Police Division in the Department of Peace Operations, which are responsible for planning and force generation at Headquarters, would need to adjust their current approaches to the development of statements of unit requirements and generic equipment lists for different types of formed units. The Uniformed Capability Support Division in the Department of Operational Support would also need to ensure that this is reflected in the MOUs negotiated with troop- and police-contributing countries for each unit deployed to peace operations. The standard mission-support concepts would have to be adjusted accordingly. At the mission level, some infrastructure upgrades and additional connections would be required to facilitate the linking of military and police camps to the civilian mission-support-managed grids. A REACT cost analysis indicated that the centralization of electricity distribution would yield financial savings, primarily from the reduction of fuel consumption, that would pay for all these upgrades in a matter of months. Troop- and police-contributing countries should be assured that this change in approach will significantly reduce the costs incurred by the UN (from reduction in fuel consumption, which the UN is required to supply at no cost to military and police contingents), but will not significantly affect the amount of reimbursement paid to contributing countries. This is because COE generators will still be required for backup and to meet requirements when units are deployed to temporary operating bases. The difference is that they will not actually be used most of the time, as opposed to the current practice of running generators continuously at low load.

At the mission level, most peacekeeping missions have a COE and MOU management review board (CMMRB) that includes heads of the military, police, and mission support components to review issues related to COE and to ensure that MOUs remain aligned with the requirements of the mission. In UNMISS and in other missions, the CMMRBs should continue efforts to review whether the existing deployment of COE generators aligns with actual operational requirements. For future MOUs, UNMISS and other missions should also support the review and amendment of the outdated benchmark, reflected in military unit manuals, for contributing countries to deploy 2.5 kVA of capacity, plus 100 percent backup, per member of a contingent.



UNMISS visit to communities in Upper Nile affected by floods and clashes. *Linda Tom/UNMISS*

Looking Beyond UNMISS

The recent appointment of a dedicated UN climate security advisor in South Sudan is a valuable development in increasing alignment across the UN family on climate security. Coordination and exchange of information between UNMISS and the country team also routinely takes place within the context of a coordination mechanism known as the Operations Management Team (OMT), though much more coordination can be done on renewable energy and on how UNMISS can support the country team's business operations strategy. Bureaucratic challenges persist as a result of differences in policies and procedures, even if the higher-level regulations and rules are broadly compatible and despite the fact that the Secretariat and the funds and programs have signed a statement of mutual recognition of policies, procedures, contracts, and related operational mechanisms. These are surmountable in principle, but missions such as UNMISS generally have a much shorter-term mindset than the country team, and are focused on progress in implementing their mandated tasks in the period until the termination of their mandates by the Security Council. At the same time, the funds and programs often have priorities, activities, and associated support requirements that differ greatly from those of the missions, and they seldom include missions in the development of their country-level business operations strategies. Moreover, the funds and programs sometimes operate in locations where missions have no presence and therefore are not automatically capable of providing services. In South Sudan, this is the case in several locations, including in Kapoeta, Maban, Wunrok, and Yida.¹²⁸ As such, UNMISS is not necessarily well-positioned to meet all of the requirements of the country team.

In South Sudan, UNMISS and the country team have an additional impetus for cooperation that comes from the need to prepare for the eventual transition of the UN presence in the country. The Security Council, requested that UNMISS begin engaging in transition planning with the country team and other stakeholders¹²⁹. Although the Secretariat has traditionally focused, during transitions, on processes related to the drawdown and closure of missions (and preparing for the deployment of a smaller follow-on presence, if such a presence has been mandated), a recent report of the Secretary-General on transitions in peace operations contexts noted that transitions that are not fully integrated, properly resourced, and adequately focused on the post-mandate period risk losing the hard-won gains achieved by peace operations.¹³⁰ Renewable-energy systems established or fostered by UNMISS can make a positive impact beyond the life cycle of the mission. Under the UN financial regulations and rules, UNOE that is not required in other missions can be disposed of by gift or sale at a nominal price to another intergovernmental organization, government, or nonprofit organization,¹³¹ and infrastructure installed by a mission in a liquidating mission can be provided to the government.¹³² Although a solar system enabled through a PPA arrangement and powering UNMISS alone (inside-the-fence) is not UN-owned, the ability of the commercial provider to operate it is tied to the disposition of the UN premises and the capacity of the owner of the premises at any point in time to pay for the services.

For example, mission support activities should be designed in such a manner as to not only meet mission administrative and logistical requirements, but also with an eye toward being able to minimize the environmental and public health impact of mission activities, stimulate the local economy where possible that can directly improve the lives of the local population.

The second instance would be to see the UN country team and major donors piggybacking on an UNMISS-initiated PPA arrangement in order to widen the size and scale of a renewable-energy project, as a way to provide power to the local community from the outset – rather than waiting for a post-UNMISS transition. Any UNMISS-driven PPA provides a unique opportunity to extend energy benefits to communities, particularly outside of Juba, across the world's least electrified country. The UN country team and international donors and partners in South Sudan should, through their own programs and their engagement with the government and the country team, seek to build on the investments made by UNMISS to ensure that local communities are also able to access clean, reliable, and affordable electricity. In either scenario, the investments made by the mission to set up UNOE systems or to foster the development of commercial capacities to deliver electricity through PPAs need to be well-coordinated with the country team to ensure that these investments in renewable energy are maximized, and do not eventually get lost with the eventual departure of the mission but can be used to support the country team and local communities long into the future.

The climate security working group co-chaired by the UNMISS Civil Affairs Division and the UNDP, for which the climate security advisor will serve as secretary, can potentially play an important role in strengthening cooperation between the mission and the country team. The establishment of a dedicated energy working group within the OMT focusing on operational coordination, including on renewable-energy projects, would also help ensure continued progress even if there is turnover in some of the key positions within UNMISS and the country team that are currently championing such projects.

More broadly, the UN system should adopt a new approach to peacekeeping operations that sees them not solely as vehicles to implement Security Council mandates within a specified time frame, but as a phase in the overall continuum of UN engagement in a country during which UN member states have dedicated additional political capital, funding through assessed contributions, and enabling capabilities that are generally not present in a country team context. These should be leveraged to any extent possible. For example, mission support activities, including electricity-generation and other engineering activities, should be designed in such a manner as to not only meet mission administrative and logistical requirements, but also with an eye toward being able to minimize the environmental and public health impact of mission activities, stimulate the local economy where possible, and also help develop infrastructure – such as renewable-energy systems – that can directly improve the lives of the local population. Coordination with the country team is necessary to ensure that these activities complement the development work of the UN without jeopardizing the clear separation of duties and mandates that could result in overlap and inefficiencies in the work of the UN, and to ensure that the funds and programs can take over projects initiated by the mission after the departure of the missions. Local private-sector providers can support and assist UN missions in a range of areas, including renewable energy. Missions should not narrowly focus on their mandated tasks, but with the right resources could find ways to implement their mandates in the manner that best positions them to support the broader UN system in setting the stage for sustainable peacebuilding and development after the departure of the mission.

CONCLUSION

As the least electrified country in the world, South Sudan's energy sector is complex and closely tied to the cycle of conflict, and the country's cursed dependence on oil. While some efforts are underway or planned to rehabilitate local electrical grids, purchase power from neighboring countries, or invest in hydroelectricity, these are limited and unlikely to deliver significant change. Distributed solar minigrids represent the most achievable and scalable renewable-energy source in this context, but the political and economic context makes new investment in this sector highly challenging outside of Juba. Yet as UNMISS pursues its own renewable-energy transition in service of the UNSCAP goals, and amid wider global commitments toward mitigating climate change, the situation presents a unique opportunity for UNMISS and its other international and national partners to support the development of a new, more sustainable, and widely accessible electricity infrastructure in the country.

As the least electrified country in the world, South Sudan's energy sector is complex and closely tied to the cycle of conflict, and the country's cursed dependence on oil.

Currently, South Sudan's limited electricity sector is almost entirely dependent on diesel-powered generators. Apart from the obvious climatic concerns around carbon emissions associated with such high diesel consumption, the imports and supply chains for diesel in South Sudan also invite a plethora of other problems. The diesel supply chains are highly exposed to external fluctuations and global shocks that are entirely beyond the control of people in South Sudan, and yet impact the pricing for all consumers dramatically, contributing to pushing costs for diesel-powered electricity untenably high for the vast majority. Moreover, as a result of the reduction in oil revenue, South Sudan's supply of the USD required to purchase diesel is increasingly insufficient.

Although the GoSS's monopoly on diesel imports has lessened in recent years, this sector still provides a window of opportunity for corruption, financial diversion, or extortion, all the way from the local-level officials on the border at Nimule, up to the leadership level of those who participate in grand corruption through the awarding of diesel-import contracts. Moreover, as diesel is moved around the country, all users – including UNMISS and other humanitarian agencies that are supposedly operating in a self-contained system – fall prey to the almost innumerable checkpoints that litter key transport routes, and the payments exacted at these checkpoints in turn serve to finance South Sudan's disproportionately large, disjointed, and unwieldy security sector and other armed elements. This perpetuates a status quo of chronic insecurity and militarization, and poses an additional layer of challenges for ordinary citizens, humanitarian agencies, and the private sector who seek stability and development. Indeed, South Sudan's diminishing oil revenues will likely mean that the checkpoint economy is not going anywhere, as non-oil resources – such as the diesel sector and other goods that can be charged heavily at checkpoints – will likely come to play an ever more important role in financing the conflict and political interests.

For ordinary South Sudanese, especially those who have been displaced and live in UNMISS PoC sites or IDP camps, as well as those who reside in the urban areas where the conflict has wrought the most destruction, such as Malakal and Bentiu, access to electricity represents a crucial entry point for moving forward, regenerating, and rebuilding. Large-scale returns for the IDP communities remain a somewhat distant prospect because of conflict-driven destruction and environmental damage.

Amid this reality, investing in systems to provide electricity to South Sudanese, including IDP settlements, PoC sites,

and adjacent towns, using means that are environmentally conscious, protected from global and national shocks to pricing and supply, and do not play into the hands of local conflict actors, could be a concrete, pragmatic, and more long-term approach to supporting peace dividends countrywide. Yet, at present, areas such as Bentiu, Malakal, and most of the country are currently far away from receiving this kind of support, as the vast majority of development and infrastructural efforts, including for electricity, are limited to Juba or for internal use by certain institutions.

While oil plays a complex but well recognized and central role in South Sudan's conflict dynamics, the role of electrification is often overlooked despite its centrality to nearly all development goals. The international community continues to play an outsized role in the country, primarily via UNMISS and humanitarian aid, but is grappling for a coherent long-term strategy amid a largely stagnant peace agreement. There is little effort or investment going toward supporting energy access or electrification; barring a change in approach, there is every reason to believe that South Sudan will remain the least electrified country in the world for the foreseeable future. Access to electricity for South Sudanese people remains dependent on access to diesel fuel, with all the complications and negative externalities that come with it.

In parallel, UNMISS continues its own transition to renewable energy in the country, as it rushes to meet the UN's own climate goals. The UN and UNMISS have made slow progress in this regard in recent years, but still lack a system to support this transition at scale. At the same time, UNMISS represents South Sudan's best hope in the near term for a clean energy transition. This presents challenges, and would require new thinking and approaches from both UNMISS and other international partners, as well as the GoSS. However, it is worth pursuing and can present a new, high-impact model to help both missions as well as host governments in fragile states like South Sudan greatly increase local energy access.

KEY FINDINGS AND RECOMMENDATIONS

Key Findings

The systems around fuel and fuel use for electricity generation are inextricably linked to the conflict dynamics in South Sudan. Electricity access is almost completely dependent on diesel and diesel generators. South Sudan exports its crude oil but must import its refined diesel. At every stage of the diesel supply chain, both money and diesel are diverted in vast quantities, with the result that the volume of available diesel diminishes while the price for the end consumer increases, with knock-on effects across the formal and informal economy. Corruption and extortion are seemingly inescapable in this sector, from the awarding of diesel contracts by the Government of South Sudan (GoSS), to the declaration of imports and payment of taxes at the Nimule border, to the middlemen in Juba and the transportation routes passing through dozens of armed checkpoints around the country, to the local diesel retailers across the country's 10 states. UNMISS trucks are routinely stopped at checkpoints and import taxes are demanded, which seriously impacts the mission's operations as the fuel needs to be transported to 10 field offices across the country. This contributes to the perpetuation of a status quo in South Sudan characterized by chronic insecurity, militarization, and stunted economic development.

Expanding electrification in the country beyond the capital is unlikely to change without new initiatives. Few international partners are focusing on energy access, and the GoSS has been unable to move forward outside of Juba. The 2018 peace agreement was primarily focused on ending the violent conflict. It therefore contains only minimal reference to the energy sector or the environment, and makes no mention of any development of renewable-energy infrastructure. The political and economic uncertainty, currency volatility, and lack of focus on expanding electrification means the status quo will remain unless something changes.

Investment in decentralized renewable energy can offer a new way to support peace in the country. Investment in decentralization would help decouple energy access from dependence on diesel, mitigating these negative externalities and supporting a wide range of development goals. For the communities that have been displaced for almost a decade and the urban areas that have been almost entirely razed by the fighting, the localized provision of renewable energy could be game-changing for their recovery, rehabilitation, and resilience.

UNMISS has made commendable progress in deploying renewable-energy systems. However, significantly expanding the mission's energy transition will require engaging the private sector through power purchase agreements (PPAs) in order to achieve the kind of meaningful renewable-energy adoption necessary to fulfill the UN's climate goals. PPAs provide the only realistic option for the mission to achieve these targets.

UNMISS's efforts to transition to renewable energy present an opportunity to support the electrification of host communities in South Sudan. UNMISS's purchasing power can be leveraged to catalyze new electrification projects across South Sudan, beginning with Malakal. The mission is currently focusing on internal inside-the-fence renewable-energy solutions with due consideration to its available dedicated resources, but this may be a missed opportunity given the lack of electrification in the country. The UN country team, in collaboration with international partners, donors, the GoSS, and potential investors, should work closely with the mission to maximize the unique opening presented by the UNMISS energy transition to expand the size and scale of UNMISS-initiated PPAs to also include electrification to local communities, or at the very least to ensure that arrangements are in place so that local communities can benefit from the electricity infrastructure developed as part of the PPA following the eventual drawdown and departure of the mission.

Recommendations

To UNMISS:

- **Meet UN targets.** The mission should articulate a coherent approach for UNMISS to meet its UNSCAP and environment plan targets annually, such as when it updates its energy infrastructure management plan.
- **Track real costs.** The mission should implement procedures to track all costs associated with diesel generators, including fuel amounts used, procurement and transport (including the opportunity cost of force protection and helicopter flights), generator procurement, and maintenance.
- **Plan for the transition.** As UN-owned renewable-energy infrastructure is likely to be handed over to the UN country team or to the GoSS when the mission draws down, the process for doing so needs to be coordinated with the UN country team as early as possible as part of transition planning.
- **Stand up an energy working group.** The mission and the UN country team should establish a dedicated energy working group to enhance coordination, which should be factored into both the business operations strategy and the mission-support concept. Cost-sharing arrangements and contract piggybacking should be pursued whenever feasible.
- **Coordinate with partners and donors.** The mission should coordinate its renewable-energy plans with bilateral donors and organizations such as the World Bank, which can support grid rehabilitation and connection infrastructure, to ensure that any commercial solar projects developed as part of PPA arrangements can eventually be interconnected.

To the UN Secretariat:

- **Shift approach to energy delivery.** With regard to procurement, the Secretariat should change the prevailing approach to assessing best value for money to take into account total life cycle costs and the ability of vendors to deliver. It should also recognize that the interest of the organization – which, along with best value for money, is one of the four principles for procurement enumerated in the UN's financial regulations – should incorporate considerations such as UNSCAP.
- **Make renewable energy the standard.** Rather than treat renewable options as the exception to UN practice, shift to making renewable energy the standard to meet new electricity requirements in peace operations.
 - Standard operating procedures should be developed that use the PPA as the default arrangement for large sites (whether inside or outside the fence), with UN-owned equipment (UNOE) arrangements through turnkey contracts (once available) for small sites. Templated statements of work should be made available to missions.
 - The Department of Operational Support should develop a structured approach by which missions can assess the viability of all types of renewable energy (and not just solar), with associated turnkey options under systems contracts.
- **Moderate the use of Contingent-Owned Equipment (COE) for improved efficiency.**
 - Rather than change COE generator specifications to include meters, missions should adjust fuel allocation procedures to require meters, which will be procured and installed at mission expense.
 - UNOE should be used to meet electricity-generation requirements in all military and police camps and bases with a mission support presence. This is an option that UNMISS is pursuing,¹³³ and should be applied across all missions. Major equipment COE generators should only be used for requirements during expeditionary deployment/in temporary operating bases or in locations without adequate

mission support presence. The Office of Military Affairs in the Department of Peace Operations and the Uniformed Capabilities Support Division in the Department of Operational Support should adjust their approaches to the development of statements of unit requirements, force generation, and negotiations of memorandums of understanding (MOUs) accordingly.

- Mission COE and MOU management review boards should regularly review existing generators for right-sizing based on actual consumption and alternative forms of electricity generation.
- Where power is provided by UNOE, military and police contingents should not be running their COE generators. Contingents should be clearly informed that generators do not need to be constantly running to qualify for reimbursement.

To the UN General Assembly:

- **Meet goals with capacity. Instead of adding additional renewable-energy expertise and capacity in missions, additional expertise should be developed at Headquarters and at the Global Service Center,** including through REACT, to serve as a resource to all missions.

To the UN Country Team, and International Donors and Partners:

- **Coordinate with mission.** Work closely with UNMISS and the host government to take full advantage of the UNMISS transition to renewable energy by preparing for, and providing funding for (as needed), the following scenarios:
 - First, to explore and be ready to support options for any private or government-led renewable-energy project.
 - Second, be ready for piggybacking on UNMISS PPA project arrangements, in order to expand the size and scale of any renewable-energy project to also benefit communities from the outset of project design and implementation.
 - Third, to work closely with UNMISS as early as possible to plan for the eventual handover of renewable-energy infrastructure or, in the case of PPAs, the relevant commercial contracts.
- **Include peacekeeping transitions into long-term planning.** International financial institutions and the African Development Bank should explore ways to incorporate the transition of peacekeeping sites in the long-term planning of energy infrastructure in South Sudan.
- **Invest in solar.** Invest in community solar installations for (former) PoC sites and IDP camps, with appropriate security to prevent theft and looting, recognizing their long-term presence.
- **Promote minigrid development.** Prioritize investment in and support for distributed solar minigrids in key towns and cities, beyond Juba, especially for use by essential public service institutions such as schools, universities, and hospitals.

To the GoSS:

- **Link interests and plans.** Establish an Electricity Sector Working Group with senior representatives from across different government departments (e.g., the Department of Energy and Dams, the Environment Ministry, and the SSEC) as well as key UNMISS/UN country team departments or positions (e.g., the climate security advisor) and other key international partners (e.g., the World Bank) to improve communication, build consensus, and generate momentum for public and private sector investment in renewable energy and the electricity sector.
- **Improve governance of energy options.** Strengthen renewable-energy-focused capacity at the Ministry

for Energy and Dams so that it can effectively regulate and provide oversight on the energy sector, and support new distributed renewable-energy development, particularly outside of Juba.

- **Promote public-private partnerships** and provide legal support to foreign investors to help them navigate government regulations, and to mobilize additional resources for the energy sector.
- **Set annual renewable-energy targets**, as well as annual price ranges for electricity providers, and empower government agencies to hold providers accountable to those targets.
- **Incentivize clean energy**, especially solar, by allocating additional resources to help private sector players overcome prohibitive financing challenges and pivot toward renewable energy, particularly outside of Juba.
- Support the **development of a skilled local labor force** by investing in vocational training for the renewable-energy sector – for example, training local young people on the installation and maintenance of solar equipment.
- Formulate an **electrification strategy** to enable and reassure private-sector minigrid development.
- Develop regulatory framework to provide some standardization and predictability of tariffs and for solar products to ensure adequate quality and sustainability.
- Review and **finalize the 2015 Electricity Law** to develop a broad legal underpinning for the power sector, including the establishment of a transparent regulatory function and clear assignment of key sector responsibilities.

To the Private Sector:

- **Look at economic options for engagement.** Recognizing the potential value of UNMISS and the wider UN as a significant anchor electric power customer, energy retailers, independent power producers, and renewable-energy developers should actively identify feasible financial opportunities to invest in the sector. Consider nearby clinics and educational facilities as additional viable core off-takers.

ENDNOTES

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