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# Global Renewable Independent Power Supplier (GRIPS)

## Phase 2 Analysis Summary

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### GOAL —

To replace off-grid industrial diesel generators with commercially mature and cost-competitive renewable alternatives, including storage, in Sub-Saharan Africa

### CURRENT STAGE —

Corporate Start-Up Phase

### SECTOR —

Off-takers across all industrial sectors, local communities, schools, universities, and hospitals

### PRIVATE FINANCE TARGETS —

Equity from private sponsors (corporates, funds and family offices) and later, institutional investors

### GEOGRAPHY —

For pilot phase: at least three countries in Sub-Saharan Africa  
In the future: Sub-Saharan Africa countries and least developed/low-income countries globally



**The Lab** is a global initiative that supports the identification and piloting of cutting edge climate finance instruments.

It aims to drive billions of dollars of private investment in developing countries.

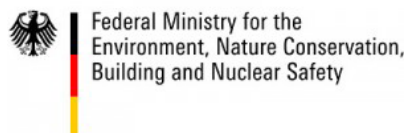
## Acknowledgements

Information included in this report is based on high-level preliminary analysis, subject to changes based on the more in-depth analysis that would be performed during Phase 3 of The Lab assessment, provided Lab Advisors select this instrument.

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## SUMMARY

A significant portion of the industrial production in Sub-Saharan Africa is not connected to a stable electricity supply, and many sites are powered with expensive, unreliable and emission-intensive diesel generators. GRIPS (Global Renewable Independent Power Supplier) aims to drive the replacement of diesel generators with cheaper and reliable renewable alternatives with potential to extend electricity access to surrounding communities, by creating “grid islands” anchored around centres of industrial activity.

GRIPS is a private sector entity that develops and builds a diversified pool of decentralized renewable energy assets (ideally base-load enabled combinations of PV and wind including storage). It brings scaled-to-fit technology “bundles” that use mature, standardized, and low-risk technologies, in line with off-taker needs and their demand-load profile. An initial 100% equity-funded portfolio approach would enable short-term power purchase agreements (PPAs) – as short as five years in length – between GRIPS and established and creditworthy industrial off-takers operating across all sectors and across most suitable countries. Risk associated with non-renewal of PPAs, or underperformance, would be spread across the entire asset pool.

Despite several barriers and challenges, the initiative benefits from a strong implementation plan and an experienced management and engineering team, strong business relationships to equipment suppliers as well as possible EPCs and experienced promoters.

In order to be fully applicable to the market, the instrument needs:

- A portfolio of four to ten reliable industrial off-takers.
- Involvement of public institutions to provide equity funding and support for the initiative.
- Contracts with technology and service providers.
- Local supply chains and workforce.

If implemented, GRIPS targets a huge and largely untapped global market of industrial off-grid diesel systems which is estimated at approximately 29 GW. By replacing these existing systems with clean alternatives, GRIPS could generate approximately USD 7.2 billion in investment through 2030. Additionally, successful implementation would avoid up to 2.5 million tonnes of CO<sub>2</sub> per year, industrial energy security, and electrification of rural communities in low-income countries.

## INSTRUMENT DESCRIPTION

*GRIPS is a private sector entity that develops, builds, and owns a diversified pool of decentralized renewable energy assets aiming to replace industrial diesel generators in off-grid areas.*

Currently, industrial users of electricity located in remote regions, such as Sub-Saharan Africa, typically rely heavily on expensive, inefficient, and emission-intensive diesel generators, or on unreliable electricity grids, to meet their energy demand.

Deutsche Bank has proposed the Global Renewable Independent Power Supplier (GRIPS) Company as an innovative and affordable approach to delivering reliable renewable energy assets to remote and off-grid energy demand centers. With this structure, GRIPS could additionally bring cheap and reliable distributed electricity to communities (and even introduce grid electricity in some cases) by developing grid-islands anchored around these pockets of industrial activity or anchor loads. Figure 1 illustrates how GRIPS is structured.

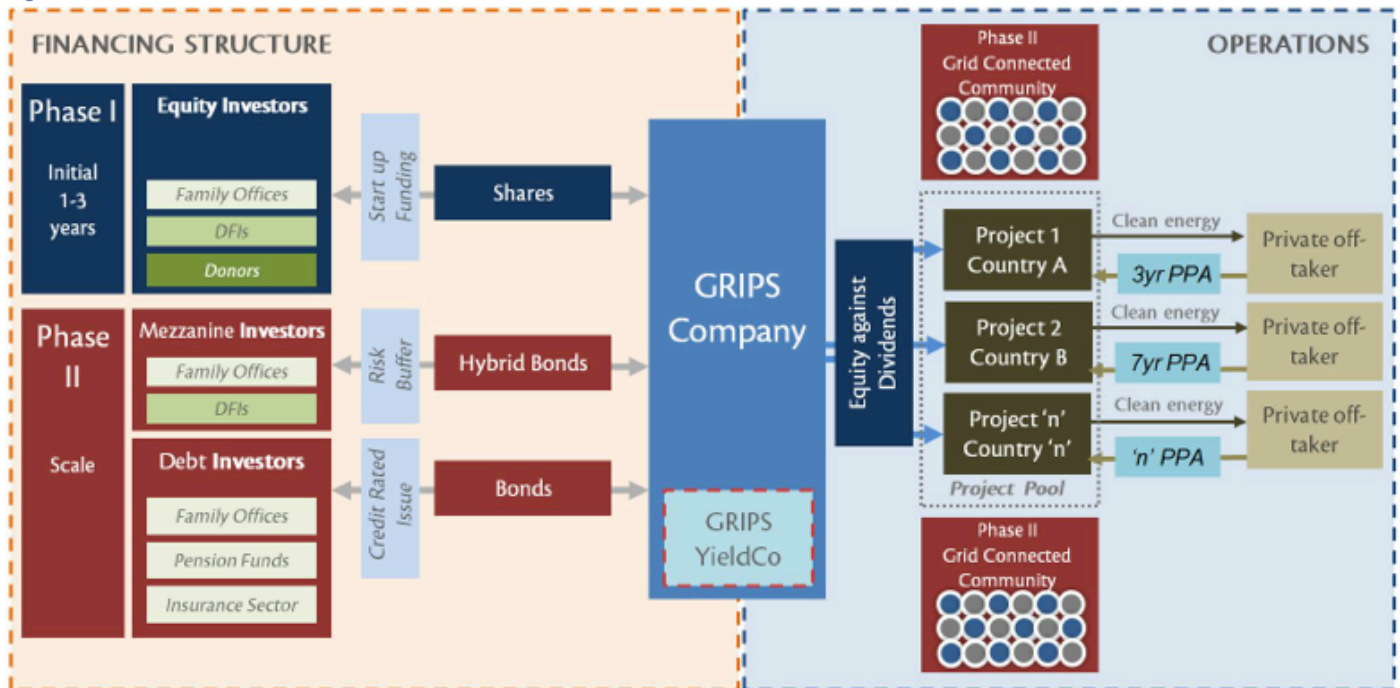
**The “GRIPS Company” is a private sector investment entity that develops, builds, and owns decentralized and commercially mature renewable energy assets such as base-load enabled varieties of solar PV and wind. It would bring scaled-to-fit technology bundles tailored to meet client needs and demand-load profile.** For example, in a remote mining site in Sub-Saharan Africa, unserved by the grid and meeting national criteria as discussed below, the GRIPS Company would i) partner with a suitable local mining firm to identify its specific electricity needs (currently satisfied with diesel generators), then ii) build and operate a new hybrid power plant and sell the electricity to the firm according to its requirements.

As projects would form part of a diversified pool of generation assets,<sup>1</sup> the proponent envisages that GRIPS would be 100% equity funded at the outset based on average asset yields in the pool. The equity-funded portfolio approach would allow for more flexible contracting with off-takers by enabling the replacement of long-term power purchase agreements (PPAs) with PPAs as short as five years. This is because the risks associated with non-renewal of project PPAs, for instance, could be spread or aggregated across the entire asset pool. In this way, equity-only financing offers a reliable alternative to traditional project finance and protects from mission creep where conflicts arise between rather impatient debt and more patient equity providers, since the assets are entirely investor-owned.

Because the renewable technologies deployed would be commercially mature, energy produced would be cheaper than

<sup>1</sup> In the text, we refer to a “project” as a single electricity production plant attached to a single industrial off-taker.

Figure 1: GRIPS flow chart



the only long-term alternative of diesel-based power. GRIPS offers PPAs designed to be at least 10% cheaper than diesel generated electricity. GRIPS prices would be in the range of 0.3 to 0.4 USD/KWh, a very competitive price in many African regions, especially where fossil fuels are not heavily subsidized.

## STAKEHOLDERS

**Host country government actors** would have several roles to play in determining the early success of GRIPS. Establishing supportive policy environments, for example by allowing business-to-business energy supply instead of state-owned generation monopolies and by reducing fossil fuel subsidies, would increase the number of locations where GRIPS could successfully be established. Government entities could also act as equity providers, or eventually as off-takers. The GRIPS approach does not assume project-level public support nor does it assume financial incentives.

**Donors / development finance institutions** would provide initial equity over the first phase of GRIPS to fund feasibility/scoping, development, and construction of a portfolio of innovative off-grid renewable energy projects. The GRIPS proponents are of the opinion that the success of their initiative is not possible without the financial and visible support from public sources in the ramp-up phase.

**Private investors** who initially are comprised of interested investors such as wealthy individuals (family offices, in particular) and specialist equity investors would provide equity to fund feasibility/scoping, development, and construction of the initial portfolio of projects. Once established, GRIPS would expand away from project-by-project level financing to an investment pool of increasingly diversified funders such as pension funds and other commercial investors. Early scoping of potential

private investors by the proponent indicates growing interest in opportunities to invest in a diversified pool of renewable energy assets in developing countries.

**Public and/or private sector energy off-takers** could reduce or replace their reliance on fossil fuel by utilizing inexpensive, state-of-the-art renewable energy and storage solutions. These off-takers may include multinational and/or national industrial actors and, in a second phase, state-owned users such as hospitals and schools that currently rely on off-grid diesel energy generation (or unreliable grid electricity) for their energy needs.

**Private sector technology providers** and specifically on-board, pre-selected, and established technology specialist companies would provide a wealth of experience and expertise in supplying off-grid renewable energy systems in targeted deployment regions. Ideally these companies will have the strength to provide engineering, procurement, and construction (EPC) services including longer-term operation and maintenance.

## TARGET COUNTRIES AND CONTEXT

GRIPS targets host countries with a combination of enabling factors and potential off-takers of clean and long-term alternatives for diesel-based energy in industrial applications. While the application is global, the initial focus of GRIPS is in Sub-Saharan Africa. This analysis has identified three countries as a potential fit for GRIPS pilot projects, namely: Nigeria, Kenya and South Africa.

## IMPLEMENTATION AND EXPECTED TIMEFRAME

**GRIPS would be carried out in two phases.**

- **Phase I:** establishment of the GRIPS Company,

and development and construction of a portfolio of workable, innovative off-grid renewable energy projects. By initially pooling equity assets over a large basket of investor-owned investments with trusted and well-established industrial actors in suitable sectors/countries, and by contracting established technology providers, risks to public and private investors are kept to a minimum. Depending on the context, Phase I would take two to three years.

- **Phase II:** GRIPS would scale up and expand the financing pool, thus expanding energy services to the neighboring communities that typically surround these industrial centers. While timing is likely to be dependent on the above country/contextual criteria, Phase II is likely to be operational by summer 2018, and would run for an additional three to five years.

### TARGET SECTORS AND TECHNOLOGIES

Ultimately, GRIPS targets diesel-based energy supply across many diverse and often energy-intensive industrial centers. As such the instrument has multi-sectorial potential. It targets established and reputable multinational industrial corporations that typically meeting their current energy needs through captive generation or unstable/unreliable grid electricity connections with significant diesel powered backup. These would act as off-takers, establishing a reliable source of long-term demand for the instrument.

Initial scoping carried out by the instrument proponent has identified a wide range of potential uses: shipping ports and other logistics infrastructure; agricultural activities such as irrigation pumps, cotton ginneries, rice mills and fertilizer plants, as well as the mining, chemicals, cement, and steel industries. By offering a viable alternative to diesel, and tailoring each project to the needs of the industrial actor (e.g. adjusting for the required load profile), GRIPS could substantially change the current approach of developing renewable energy solutions.

Contractual arrangements would offer some stability and flexibility, for example by offering five-year PPAs that could be rolled forward or renewed to adjust for changing conditions (e.g. cost changes, competition, project performance). A proprietary tool kit would define the most appropriate combination of renewable technologies and storage that best fits the profile of each off-taker. The standardization of technology package(s) would bring economies of scales and other operational and implementation efficiencies.

### ROLE OF THE LAB

As an early-stage concept, GRIPS is benefitting from analysis and peer review provided by The Lab Advisors and working group experts. In Phase 3, more detailed Lab analysis with the proponents would focus on identifying countries and an initial portfolio of projects for piloting, potentially as early as 2015. Analysis in Phase 3 of the Lab would develop a more detailed implementation plan, including exploring with Lab members opportunities to provide equity funding to GRIPS. Furthermore, the collaborative environment of the Lab could facilitate the

identification of partner institutions and other potential investors.

## CONTEXT

*A significant portion of the industrial production in Sub-Saharan Africa is not connected to a stable electricity supply, and so many sites are powered with expensive and unreliable diesel generators. GRIPS introduces low-carbon alternatives to industrial centres that not only bring cheaper energy security but also socio-economic development benefits for surrounding communities.*

599 million people live in Sub-Saharan Africa without access to electricity. This number is projected to rise to 645 million by 2030.<sup>2</sup> At the same time, a significant portion of the region's industrial production is not connected to an electricity grid. Companies are mostly powered with expensive, carbon-intensive and unreliable diesel generators that make them vulnerable to unscheduled power outages and related costs and losses.

The GRIPS approach offers a potential win-win solution to industrial centers and their surrounding communities by shifting the traditional understanding of developing and financing renewable energy projects. However, to be effective, it will need to fit into and evolve along with the sectoral and national operational framework in which it operates. GRIPS will initially target lower-middle income countries with established industrial demand that if tapped, could also support wider-community development objectives. Once proven, the approach could be replicated in middle-income countries and even in least developed countries.

### POLICY SETTINGS

GRIPS would be well suited to regions in which industrial energy use is currently heavily dependent on self-owned diesel generation, where fossil fuel subsidies are not overly high, or where electricity grid supply is unreliable. However, the feasibility of GRIPS in any one country will be strongly influenced by the energy and industrial policies that frame the working interactions and relationships between domestic institutions (including state-owned entities), private (international) actors including companies from the industrial and finance sectors, and local communities. A successful roll out of GRIPS requires action in a number of policy areas, which relate closely to many Sub-Saharan African countries where GRIPS would deploy initially.

- **Policies that provide open market access to captive power generation from international private sector power producers (IPPs):** The extent to which the current environment (including industrial energy suppliers) is open to international private actors will be fundamental to the success of the instrument. Saturation

<sup>2</sup> IEA, 2013.

of any market by state-owned entities (including in energy supply), for instance, could hinder effective deployment. Policies that support open industrial energy supply to other actors, including private sector entities, could prove valuable.

- **Policies that aim to limit or phase out (diesel) fuel subsidies or taxes:** Fossil fuel subsidies and tax incentives can significantly distort energy market pricing and impact industrial demand and need to be taken into account when determining GRIPS locations and measuring any comparative advantages (to fossil fuel alternatives).
- **Clear renewable energy objectives:** Targets for renewable energy deployment provide crucial incentives to invest in renewable energy in the first place, and can assist the roll out of small-scale applications of renewable energy in the country.
- **Policies that prioritize and promote energy security:** Volatile fuel pricing and import risks mean that reliance on diesel-based generation in industrial centers is unsustainable in the long-term. Policy objectives that shift industrial users away from reliance on such energy sources, encouraging domestic production in line with energy security objective, would favor GRIPS in the long-run.
- **Development objectives that include improved access to energy for communities:** Phase II of the instrument could improve access to energy and build long-term employment for communities surrounding the industrial centers. GRIPS could thus benefit local development objectives including stabilizing industrial energy supplies, electrification of off-grid rural populations and encourage further development infrastructure. The World Bank has already recognized the potential that private sector “anchor-based” initiatives can play in achieving rural electrification targets in developing countries.<sup>3</sup>

## FINANCIAL MARKET SETTING

Most industrial renewable energy financing relies on corporate or traditional project finance models and on public sector incentives such as long-term feed-in tariffs, tax credits or grants, many of which are unsustainable. By sidestepping traditional finance, and avoiding project level public support and financial incentives altogether, the GRIPS approach would transform the financing of industrial renewable energy applications.

The GRIPS approach works with a large pool of investors who would provide equity into a portfolio of standardized energy supply projects in strategic sectors and areas (see technology discussion). The aggregated asset approach means these

investments would earn portfolio-based returns with stability and lower risk than individual investments alone. Importantly, after the kick-start and the ramp-up phase, the GRIPS financing approach does not require public support via guarantees or financial incentives, but rather seeks to meet real demand for commercially viable renewable energy projects.

Depending on the appetite of investors, GRIPS, in its second phase, could also consider a “YieldCo” concept to place a diversified pool of running assets into the equity markets, thus enabling capital rotation by using the proceeds from the asset disposals for new development and construction. The GRIPS YieldCo would distribute all dividends to investors and, due to the existing PPAs and asset diversification, would benefit from significantly lower cost of capital than the GRIPS Company.

## STAGE OF TECHNOLOGY DEVELOPMENT

Technologies deployed would be mature and commercially viable. Solar photovoltaic and wind energy solutions offer already excellent delivery opportunities for reliable and cost-effective sustainable energy in parallel with diesel generation. Depending on the need of the industrial off-taker (e.g. the required load profile) and the chosen host country/region, GRIPS projects will firstly aim to introduce renewable energy to existing diesel generation as a hybrid approach, before ultimately including state-of-the-art electrical storage covered for performance risks by insurance companies and/or by long term manufacturer guarantees. The introduction of renewable energy with diesel serves as a reliable first step towards total diesel generation replacement with a combination of renewable energy and storage.

## LESSONS FROM SIMILAR INSTRUMENTS

GRIPS is unique and not fully comparable with any other existing initiatives. Some other instruments share design elements that offer lessons to inform the development of the GRIPS approach. Projects in South Africa, Azores and Seychelles<sup>4</sup> have demonstrated how replacing off-grid diesel with renewable energy makes economic and environmental sense in remote locations far from transmission line areas or where the cost of connecting is prohibitive. Local producers using off-grid diesel rely on a carbon-intensive technology, which requires regular expensive fuel shipments and is prone to unscheduled power outages that might affect the production chain. Appropriately designed renewable and storage systems represent a more reliable and cheaper alternative.

<sup>3</sup> The World Bank’s “A-B-C” approach is based on a similar concept: off-grid areas in least developed countries, where large companies (i.e. mining companies or telecom towers) powered by local energy service companies could serve as an anchor (A) to extend their excess energy to surrounding businesses (B) and communities (C) (WB, 2013).

<sup>4</sup> Namely: Cronimet Energy Thaba Mine PV Plant (South Africa); Port Victoria Wind Farm (Seychelles); Electricidade dos Acores SA Graciosa Microgrid Project (Graciosa Island, Azores). Alexander Voigt, founder of GRIPS, is also the founder of Yunicos AG, a renewable energy and storage company that developed the Azorean project.

## INNOVATION AND BARRIER REMOVAL

*GRIPS offers a novel approach to finance and develop renewable energy projects in developing countries, based on flexibility, innovation and risk-reduction. A 100% equity-funded portfolio enables short-term PPAs between GRIPS and reliable and creditworthy industrial off-takers operating across all sectors and across most suitable countries. Diversification ensures the risks from any single project are spread across the entire portfolio.*

### INSTRUMENT INNOVATION

GRIPS offers an innovative approach to deliver commercially viable, cutting-edge energy technology through a robust equity-based financial and risk management model to deliver on socio-economic development opportunities. While similar initiatives have been established to replace off-grid diesel energy with hybrid solutions, currently no comparable instrument exists. When proven, GRIPS could readily scale up and replicate across a wide range of regions to deliver clean and stable energy supplies for industrial uses, as well strong development benefits for surrounding communities. Among GRIPS' innovations, the instrument approach does not include project level public support (e.g. public loan guarantees) or financial incentives (e.g. feed-in tariffs).

### BARRIERS ADDRESSED

**Lack of local demand for alternative energy sources:** Where public or private sector incumbents are unable or unwilling to invest in renewable energy, the international private sector GRIPS clients could provide the credible demand to deploy renewable energy in the country. The pool of commercially mature renewable energy assets (initially hybrids with diesel backup) will grow across a diverse set of jurisdictions, sectors, and counterparties creating a risk profile that attracts international private sector investors.

**Access to finance for projects:** GRIPS introduces an innovative approach to finance small-scale renewable energy/storage solutions in developing countries, otherwise limited by existing project finance models. Risk, whether real or perceived, is still the major impediment for venturing in these regions and GRIPS may create new possibilities to unlock markets where investments are desperately needed.

**Access to project financing without debt:** GRIPS Company would be funded solely with equity relying entirely on the average asset yields in the pool (i.e. 100% corporate equity finance, no leverage, and no project finance). Equity-only financing helps to protect from mission creep, especially in the ramp-up phase, since the assets are entirely investor-owned, avoiding potential conflicts between rather impatient debt and more patient equity providers. It also keeps risks to public and private investors to

a minimum. Finally, the future corporate structure allows later funding diversification by issuing instruments such as bonds (green), equity, or mezzanine debt – all of which are standardized and well known to institutional investors. The abovementioned GRIPS YieldCo concept could be a further financing alternative in Phase II, which could create a significant lever for the initial capital funding from investors.

**Commercial and technical risks:** The equity-funded portfolio approach in GRIPS allows replacing long-term PPAs with those as short as five-years in length, ensuring flexibility, and risk reduction; for instance, commercial risks associated with non-renewal of project PPAs or underperforming assets can be spread across the entire asset pool. Technical risks, such as hardware breakdowns or complications in the operation and management processes, benefit from the portfolio approach in the same way.

**Perception of complex and homogenous renewable energy technologies:** A major step in renewable energy project development in GRIPS is the possibility to standardize what projects can deliver in line with client needs with technology packs. GRIPS can thus reduce complexity and transaction costs without increasing construction and operation risks even in inhomogeneous, developing country settings. These standardized packs comprise of the following items which can bring benefits such as economies of scale and other operational efficiencies, including:

- **Energy needs of client:** energy for day-peak, base-load, or other technical needs depending on the industry (e.g. electricity or heat demand);
- **State-of-the-art ground data:** standardized database of local conditions (dust, water availability, etc.), local and site specific resource potentials (solar irradiation, wind resource, etc.), and client needs (load profile, energy availability needs, etc.);
- **Ideal penetration of renewable energy:** By employing advanced storage technology, in combination with commercially viable renewable energy technologies, the GRIPS proponents hope to make in-roads into the provision of clean, stable, and long-term sources of energy for industrial applications. Ideally, GRIPS could deliver penetration rates in the 60-80% of total energy demand for each user, or higher.
- **Source and capacity of generation technology pack:** in regular increments such as 0.5 MW, 1 MW, 2 MW, 5 MW etc. Important element to the project is the use of mature and commercially viable technologies. Depending on local conditions, the envisaged system could utilize solar PV and/or wind, and depending on the penetration rate needed a hybrid or stand-alone approach. For example, solar-diesel hybrid, 100% solar, 100% wind, wind-hybrid, solar-wind hybrid, etc. (see later for cost analysis of these options).
- **Storage potential and application:** Depending on client needs, GRIPS hopes to utilize state-of-the-art battery storage to sit alongside renewable

energy sources and offer entire replacement of diesel generation. Battery technology is quickly evolving where technology warranties and guarantees are becoming the norm. However, there is still a perceived risk which is a barrier that GRIPS will directly address.

- **Strong technology supplier and contractors to reduce construction and operation risks:** ideally an established, trusted multinational with operational experience in the region. At the same time, a strong EPC (engineering, procurement and construction) provider with technical warranties and guarantees will reduce construction and operational risks, especially if similarly reliable operations and maintenance (O&M) providers can be engaged.

**Investors' perception that battery storage is unproven:** One of GRIPS sponsors is a world leader in the electricity storage market. This should encourage investors in recognizing the market's commercial opportunities (i.e., advanced technology, easier maintenance efforts and higher cost competitiveness). Batteries already benefit from long-term creditworthy manufacturer warranties and performance insurance solutions.

#### BARRIERS NOT ADDRESSED

**Lack of real demand for alternative energy sources:** If established industrial actors are locked into long-term contracts with state-owned energy entities, they may have only limited opportunity to take advantage of a GRIPS approach. Vested interests and complex interactions with state subsidies could hamper its diffusion.

**Identification of off-taker:** There is an abundance of off-grid operating companies in Sub-Saharan Africa. However, identifying an initial set of pilot sites requires off-takers to comply with a wide array of stringent requirements, which could limit the number of suitable off-takers, including, among others:

- Reliably purchase the contracted amount of energy;
- Only undertake projects that ensures a minimum return of 8-12% to GRIPS' shareholders;
- Ensure the adequate national political, regulatory, and business environment is adequately in place.

**Policy and regulatory risk:** The GRIPS approach reduces policy and regulatory risk related to unstable investment climates, administration, and bureaucratic hazards (e.g. substantial delays and permitting challenges). However, in countries with established energy generation monopolies, GRIPS may not be able to establish a business-to-business model that could operate entirely independent from a regulatory perspective. Nonetheless, over the past decade, many countries have made progress towards creating a more open environment for independent power producers (IPPs).

**Distorting fossil fuel subsidies and tax incentives:** Because PPAs would cover relatively short time frames, rapid price decreases for diesel alternatives could erode GRIPS' competitiveness and result in industrial off-takers reverting to diesel generation. The reliability of the GRIPS technology and

its enhanced service provided could serve to mitigate this event.

**Local supply chain and knowledge barriers:** Some developing countries (e.g. South Africa) impose minimum levels of local/domestic content provisions for projects. Depending on countries' institutional structures and demand for renewable energy projects, GRIPS may be unable to source sufficient local technology/construction suppliers, or positively impact the local supply chains. Likewise, there may be difficulties accessing appropriate skills needed to operate the project on the ground.

#### IMPLEMENTATION AND RELATED CHALLENGES

*Work is already underway to design GRIPS' operating regime, identify early funding options, and pilot projects. However, while several implementation challenges exist, such as lack of homogeneity in host countries and projects, the careful selection process of suitable regions, off-takers, and technology suppliers can mitigate most.*

The innovative nature of GRIPS is set to open up new opportunities to develop off-grid supplies of renewable energy/storage in multiple regions and for multiple sectors and communities. While still at a conceptual stage, GRIPS benefits from an experienced proponent<sup>5</sup> with advanced thinking for a robust implementation plan, a variety of strong links to possible implementing organizations and an envisaged operating structure that fits well in the pre-selected regions. However, implementation challenges remain, including selecting host regions, finding industrial clients, establishing equity funding, engaging technology suppliers, and navigating local policy and financial frameworks as necessary.

#### INSTRUMENT IMPLEMENTATION AND FEASIBILITY

Backed by a strong implementation plan and complemented by the right national policy environments, GRIPS has good potential to meet a real demand from energy off-takers, and exploit established international technology supply chains.

GRIPS must complete four steps for implementation:

1. Identify existing demand in order to prepare a potential pipeline of projects. Ideally, these would be linked to creditworthy industrial corporations to act as off-takers in the first instance. This would establish a reliable source of long-term demand for the instrument and minimize implementation risks during the ramp-up phase;
2. Select suitable host countries, likely Sub-Saharan African

<sup>5</sup> Alexander Voigt has established a variety of renewable energy businesses over the last 20 years (amongst them Q-Cells, Solon and Younicos AG), and has strong and long standing business relationships in renewable/battery hybrids with EPC companies, such as Gildemeister energy solutions.



countries, with high diesel fuel price, existing off-grid applications of diesel generation, demand for alternative solutions, and openness to independent generators;

3. Determine interest and secure commitment from initial equity backers for a small number of pilot projects (e.g. four to ten projects), including from respected public entities, and finally;
4. Establish a set of specialist renewable energy (and battery storage) technology providers with existing delivery capacity and strong supply chains in the region. Trusted multinational entities will likely reduce construction and operation risks, as will robust technology warranties and performance guarantees.

**Experienced implementation organization.** Once established, the GRIPS Company would be the implementing organization. Its potential organizational structure, internal funding structures, corporate governance, and identification of first hire have been completed, allowing for smooth and rapid instrument development, implementation, and scale-up. Members of the GRIPS implementing team have a sound track record innovating renewable energy and storage solutions, production and scaling up, and broad access to other industry-leading project developers, sector experts, and international technology suppliers.

**Fit alongside national policy.** The regional selection process would identify the appropriate contexts in which to implement pilots, in addition to energy end-users, technology suppliers, and contractors. GRIPS' business-to-business level structure would limit interaction with national policies that might cause interference (except, of course the introduction and establishment of private energy generators in industrial sectors).

## IMPLEMENTATION CHALLENGES

### REGIONAL SELECTION CHALLENGES

- **Country-level risks:** Developing countries can be subject to high risks including political instabilities, policy changes, or corruption. Such local disruptions could result in significant bottlenecks at off-taker and national government/regulatory levels and may not be able to be mitigated by insurance mechanisms such as MIGA Political Risk Insurance.
- **Established national entities and vested interests:** State-owned entities, including vertically-integrated/monopolistic energy and industrial sector actors, could present regulatory challenges to private sector entrants. Long-term contracts for heavily subsidized energy could crowd out external participation and significantly disrupt the potential of GRIPS and add substantial costs onto administration with permitting to licensing to become legal entity.
- **Heterogeneity of host countries and off-takers:** While the range of countries and the diversity of industrial sectors and off-takers is desirable from a risk diversification perspective, it could add significant administrative challenges and operational risks.
- **Subsidies that create no clear cost savings over**

**diesel generation:** Existing subsidies can add complexity to the process of pricing alternatives accurately. There is a risk that GRIPS projects are priced out of the market, which makes it that much more important to carefully determine suitable locations.

### STAKEHOLDER CHALLENGES

- **Lack of a local supply chain:** Niche technology provision could limit local supply chain potential, and mean GRIPS relies on more expensive international providers. Similarly, lack of local content in projects could be directly at odds with policy requirements, delaying project delivery (see CPI's Eskom CSP case study).
- **Reliance on established and trusted entities:** Established and experienced industrial actors and technology providers could fail to pass on the full benefits of cheaper, clean energy to the local population or crowd out local providers of technologies/expertise if they exist.
- **Managing relationships:** It could be challenging to manage and convene across GRIPS off-taker and investor pools, and across country/regulatory entities.

### FINANCING CHALLENGES

- **Raising sufficient capital from targeted investors:** GRIPS has not started fundraising and some funding providers, in particular public sponsors, are not yet identified. In order to become operational, the initiative would likely need to draw upon its own network of supporters, The Lab and the network and experience of Deutsche Bank going forward.
- **Currency risks:** Financing across many different countries could introduce significant currency challenges if PPAs cannot be secured in foreign currency when investors expect dividends in USD.

### ASSESSMENT OF IMPLEMENTATION TIMELINE

While no true comparison exists, the South African REIPPP program is a good example of introducing international private sector renewable energy generation companies to diversify the national energy supply away from state-owned fossil fuel. The South African government developed the REIPPP<sup>6</sup> program in 2011, following approximately three years of policymaking. Given the advanced state of the GRIPS company implementation plan and early identification of potential financiers and pilot projects, total time needed could be significantly lower. The business-to-business approach in GRIPS aims to avoid the need to carry out complex political or bureaucratic processes. **Depending on the country context, the first project-level phase might thus be implemented in two to three years.**

Scaling up the financing arrangement of GRIPS (including diversifying funding and expanding the project pool), in addition to developing electricity micro grids around existing industrial centers would require new policy/regional interactions that could

<sup>6</sup> Renewable Energy Independent Power Producer Procurement.

take substantial organization and management.

## PRIVATE FINANCE MOBILIZATION POTENTIAL AND OTHER POSSIBLE IMPACTS

*GRIPS has the potential to mobilize up to USD 145 million of private finance by 2020. If successful in its pilot phase, the instrument could rapidly expand and create a worldwide market in 2030 worth an estimated USD 7.5 billion.*

Despite huge energy needs and an abundance of renewable resources, investment for clean energy in Sub-Saharan Africa is still low. Around USD 20 billion was invested in renewable energy in the region between 2006 and 2014 (corresponding to roughly 1,800 MW of renewable energy installed capacity). Development finance institutions (DFIs), contributed more than a quarter of the total investment (USD 5 billion) enabling the private sector to enter this relatively risky environment. Analysts expect the private sector to continue to play a crucial role in the near future, growing the market significantly, up to USD 7 billion a year by 2016.<sup>7</sup>

### CATALYTIC POTENTIAL

**Based on the PLATTS database, we identified 400 captive-generating oil-powered industrial sites in Sub-Saharan African, totaling 1.4 GW of which, almost two thirds belong to cement and mining sectors.** In order to identify the most appealing countries for implementing GRIPS, we filtered these sites with several criteria:

- Political and regulatory stability;
- Existence of public subsidization of fossil fuels;
- Availability of renewable resources within the locality, and particularly solar irradiation and wind;
- Penetration of state-owned enterprises and specifically vested-interest in the energy/industrial market places; and
- Presence and size of potential industrial off-takers, initially large creditworthy Multinational Corporations and preferably with existing relationships with stakeholders.

**Based on these drivers, we focused on Nigeria, Kenya, and South Africa as good fits for GRIPS pilot projects.**

**We estimate GRIPS has the potential to mobilize up to USD 145 million of private investment to 2020.** We came to this estimate by modeling alternate pilot portfolios, each of which included five generation plants capable of producing a 5 MW base-load to match the production demand of a standard industrial off-taker based in one of the potential pilot countries identified. For simplicity we assume all plants are located in Kenya. Since the main objective is to maximize the ratio of renewables in each plant at the lowest possible operating price, plants have different combinations of solar PV, wind, storage,

<sup>7</sup> BNEF, 2014a.

and backup diesel. All combinations are designed to deliver an 8% minimum return on investment (as per proponent plan). **Thus, depending on the mix of technologies used, we estimate that the GRIPS pilot portfolio will cost between USD 163 – 289 million.<sup>8</sup> Assuming that public sponsors will contribute 50% of such amount,<sup>9</sup> private finance mobilized ranges from USD 82 – 145 million.**

### TRANSFORMATIVE POTENTIAL

Assuming two projects are built every year starting in 2018, up to 30 projects are likely to be built by 2030 in the Sub-Saharan African GRIPS, corresponding to a **cumulative market totaling up to USD 1,740 million.** Standardized packages, know-how accumulation, and clear success of the pilot phase make the roll out easier and might achieve a higher share of this untapped 1.4 GW market. Therefore, we calculated that one GRIPS project would likely save **between 8,500 and 19,800 tonnes of CO2 per year** (depending on the technology mix).<sup>10</sup> Cumulatively, **the initiative could save up to 595,000 tonnes of CO2 per year since 2030 in SSA alone.**

When looking to the potential global market for GRIPS and similar initiatives based on the same business model, we identified more than 5,200 potential off-takers operating in the world, for a cumulative capacity of 25.9 GW,<sup>11</sup> spread across 111 developing countries. Although the projected global consumption of diesel for power production is projected to decrease by almost 30% by 2035,<sup>12</sup> there is an additional 3 GW currently planned to become operational in next years, bringing the maximum potential market size to almost 29 GW.

Assuming the country diversification is the most important driver to ensure this approach is successfully replicated elsewhere, we estimated a potential market value achievable by 2030. At least five initiatives can possibly start in 2020, each focused on 20 different developing countries, with the same business model, size and growth rate of GRIPS. **We estimate that the cumulative impact of the GRIPS approach can generate a global market valued approximately USD 7.2 billion by 2030 and capable of saving up to 2.5 million tonnes of CO2 per year from 2030.<sup>13</sup>** Emissions avoided are likely to be

<sup>8</sup> Figures are calculated using US and European prices communicated by proponents. The effective investment is likely to be higher, because of transportation, tariffs and other costs. A more detailed assessment of costs and revenues will be carried out in Phase 3 of the GRIPS study.

<sup>9</sup> Proponents have not confirmed this information yet and public/private shares in the financial structure might differ significantly.

<sup>10</sup> Using a capacity factor for small-scale diesel of 0.965 tCO<sub>2</sub>/MWh (EIA, 2011).

<sup>11</sup> PLATTS, 2014. Figures include Sub-Saharan Africa.

<sup>12</sup> IEA, 2013a.

<sup>13</sup> Estimates for the global market potential by 2030 should not be interpreted too hastily as we did not consider many other driving factors and limitations.

significantly higher, if the impact of cleaner electricity supply on the surrounding communities is also considered.

#### OTHER IMPACTS

In addition to CO2 savings and private market mobilization, GRIPS strives to secure significant and measurable socio-economic impacts:

- **Employment - local content and skills:** The GRIPS projects could generate substantial employment through project development, construction, and operation. The longer term benefits could attract new capacity in the project supply chain for further scale-up, facilitating wider economic co-benefits.
- **Energy access - development potential:** The second stage of GRIPS could help develop regions of remote and off-grid populations, including energy access, reduced reliance on fossil fuels, and improved local infrastructure including water, health and transport. Moreover, the enhanced energy independence and savings of the industrial off-takers could contribute to their expansion that indirectly can bring more employment and wealth to the region and the entire country.
- **Secondary benefits:** Additional benefits include enhanced energy security national at the country level, fiscal benefits with less reliance on potentially imported energy sources.

#### UNSUBSIDIZED FINANCIAL PERFORMANCE

Initially, public sponsors of GRIPS are required to build credibility and realize its pilot stage. While public funders will be important additions to the GRIPS investment pool, each project is expected to operate without the need for other public subsidies such as guarantees or incentives. GRIPS will only select settings that allow for a project IRR of 8-12%.

#### CONCLUSIONS AND NEXT STEPS

**GRIPS represents a promising concrete investment opportunity for developing off-grid supplies of renewable energy and storage in developing countries.** Innovation, flexibility, and risk-reduction are at the base of this new business approach that aims to replace off-grid diesel generators in Sub-Saharan Africa, with cheaper, cleaner, and more reliable renewable alternatives.

**The instrument aims to provide a viable business case that establishes a “new normal” in sustainable energy finance with significant development co-benefits.** GRIPS could prove to be the catalyst for a new approach that finances the power actually used rather than the power that is produced based on a sensible analysis of the locations of users and load profiles. Ultimately, GRIPS intends to introduce a paradigm shift in the way renewable energy projects are financed and implemented in developing countries.

**Despite several barriers and challenges, the initiative benefits from a strong implementation plan and experienced**

**promoters.** In order to be fully applicable to the market, the instrument needs:

- A portfolio of four to ten reliable industrial off-takers.
- Involvement of public institutions in funding and supporting the initiative.
- Contracts with technology and service providers.
- Local supply chain and work force.

If implemented, GRIPS targets a huge and largely untapped global market of industrial off-grid diesel systems which is estimated at approximately 29 GW. By replacing these existing systems with clean alternatives, GRIPS could generate approximately USD 7.2 billion in investment through 2030. Additionally, successful implementation would bring substantial achievements in CO2 savings, industrial energy security, and electrification of rural communities in low-income countries.

#### NEXT STEPS

The Secretariat will present the results of this analysis at the Lab Advisor Meeting on 20 October 2014 in Venice. Lab Advisors, in consultation with their Principals, will select the most promising three to four for further detailed analysis and development. A written report summarizing the analytic findings for the seven instruments will be published at the end of November 2014.

Should GRIPS be selected, analysis in Phase 3 of the Lab would develop a more detailed implementation plan, based on a pilot portfolio of four to ten projects. Methodology will be based on the San Giorgio Group case study approach. Furthermore, the collaborative environment of the Lab would facilitate the identification of partnering institutions and potential investors as well as ensure the evolution of potential synergies between Lab work streams.

## INDICATOR ASSESSMENT SUMMARY

CRITERIA	INDICATOR	ASSESSMENT	COMMENTS/RATIONALE
Innovative	Addresses: Access to finance for projects	High	GRIPS introduces an innovative approach to finance small-scale renewable energy/storage solutions in developing countries, otherwise limited by existing project finance models.
	Addresses: Lack of alternatives to energy supply	High	GRIPS introduces a clean, reliable, and cheap alternative to replace fossil fuel off-grid solutions.
	Addresses: Batteries misconception	High	One of GRIPS' sponsors is a world leader in the electricity storage market. This should encourage investors in recognizing the market's commercial opportunities.
	Addresses: Lack of private sector participation in African energy	Medium-High	Where public sector incumbents may be unable or unwilling to invest in renewable energy, international private sector GRIPS clients could provide the credible demand to deploy renewable energy in the country and extend electrification to remote communities.
	Addresses: Access to initial funding	Medium-High	Although GRIPS has not started fundraising and has not yet identified its funding partners, it may benefit from its network of supporters, the Lab and the network and experience of Deutsche Bank.
	Addresses: Commercial and technical risks	Medium-High	Risk of non-renewal of PPAs, underperforming assets, technical risks (hardware breakdowns) are spread across the entire portfolio and de-facto, mitigated.
	Addresses: Complexity of the business model	Medium	Standardization of project elements and innovative financing structure means GRIPS can reduce complexity and transaction costs without increasing construction and operation risks even in inhomogeneous, developing country settings.
	Addresses: Lack of local supply chain and knowledge barriers	Low-Medium	GRIPS may be unable to source sufficient local technology/construction suppliers in line with national regulation (e.g. in South Africa), or positively impact on the local supply chains.
	Addresses: Lack of real demand for alternative energy sources	Low-Medium	Despite the high potential on paper, GRIPS may be unable to find enough off-takers to achieve the diversification needed and the expected returns.
	Addresses: Presence of subsidized fuel or tax	Low	Subsidies to diesel-fuel or tax incentives to certain industries can distort the energy market and lower the attractiveness of GRIPS to off-takers.
	Addresses: Policy and regulatory risk	Low	Business-to-business approach inherently reduces policy and regulatory risk that would otherwise be driven largely by unstable investment climates, administration and bureaucratic hazards. In some countries, GRIPS may be unable to establish a model that can operate entirely independent from a regulatory perspective.
	Addresses: Currency risk	Low	Financing across many different countries could introduce significant currency challenges if PPAs cannot be secured in foreign currency when investors expect dividends in USD.
	Instrument Innovation	High	Similar initiatives have been established to replace off-grid diesel energy with hybrid solutions. However no comparable instrument currently exists.

CRITERIA	INDICATOR	ASSESSMENT	COMMENTS/RATIONALE
Actionable	Time to implementation ("Phase I")	2-3 years (likely less). Potentially operational by summer 2018.	"Phase I" comprises of three distinct project stages: GRIPS company Implementation, Project Development and Construction. The business-to-business approach in GRIPS should avoid the need to carry out complex political processes, and the first project-level phase could thus be implemented in 2-3 years
	Time to implementation ("Phase II")	3-5 years following Phase I.	Scaling up the financing arrangement of GRIPS (including diversifying funding and expanding project pool), in addition developing electricity (micro) grids surrounding existing industrial centres would require new policy/regional interactions that could take substantial organization and management.
	Strength of implementation plan	Medium-High	Robust plan that identifies existing demand for GRIPS and potential pilot industrial actors in several Sub-Saharan African countries, potential technology providers, and establishes initial financing interests.
	Strength of implementing organization	Low-High	The implementing organization, "GRIPS Company", is still to be established. However the implementation process has been identified (including potential organizational structure, internal funding structures, corporate governance, and identification of first hire) which would allow for smooth and rapid instrument development. The potential implementing agent has a long track record in renewable energy and electrical storage innovation, production and scaling, including broad access to other industry leading project developers and technology experts
	Fit to national policy environment	Medium (High through effective region selection)	As GRIPS will operate on a business-to-business level, interactions with national policies will likely be kept to a minimum (except, of course the introduction and establishment of private energy generators in industrial sectors). The regional selection process accounts for these and other factors, including for instance national energy market openness to private sector generation, or existence of fossil fuel subsidies.
Catalytic	Private finance mobilized	USD 145 million	Different scenarios for a potential pilot portfolio of 5 x 5MW plants show that initial investment ranges from USD 163 and 289 million. We assume public sponsors contribute 50%.
	Public finance needed	USD 145 million	Assuming 50-50 public-private shares in GRIPS.
Transformative	Market potential in 2030	USD 7.2 billion	Assuming 2 projects are built every year up to 30 projects are likely to be built by 2030 in SSA, worth USD 1,740 million. If replicated in other regions from 2020, the potential global market created is estimated in USD 7.2 billion.
	Adaptation / Mitigation impact (potential)	Up to 2.5 Mt CO <sub>2</sub> e/year	A single GRIPS project could likely save between 8,500 and 19,800 tonnes of CO <sub>2</sub> a year (depending on the technology mix). Cumulatively, the initiative could save up to 2.5 M tCO <sub>2</sub> per year starting from 2030.
	Local development impact	Both positive and negative impacts	<ul style="list-style-type: none"> <li>Positive impact on: employment/local content and skills; energy access/development potential; secondary benefits (enhanced energy security, less reliance on imported fuels and improved infrastructure to rural areas)</li> <li>Negative impact: reliance on established and trusted entities – established and experienced industrial actors and technology providers could fail to pass on full benefits to local population or crowd out local providers of technologies/expertise if they exist</li> </ul>
	Unsubsidized financial performance	8-12% IRR	GRIPS will only select settings that allow for a project IRR of 8-12%. No debt will be used in the initial phases. This target IRR is based on the assumption that approx. 10% savings against the benchmark diesel LCOE at the project site needs to be achieved (this doesn't account for volatile diesel price/reliance on fossil fuel).

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