

# Sub-Saharan Africa Power Trends

## Power disruption in Africa



# Preface

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This report is a summary of the consolidated point of view of the Deloitte power leaders across Africa, backed by research.

We are delighted to introduce the inaugural annual Sub-Saharan Africa power trends report to the market. We have taken a snapshot view of several Sub-Saharan African (SSA) markets and share some of the developments specifically relating to the trends that Deloitte sees as emerging 'disruptors' in the SSA power sector, presenting new opportunities for power companies in today's challenging economic climate.

This report is a summary of the consolidated point of view of the Deloitte power leaders across Africa, backed by research.

We welcome your comments and input and hope this report will help to drive long-term value for your organisation.



**Andrew Lane**  
Africa Energy &  
Resources Leader  
Deloitte



# Introduction

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Low levels of infrastructure and power supply are a deterrent for many wanting to invest across various sectors in Africa.

Despite a significant oil price drop in recent months signalling renewed headwinds in the global economy, the SSA economy is forecast to grow at a combined rate of 5% over the next few years. To support this level of growth, large investments into infrastructure and sustainable power supply need to be made.

Low levels of infrastructure and power supply are a deterrent for many wanting to invest across various sectors in Africa. The development of large capital projects needed to support the growth of the African economy and attract the required investment relies on robust planning, reliable funding, resilient operating structures and skills development. In light of the main challenges facing the SSA power industry, such as inadequate generation capacity, poor transmission infrastructure, unskilled or low numbers in the skilled workforce, poor maintenance of existing power stations, as well as poor metering and billing systems resulting in unreliable supply, countries will need to innovate to achieve financially viable growth in the sector.

These challenges, coupled with a changing landscape in terms of technologies and the costs thereof, are giving rise to a number of 'disruptors' in the sector, inspiring a shift away from traditional generation practices and mixes, modes of business, methods of operations and systems, funding channels and models, as well as the landscape of players and stakeholders, towards the application of new and innovative technologies and dynamics in Africa's power infrastructure.



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# Mapping disruptors in SSA's power sector

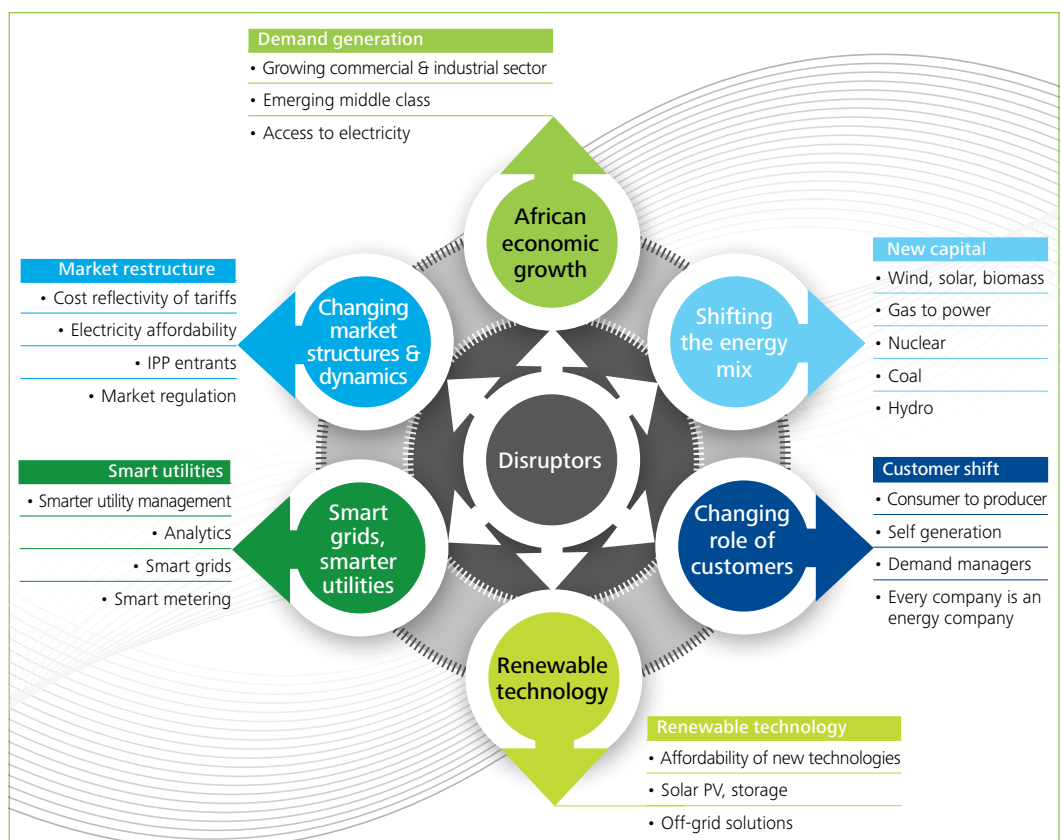
Unreliable, insufficient and costly power generation and distribution across the African continent has arguably been the Achilles heel to higher and more inclusive growth and socio-economic development of the region. Infrastructure stock levels have impeded rather than facilitated growth and development. This is changing rapidly, as, in order for Sub-Saharan Africa (SSA) to develop and industrialise in a viable manner, a revolution in the power and related infrastructure sector is inevitable.

A number of emerging 'disruptors' already are visible and will continue to disturb power landscapes in the region, including existing models of business, methods and systems of operations, as well as the blend of players in the region's power and electricity subsectors. Although the change that is underway is a gradual one, stakeholders in the sector are cautioned not to fall subject to a 'boiling frog syndrome' – although incremental, this change will result in a significant shift in Africa's power sector, which requires adaptation strategies. Some of these emerging disruptors can be summarised to include the following:

“A disruption displaces an existing market, industry or technology and produces something new and more efficient and worthwhile. It is at once destructive and creative.”

Harvard Business School professor and disruption guru Clayton Christensen

Chart 1: Emerging Disruptors in Sub-Saharan Africa's Power Sector



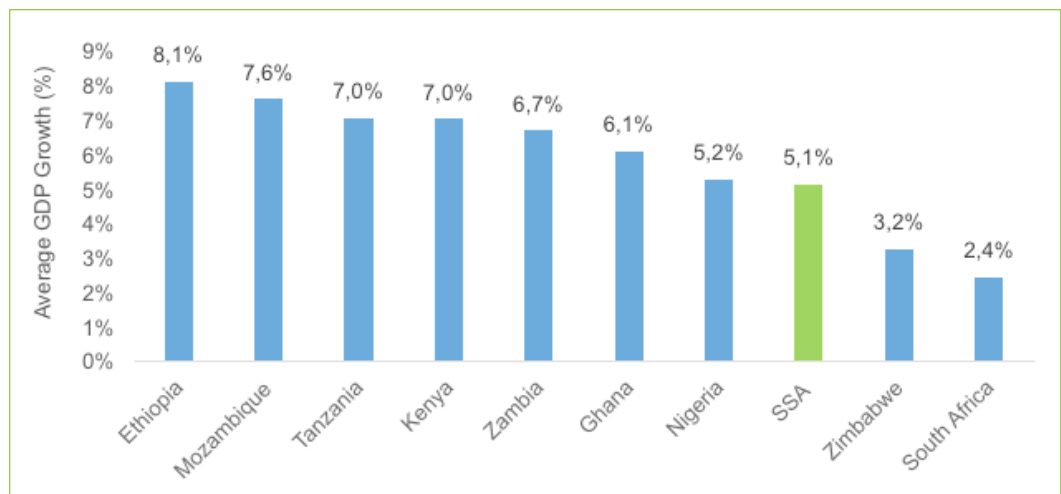


**Disruptor 1: African economic growth, transformation and rising demand**

SSA is one of the fastest-growing regions, averaging 6% growth over the past 15 years. With continued high growth rates expected for the region (in excess of 5% over the years to 2019), reducing the current power infrastructure shortcomings will be crucial in supporting the next chapter of Africa’s growth model – one that pursues economic diversification and industrial development. This is in order to make a dent in unemployment, poverty levels and rising inequality amidst a population that is expected to more than double to 2.7 billion people by 2050.

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**Chart 2: Forecast Average GDP Growth for Select SSA Countries (2015f-2019f)**



Source: IMF World Economic Outlook, 2015.

A general increase in household income levels in Africa has facilitated the emergence of a growing African middle class, which has been coupled with increased household consumption expenditure. Other demand drivers in the power sector include urbanisation, increased household consumption and various infrastructure projects that are directly and indirectly linked to the power sector.

Three industries in particular will require an increasing amount of electricity and thus result in higher power demand. These include the mineral resources and related value-adding activities; consumer and retail-related manufacturing; and agriculture and agribusiness – all of which will underpin commercial and industrial developments going forward.

Countries are, however, grappling with low reserve margins (mostly less than 5% for the nine countries evaluated by Deloitte and increased pressure on power supply creates a definite need for government and public sector stakeholders to establish real solutions to address the supply deficit.

Improved access to electricity across SSA is expected to be driven by electrification programmes, as well as better pricing and generation growth, with the largest generation growth expected to be seen in renewable energy through off-grid and mini-grid solutions.

By 2022, non-hydro renewables are expected to increase their share in the energy mix by a factor of five from 2011 values.



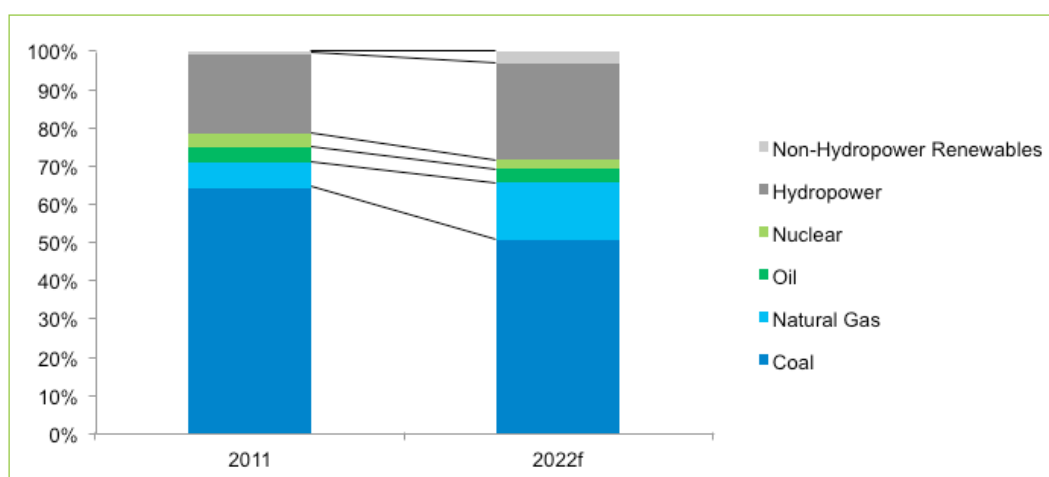
#### Disruptor 2: A shifting energy mix gives rise to new capital and players

SSA's changing energy mix trend is in part driven by the fact that the region's energy woes have been underpinned by the reliance on a single source of electricity production. This overreliance is waning and energy generation sources are diversifying.

While power generation from coal will still account for an important share of the energy mix in the foreseeable future, SSA countries are reducing their dependence on coal and oil-based energy sources. Countries are diversifying into more sustainable solutions including non-hydro renewables and natural gas, as the fast-dropping cost of these technologies makes them increasingly more viable.

By 2022, non-hydro renewables are expected to increase their share in the energy mix by a factor of five from 2011 values. With 90% of the continent's hydropower potential still unexploited, hydro-generation is expected to double in output, and increase its contribution in the energy mix from one-fifth to one-quarter by 2022.

Chart 3: SSA's Diversifying Energy Mix (2011 vs 2022f)



Source: Deloitte analysis based on BMI data, 2015.

Note: SSA countries included are Angola, Botswana, Cameroon, Côte d'Ivoire, Ethiopia, Gabon, Ghana, Kenya, Mozambique, Namibia, Nigeria, South Africa, Sudan, Tanzania, Uganda, Zambia and Zimbabwe.

Another solution to SSA's energy security challenges is decentralised renewable energy capacity in the form of off-grid and mini-grid solutions, particularly for remote and rural communities who have lagged access to electricity, given costly grid expansion to less densely populated areas.

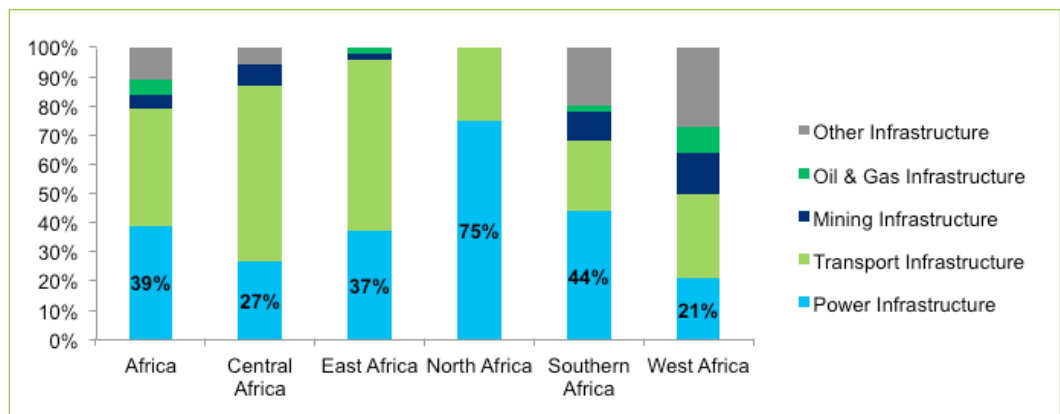
To address some of the longer-term issues of energy security, increased regional collaboration will be crucial. More affordable tariffs and an optimal generation capacity could be developed in the power sector through infrastructure linkages of power utilities and the regional power pools.

These challenges also include overcoming the power sector's funding gap. Out of all infrastructure subsectors, power is reported to have the largest annual funding gap, at more than 70% of required funds for maintenance and new-build projects. Deloitte research (Chart 4) shows that power sector projects by number make up a large share of infrastructure and construction sector projects at the regional level. This includes 44% of projects in Southern Africa and 39% of projects in East Africa in 2014. However, for some countries, power spending requirements make up a significant investment relative to the size of their economies.



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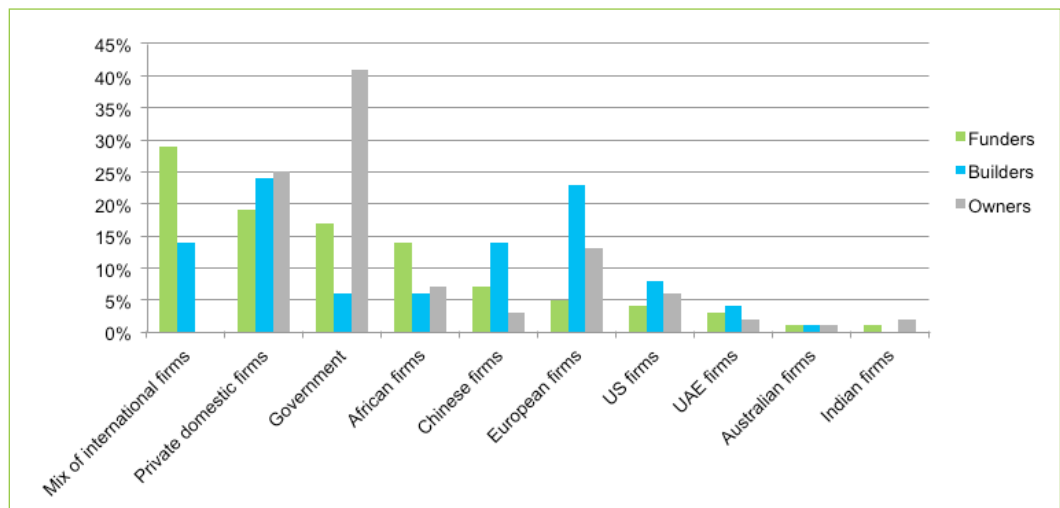
Chart 4: Power Infrastructure Projects as a Share of Total Number of Construction Projects by Region (2014)



Source: Deloitte on Africa: African Construction Trends Report, 2014.

A key trend is that there is an increasing emergence of independent power producers (IPPs), private companies and entrepreneurs, as well as development finance institutions (DFIs) speeding up the process of bridging this gap. Closer relationships between public and private players in terms of funding models, as well as regional projects and solutions remain a requirement. China, the European Union and the United States are notable players who have and are contributing a mix of government loans, equities and private investment to Africa's power funding requirements.

Chart 5: Funders, Builders and Owners of SSA Power Infrastructure Projects (2014)

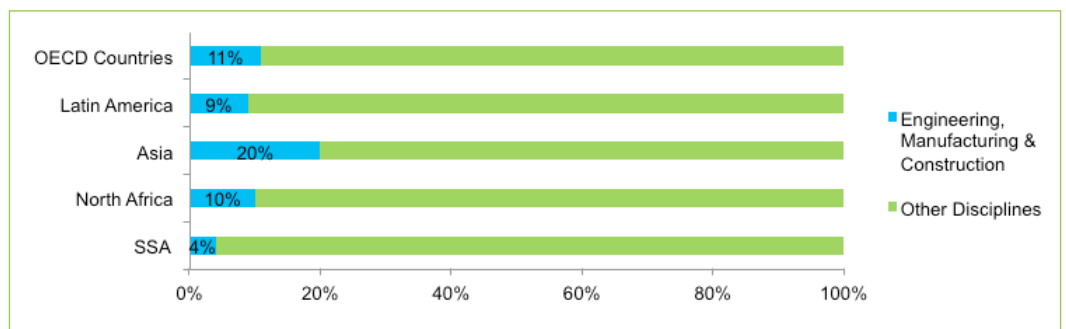


Source: Deloitte on Africa: African Construction Trends Report, 2014.

Note: The sampling basis for identifying and mapping infrastructure construction projects in the power sector, was based on projects to be a minimum value of US\$50 million and to have broken ground, but not been commissioned, by 1st June 2014.

In addition to physical power infrastructure development and funding thereof, Deloitte has identified skills and manpower development as the most significant area for investment in the power sector going forward. Investment in engineering and technical training will be required for the sector and its capital expansion plans to perform optimally.

**Chart 6: University Graduates in Engineering, Manufacturing & Construction (2008-2010)**



Source: African Economic Outlook based on UNESCO

## The economics of and business case for renewable technologies are evolving.

### Disruptor 3: Changing role and type of customers

The refocused energy generation mix in SSA also includes a changing structural makeup of players and stakeholders that will complement traditional utilities in producing electricity. The role of consumers is changing. Consumers are increasingly complementing the role of producers through self-generation, co-generation and new generation structures.

Despite the high urban growth rate in SSA of 3.6%, double the world average in 2014, the type of consumer is also changing, increasingly including more remote and rural consumers with localised requirements and funding abilities. New industries are emerging, such as 'consumer-established' industries ranging from small-scale cottage food processing to commercial businesses in manufacturing and private power generation, amongst others.

Furthermore, through cleaner technologies for off-grid or mini-grid solutions, consumers have and will be shifting away from uneconomical and environmentally unfriendly energy options in the SSA region.

### Disruptor 4: Renewable technologies

The economics of and business case for renewable technologies is evolving. For example, the lower cost structures of more reliable, affordable and greener solutions, underpinned by increasingly energy-efficient, sustainability focused and climate-conscious trends globally.

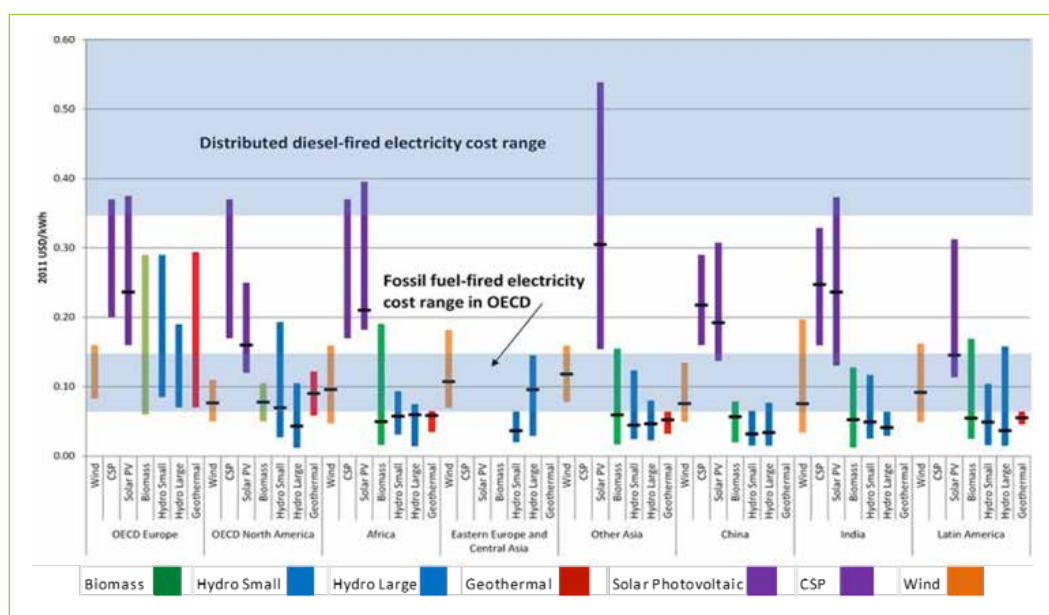




Other successful private sector projects have included Ghana's Takoradi II project; Kenya's Iberafrica, Orpower4, Tsavo and Westmont Power projects; and Nigeria's AES Barge and Okpai projects.

Improved and cost-effective technologies and innovations linking the power sector to Information and Communications Technology (ICT) advancements are also resulting in smarter systems and grids to incorporate such technologies into generation mixes of utilities, as well as new financing models for off-grid solutions.

Chart 7: Comparative Cost Ranges by Region of Renewable Technologies vs Diesel-Fired Solutions



Source: Taken from IRENA, 2015.

With the cost of renewable technologies fast-aligning to the cost of conventional electricity sources, including diesel-fired electricity costs, the economic case for off-grid renewables becomes more viable. It is thus predicted that off-grid and mini-grid systems could account for as much as 70% of those gaining access to electricity in the next two to three decades, with the bulk of these systems likely to be powered by solar, small hydro and wind.

#### Disruptor 5: Changing market structures and dynamics

A shift from currently centralised monopolies to unbundled structures and more decentralised power generation systems and models is becoming evident and intensifying. Structural reforms through vertical unbundling, which is the process of 'unpacking' integrated utilities into separate generation, transmission and distribution companies, have been the preferred option for countries including Ghana, Kenya, Namibia, South Africa, Uganda and Zimbabwe.

Other notable reform options 'disrupting' the power sector in the region include management contracts, commercialisation, IPPs, and electricity regulatory and legislative amendments. These reforms have had the most significant impact on renewable energy and energy efficiency in the region. In Nigeria, for example, regulators have moved towards cost-reflective tariffs, thereby providing sustainable returns for market participants. Transparent bidding processes and tariff incentives have also been aimed at boosting private sector involvement in the power sector in Nigeria.

Other successful private sector projects have included Ghana's Takoradi II project; Kenya's Iberafrica, Orpower4, Tsavo and Westmont Power projects; and Nigeria's AES Barge and Okpai projects. Compared to the rest of the world, however, SSA's reform process is by far the slowest.



#### Disruptor 6: Smarter grids and systems, smarter utilities

Linked to the changing market structures and dynamics are smarter energy systems supporting better energy management and pricing structures, which are changing the relationship between producers and consumers, particularly given new applications of technologies.

Smart grids – electricity supply networks that use digital communications technology to analyse, detect and react to local changes – are increasingly being incorporated into African power utilities’ action plans, including countries such as Kenya, Nigeria and South Africa, amongst others. In addition to other power utility management objectives across the SSA region, optimising asset utilisation and operational efficiency will be one of the major benefits of smart grid solutions.

On revenue management, most countries in SSA have adopted numerous payment methods for electricity, ranging from the old-school walk-in cash transactions to mobile and Internet payments. In South Africa for instance, the introduction of pre-funded metering will improve the revenue management system in the country’s power sector. This is also the case in areas where pilot off-grid renewable energy is being implemented.

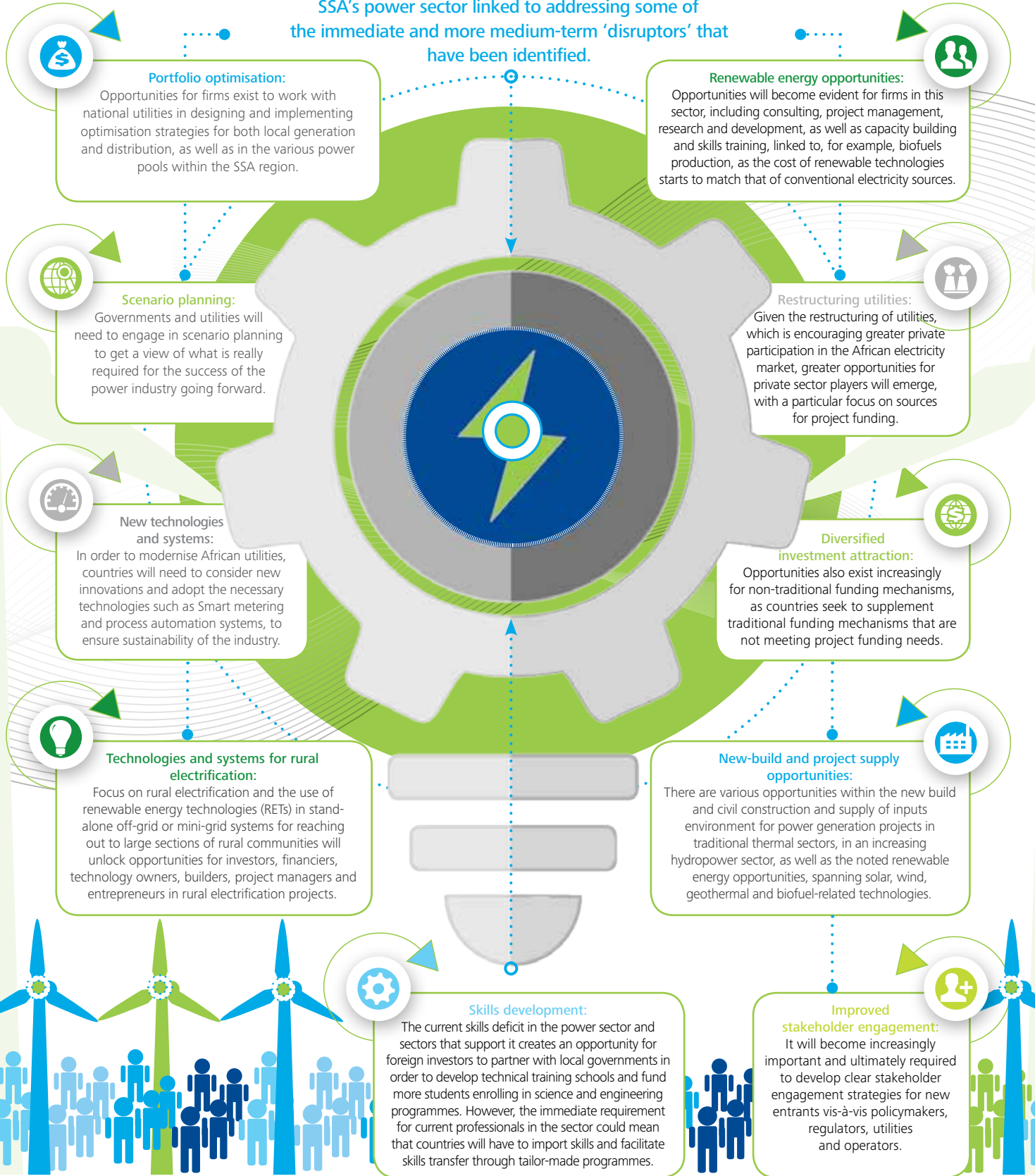
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The integration of technology and intelligent solutions in the power sector is a clear transformation to more efficient, cost-saving and ‘intelligent’ infrastructure.

Despite the skills and capital injection challenges that a number of African governments and power utilities face, opportunity lies in the integration of all these technologies to feed into the smart grid system, such that generation, consumption, payment and revenue management for instance, are possible from a single device or system. The integration of technology and intelligent solutions in the power sector is a clear transformation to more efficient, cost-saving and ‘intelligent’ infrastructure. This also tilts the balance of power in the sector, as consumers can sell excess electricity and feed it into the grid – legislation permitting.

# Opportunities in the SSA power sector

There are both funded and unfunded opportunities going forward in SSA's power sector linked to addressing some of the immediate and more medium-term 'disruptors' that have been identified.



**Portfolio optimisation:**

Opportunities for firms exist to work with national utilities in designing and implementing optimisation strategies for both local generation and distribution, as well as in the various power pools within the SSA region.

**Renewable energy opportunities:**

Opportunities will become evident for firms in this sector, including consulting, project management, research and development, as well as capacity building and skills training, linked to, for example, biofuels production, as the cost of renewable technologies starts to match that of conventional electricity sources.

**Scenario planning:**

Governments and utilities will need to engage in scenario planning to get a view of what is really required for the success of the power industry going forward.

**Restructuring utilities:**

Given the restructuring of utilities, which is encouraging greater private participation in the African electricity market, greater opportunities for private sector players will emerge, with a particular focus on sources for project funding.

**New technologies and systems:**

In order to modernise African utilities, countries will need to consider new innovations and adopt the necessary technologies such as Smart metering and process automation systems, to ensure sustainability of the industry.

**Diversified investment attraction:**

Opportunities also exist increasingly for non-traditional funding mechanisms, as countries seek to supplement traditional funding mechanisms that are not meeting project funding needs.

**Technologies and systems for rural electrification:**

Focus on rural electrification and the use of renewable energy technologies (RETs) in stand-alone off-grid or mini-grid systems for reaching out to large sections of rural communities will unlock opportunities for investors, financiers, technology owners, builders, project managers and entrepreneurs in rural electrification projects.

**New-build and project supply opportunities:**

There are various opportunities within the new build and civil construction and supply of inputs environment for power generation projects in traditional thermal sectors, in an increasing hydropower sector, as well as the noted renewable energy opportunities, spanning solar, wind, geothermal and biofuel-related technologies.

**Skills development:**

The current skills deficit in the power sector and sectors that support it creates an opportunity for foreign investors to partner with local governments in order to develop technical training schools and fund more students enrolling in science and engineering programmes. However, the immediate requirement for current professionals in the sector could mean that countries will have to import skills and facilitate skills transfer through tailor-made programmes.

**Improved stakeholder engagement:**

It will become increasingly important and ultimately required to develop clear stakeholder engagement strategies for new entrants vis-à-vis policymakers, regulators, utilities and operators.

# Concluding remarks

## Africa's power sector is open for business

SSA's power sector is adapting and rapidly changing in line with global trends and local realities. While supply to date still continues to fall short of demand requirements, reducing the current power shortcomings will be crucial in supporting the next chapter of Africa's growth model.

This makes the market attractive for new entrants.

Solutions that are emerging in other parts of the world will be replicated into the African power sector. A number of global utilities have seen the continent as a growth market for their businesses, bringing into the market proven technologies that need localisation.

As an advisor to these utilities, Deloitte has observed the inquiries by the number of global utilities increase substantively in the last 24 months upon entering the market.

## The power sector is a place for entrepreneurs and innovators

As the power sector experiences both disruptions as well as innovations, and as it adapts to become one that is more efficient, players in the sector will need to change their approach, identify solutions and strategic partners and adjust their business models in order to navigate these challenges and to capture the outlined opportunities.

New entrepreneurs are emerging all the time, helping the industry business model evolve from traditional state-dominated players to the emergence of smaller, newer IPPs. Consumer-to-producer changes in the roles of stakeholders is a key trend, as companies look for mechanisms through technological advancements to create better growth advantages through cheaper electricity supply.

## Technology is going to change the face of the industry

New affordable technologies offer the best bets for disruption to the sector. Our focus is to help the early adopters realise value from these technological developments in smart grids and smart metering. Where these projects have been aligned to tangible business and customer benefits, there has been successful adoption of technological solutions.

## Finally – evolving the African utility business model

These disruptors are forcing a change in the business models of utilities. No longer are the state-dominant players the only players. If these do not react in a market that is fast-evolving, they run the risk of being left behind as consumer patterns change.

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“It is not the strongest of the species that survives but the most adaptable.”



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