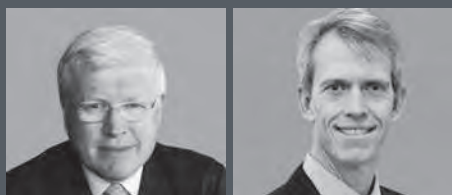


The Street View

Actis Macro Forum

December 2019

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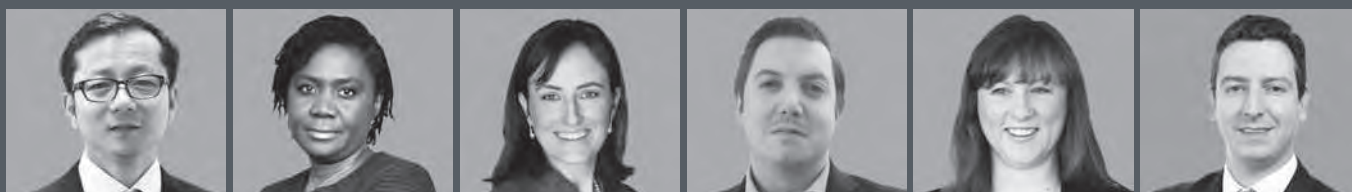
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Pratik Jain

Tackling change

Ewen Cameron Watt

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Welcome to this edition of Street View. As usual our worldwide team looks at investment related issues drawing on local knowledge and global presence. The theme of this 2019 year end edition is tackling change.

The world needs to decarbonise rapidly or face appalling longer-term risk. Many of the best opportunities to adapt to energy transition lie outside the G7. More sunshine and more wind sounds like a holiday advert for sailing enthusiasts. In this case though it conveys why opportunities in renewable generation and distribution abound in emerging markets.

Capturing these opportunities is not always easy. Actis has a proud heritage of taking on and delivering, in an efficient and cost-conscious manner, projects which look difficult at first. James Mittell and Rowan Parkhouse share the story behind Lekela Power, now the largest wind farm company in Africa. Egypt in 2014 might seem an unusually risky place to begin this journey. Contract negotiations were an exhaustive process. Success demanded strong local links and deep industry knowledge. Fast forward to 2019 and Lekela is starting its seventh wind farm lifting capacity in operation or under construction to over 1000 MWs spread across Egypt, Senegal and South Africa.

Renewables are growing as asset owners seek to meld the pursuit of returns with responsible investing needs. Clearly the wind does not always blow or the sun shine. It's therefore critical that storage systems can evolve to overcome intermittent supply risk. We see this as a key enabler if renewables are to reach the '50 by 50' target of supplying more than half of world generation needs by 2050.

Preyavart Gadhavi from our Energy Infrastructure team takes a look at progress in enhancing storage capacity. Students of disruption and change know that reliability and reduced prices are essential enablers of change. Preyavart finds this is the case with storage systems positing that producers can deliver a further 60% decline in prices over the next decade to follow up on an 85% drop

since 2010. Add into this improved energy density, and adaption rates could be on the brink of rapid acceleration.

'The most sophisticated biometric project in history' is how Pratik Jain from our Mumbai office describes the introduction of Aadhaar, a project giving 1.1 billion Indians their own biometric identifiers. In parallel with this the introduction of Direct Benefit Transfer ('DBT') in 2013 has transformed the delivery of welfare payments. Since 2013 over 295 million new bank accounts have been opened and over \$20 billion of payments which were previously lost through corruption have reached beneficiaries.

Whilst India is currently suffering from some excesses in the financial system, elimination of these losses go a long way towards supporting longer-term broad-based consumption growth. The best news is that DBT has yet to reach some of the largest parts of the welfare payments system so there is much more to come.

Politics plays a big role in assessing emerging markets investment risk. Stuart Jackson plots our annual look forward at key elections in 2020.

Looking back at 2019, The Street View, produced by the Actis Macro Forum, our worldwide knowledge sharing initiative, has roamed widely. We have introduced readers to countries from Colombia to Vietnam. Our enhanced real estate franchise has lifted the lid on value added investing in Korea and China. Technology change has featured widely including features on artificial intelligence, roof top solar and the Fourth Industrial Revolution. We have looked at political developments including the major changes in Brazil and Mexico and the view of Middle East risks as seen from the Iranian perspective.

We have examined deepening financial systems which can arise from growing pensions systems and speculated on the longer-term impacts of such developments on currency volatility-the bug bear of investors in emerging markets.

Our focus remains on changes, which offer value accretive opportunities.

The Actis "Values Drive Value" mantra which combines investor priorities with a responsibility to the countries, cities, and communities where we operate. We look forward to building on these and other themes into 2020 always striving to give you the street view... Thank you as ever for your support.

Values Drive Value: Accelerating towards a low carbon future

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The climate emergency

Climate change is front and centre for everyone. Global temperatures are at 3 million year highs. We face a significant threat to our current way of life if we do not adapt, quickly and dramatically, to the climate emergency. Rapid decarbonisation and a full scale energy transition are essential to halt our current direction of travel.

Predictions of the impacts of climate change can seem biblical in their nature - droughts and floods, famine and extreme

storms, ecosystem collapse and disruption of oceanic and atmospheric circulation. Some of these physical impacts involve thresholds in the climate system beyond which major impacts accelerate or become irreversible and unstoppable. We could face severe food and water insecurity in some regions, the advent of climate refugees and mass migration, displacement and conflict - triggering the erosion of our political and democratic systems, themselves critical to finding solutions. The lives and livelihoods of hundreds of millions, if not billions, of people worldwide will be affected.

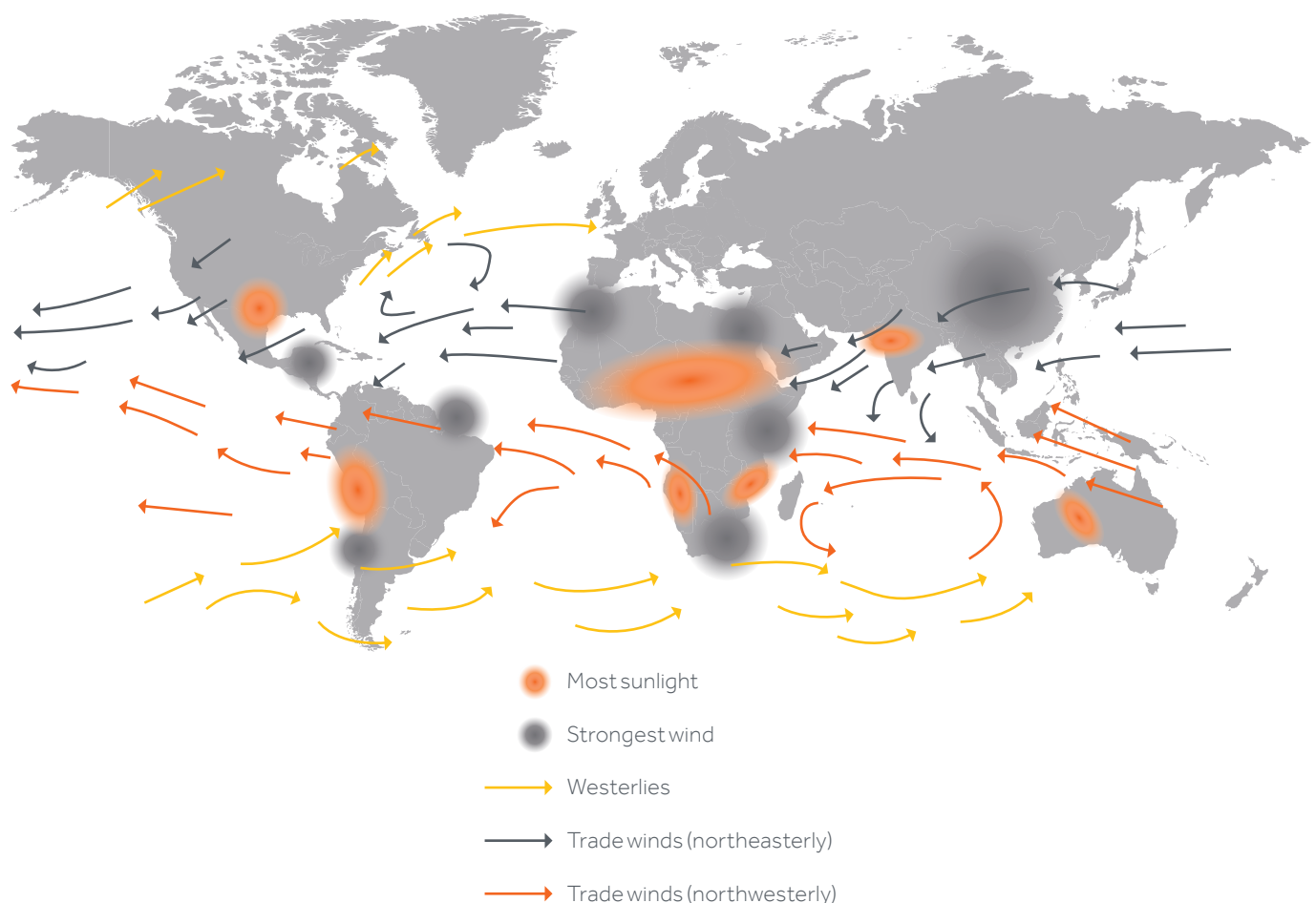
How long do we have?

The Paris Agreement commits to limiting global temperature rise to 2 degrees Celsius (above pre-industrial levels), and

to pursue 1.5 degrees Celsius, which would cause significantly less harm. The landmark UN Intergovernmental Panel on Climate Change (IPCC) report released October 2018, uses the starkest language yet to underline the urgency and the impacts of a changing climate, claiming that we have 11 years left to limit the climate catastrophe.¹

To limit warming to 1.5 degrees Celsius, we have to reduce our net carbon emissions to zero by 2050. This means huge changes to how we live, organise our cities, travel, what we eat and how we generate electricity. The good news is that it is eminently doable - we know what needs to be done and we have the tools to do it.

Exhibit 1: Renewables in our markets (wind blows, sun shines)



Source: Bloomberg New Energy Finance

1 The Intergovernmental Panel on Climate Change, Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C approved by governments

The role of the renewables revolution

The last decade has seen investment into new renewable generation capacity exceed \$2.5 trillion, and capacity quadrupled to 1650 GW². In 2016, for the first time annual new installation of renewables exceeded that of fossil fuels. Despite such huge strides, wind and solar generation today remains at just 7% of the total and there is a clear need to accelerate the pace of the switch to renewables.

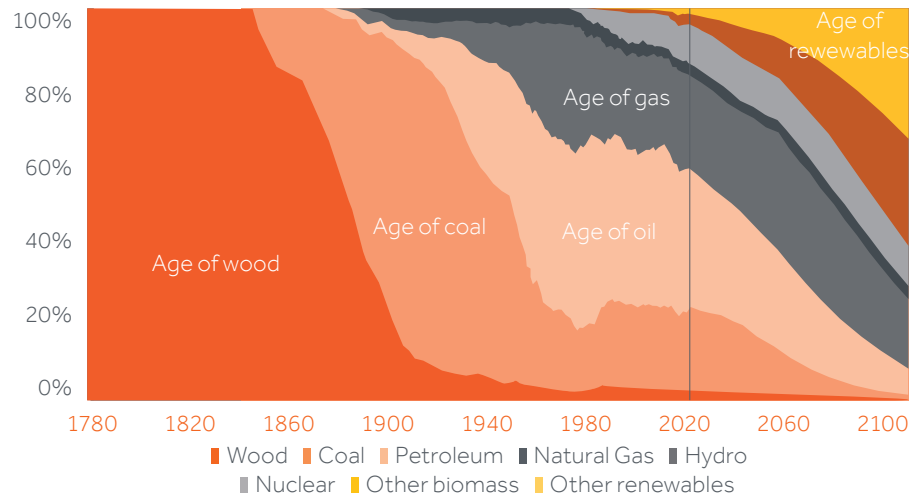
So, how to finance the switch? And what are the opportunities for investors?

The largest opportunity is in emerging markets. The sun is hot, the winds are swift and demand growth rapid.

We estimate that 10,000 GW of new capacity is needed by 2050 and the majority of that – 7000 GW – will be in non-OECD markets. Approximately 80% of new generation capacity to 2050 will be renewables.

Exhibit 2: Welcome to the age of renewables

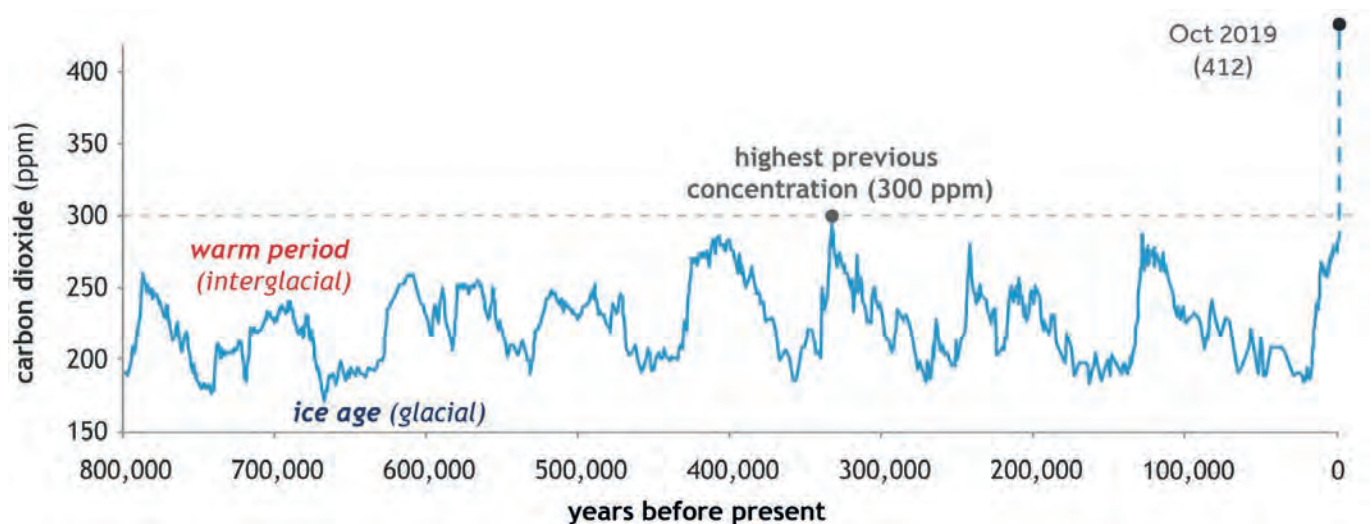
The energy transition is happening



Source: IEA, EIA, Citi Research

Exhibit 3: Rising atmospheric CO₂

CO₂ during ice ages and warm periods for the past 800,000 years



Source: NASA

2 The United Nations Environment Programme, Global Trends in Renewable Energy Investment 2019

Wind and solar would go from 7% of generation today to 50% by 2050 ("50 by 50"). Costs continue to decline for wind and solar – which are now the cheapest technology across more than two-thirds of the world (PV cell prices have fallen 90% in the last 15 years). By 2030 wind and solar should undercut commissioned coal and gas almost everywhere. Coal's role in the energy mix will fall from 37% today to 12% by 2050. Oil will be negligible and gas, hydro and nuclear will remain about the same³.

Electricity demand is set to increase by 62% to 2050 - meaning there is a need for almost \$14trillion in new investment⁴.

This represents a huge opportunity for investors, particularly those investing in emerging markets. Diverse strategies can be deployed: invest in growth and build-outs of new capacity (greenfield), or invest into operating assets, offering annuity type returns, over a longer time-frame. Venture capital investors can focus on investing in battery technology,

carbon capture storage, hydrogen and other new technologies. Beyond investing thematically into 'solutions' to the energy transition (eg renewables), prudent investors must act on the fact that companies across all sectors need to focus on two areas: decarbonisation (adaptation) and resilience (mitigation).

Decarbonisation – beyond generation

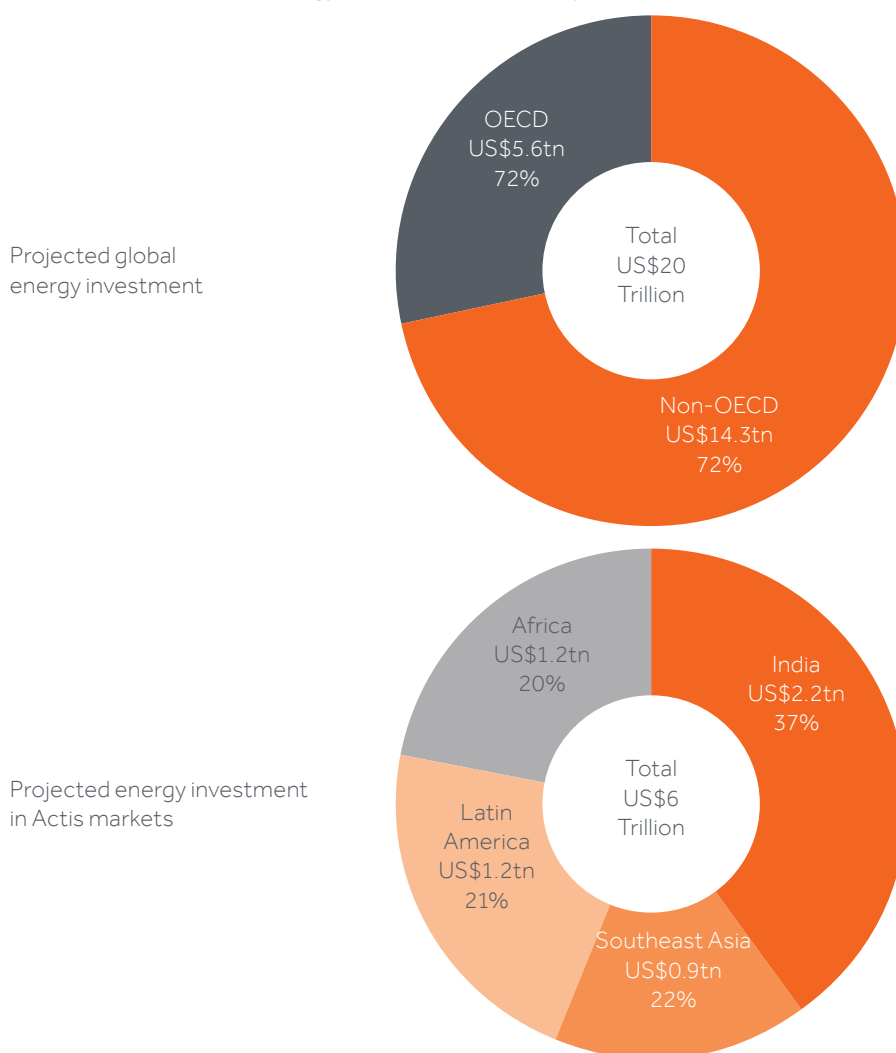
Our **private equity** business spans a diverse range of sectors. In each area, we strive to mitigate the risks posed by climate change and identify the value creation opportunities that it presents. We are investors in supermarket chains, where the potential for supermarket savings is significant. For example, Companhia Sulamericana de Distribuição in Brazil and Food Lovers Market in South Africa have both committed to resource efficiency, waste reduction and recycling programs. These programs have already delivered tangible benefits, such as a 60% reduction in energy consumption. This has also helped to secure debt at below market rates from development finance institutions. In addition, both companies now focus on sourcing goods locally,

3 Bloomberg New Energy Finance, New Energy Outlook 2019

4 Bloomberg New Energy Finance, Solar, Wind, Batteries To Attract \$10 Trillion to 2050, But Curbing Emissions Long-Term Will Require Other Technologies Too

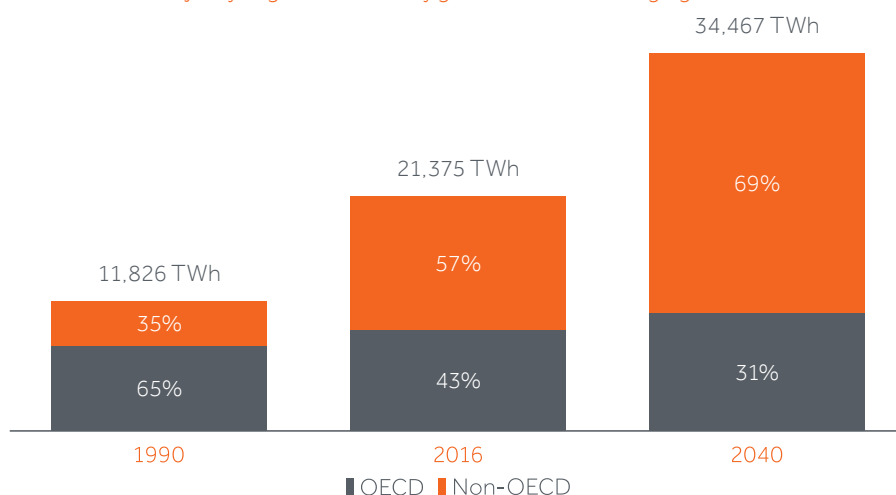
Exhibit 4: Significant market opportunity (2018-2014)

US\$14 trillion non-OECD energy investment opportunity



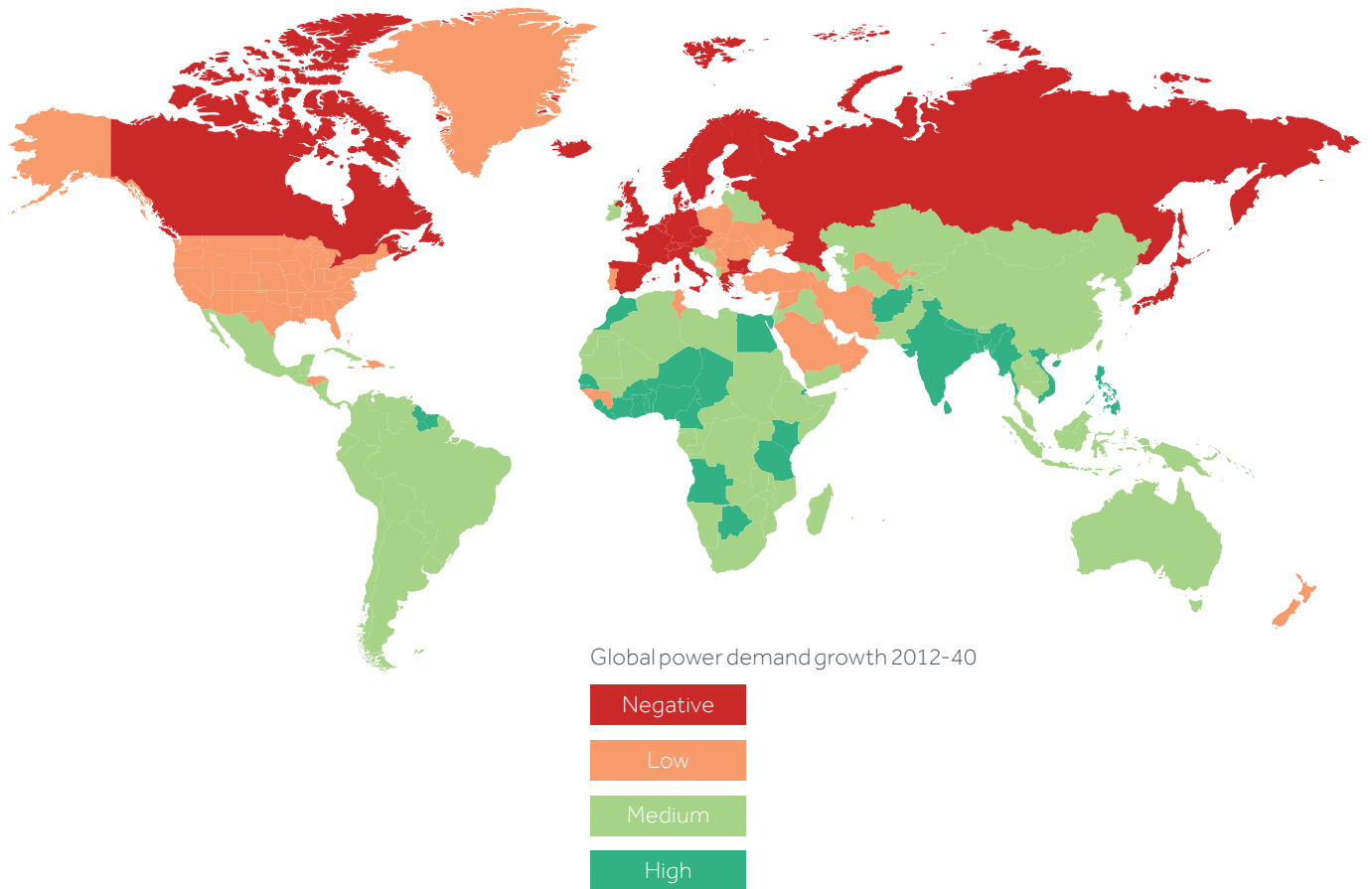
Source: IEA World Energy Outlook 2018

Exhibit 5: Vast majority of global electricity growth is in the emerging markets



Source: IEA World Energy Outlook 2017, New Policies Scenario (TWh = Terawatt hour)

Exhibit 6: The growth of electricity demand is in the emerging markets...the growth markets



Source: Bloomberg New Energy Finance

reducing the carbon footprint of produce while also reducing prices by 20% without compromising on margins.

In the Real Estate Sector, developments and buildings combined account for nearly 40% of global CO₂ emissions. The IEA points out that there is potential for global building energy demand to decline between now and 2040, despite total building floor area growing by a further 60%. On average, buildings in 2040 could be nearly 40% more energy efficient than today⁵.

In our markets, we have seen first-hand how improved resource efficiency deliver significant cost savings and lower emissions. Rapidly declining costs of solar PV combined with sub-Saharan Africa benefitting from globally high irradiance levels means that installing rooftop

solar panels often makes commercial sense. Actis' Jabi Lake Mall is set to become Nigeria's first solar-powered mall – a 600KW rooftop solar plant is being installed and will sell power to Jabi Lake Mall through an innovative 15-year Power Purchase Agreement. This will offer a cheaper and more stable energy alternative and will reduce the shopping centre's CO₂ emissions by over 13,000 tonnes.

In addition to the opportunities presented by solar, we have implemented a "green by design" approach to real estate investments that meets both our commercial and environmental goals. Actis has built the first internationally certified green commercial buildings in Nigeria, Ghana, Kenya and Cameroon. Douala Grand Mall in Cameroon has achieved a green rating, and it is calculated

that it will be 29% more energy efficient than other non-green buildings in Douala⁶. This has been achieved through reduced window to wall ratio, reflective paint/tiles for the roof, insulated roof and external walls, energy-saving lighting, occupancy sensors in the bathrooms and skylights to provide daylight to 50% of the top floor area.

Renewables are here to stay. More than that they are here to grow. Not only do they contribute to the vital and herculean task of tackling rapid carbonisation they meet portfolio investors needs to incorporate responsible investments in their portfolios. The growing background of stakeholder pressures on asset owners to play a role in delivering climate change and increasing adaptation of renewables cannot come too soon.

⁵ The International Energy Agency, Energy Efficiency: Buildings

⁶ Excellence in Design for Greater Efficiencies, Douala Grand Mall

Gas must be part of the mix

Energy demand is rising and it is forecast to reach 40TWh by 2040, with almost 70% of demand occurring in emerging markets⁷. A secure supply of energy is required to meet increasing demand and, due to supply intermittency, cannot be footed by renewable energy sources alone. Maintaining a reliable energy grid is a fundamental requirement of an energy system.

Gas will play a critical role in the energy transition acting as a bridging fuel to a low carbon future.

Key benefits include:

- Providing flexible energy supply to counter intermittency of renewables. We are not yet at the point where economies can forgo centralised thermal generation completely
- CO2 emissions (per unit of energy produced) from gas are around 70% lower than coal and around 30% lower than oil⁸
- Gas is more efficient and more readily available than coal or oil in many key Actis markets (some African nations have significant indigenous reserves). Harnessing indigenous gas reserves and displacing reliance on more expensive, imported fuel sources enables funds to be diverted to other critical services and infrastructure
 - Songas, a gas platform in our first energy fund, is an example of this. It is estimated that the platform's use of indigenous natural gas saved the Tanzanian economy US\$5 billion as it reduced use of expensive liquids fuels. It now supplies 21% of Tanzania's electricity⁹
- Aside from the CO2 advantages of gas versus other fossil fuel sources (coal, HFO, diesel, burning charcoal), gas is also preferable in terms of impact on local air pollutions/ human health e.g. SOx and

particulates, waste management issues and environmental pollution (leaks, spills)

- Inclusion of gas in a system versus 100% wind and solar, reduces overall power prices. This will change however as batteries and other forms of storage become cheap enough. Affordability itself drives economic wealth which enables economies and civil society to better mitigate for and adapt to climate change.

Actis' approach to gas

- Actis' overarching strategy across Energy and Infrastructure is to identify opportunities for operational efficiencies to maximise energy production. This ensures as much energy as possible is generated from the same quantum of fuel type and that losses are minimised
- We see significant financial and environmental benefits in converting open-cycle gas turbine plants to combined-cycle gas turbines (CCGT). By converting the Azito power plant in Abidjan, Actis increased the generating capacity by 140 MW without any increase in gas consumption increasing the value of the asset while significantly reducing the carbon intensity. CCGTs emit fewer gases (sulfur dioxides, carbon dioxide and nitrogen oxides) into the atmosphere than OCGTs and are more efficient as reuse waste heat to generate more power
- We focus on harnessing indigenous gas reserves to support national economies to meet rising energy demand in a self-sufficient manner, and to reduce reliance on imports.

⁷ <https://www.iea.org/geco/>

⁸ <https://www.iea.org/geco/emissions/>

⁹ <https://songas.com/overview/>

Actis in Action: Wind of change

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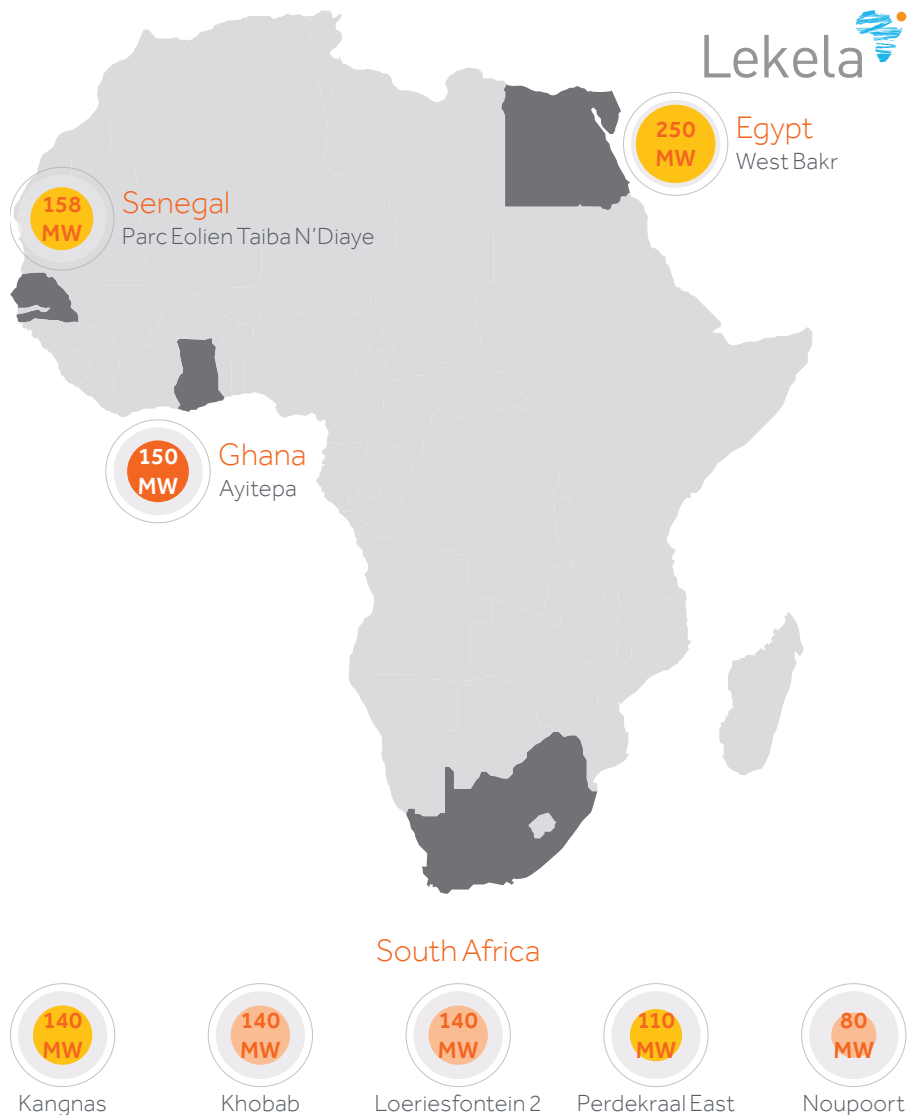


June 2014, the World Cup kicks off in Sao Paulo, tornados devastate parts of the US Midwest and a Monet sells at auction for \$54 million. Meanwhile, Lucy Heintz, Actis Energy Head of Africa is proposing Project Sky to the Energy Investment Committee, an opportunity to create the leading independent renewable energy company in Africa. Lekela Power was created, a 60/40 joint venture between Actis and Mainstream Renewable Power, an Irish renewable energy developer. Shortly after, in October 2014, "Project Shu" was added to Lekela's business plan in October 2014; the beginning of the journey to building a 250MW wind project in Egypt. Fast-forward to September 2019 and Lekela is starting construction of its seventh wind farm, the 250MW West Bakr Wind Project, bringing its portfolio of wind projects in construction or operation to 1,018MW and making it one of the largest wind power company in Africa.

Actis and Egypt

Actis has a longstanding commitment to Egypt, opening an office in Cairo more than 15 years ago, and having committed and invested close to US\$1 billion of equity in the country across multiple sectors. This includes the 685MW Sidi Krir power plant back in 2004, Commercial International Bank, the leading bank in Egypt, and Edita Food Industries, the largest independent snack food business in North Africa, to name a few of Actis' landmark investments in Egypt over the years.

Exhibit 1: Lekela's Wind Projects



● 150MW In Development ● 658 MW In Construction ● 360MW In Operations

Source: Actis

The West Bakr Story

Egypt has a history of pioneering renewable energy technologies, establishing the New and Renewable Energy Authority in 1986, which went on to construct over 1GW of state-owned onshore wind projects in the country. Building on this, the Egyptian government set ambitious targets to increase the share of renewables in their electricity generation mix to 20% by 2022 and 42% by 2035. This requires over 20,000MW of wind power, more than 1,000MW per year, creating one of the largest wind markets in Africa. Plentiful natural resources have meant that Egyptian electricity from solar and wind power plants needs no subsidy

and can undercut fossil fuel on cost. Indeed, the wind is so strong at the West Bakr site that the project works at 55% capacity, a level more normally associated with gas power plants than wind, and more than twice the capacity in what you would get in most of Europe. The Gulf of Suez area is the perfect location for wind farms with constant and uni-directional strong winds, which according to Lekela's Egypt General Manager, Faisal Eissa, also makes it a perfect location for kite-surfing.

Based on these attractive fundamentals, the government launched the tender for the 250MW Gabal El-Zeit wind project, the first privately financed wind project in the country. In April 2015, the Actis and

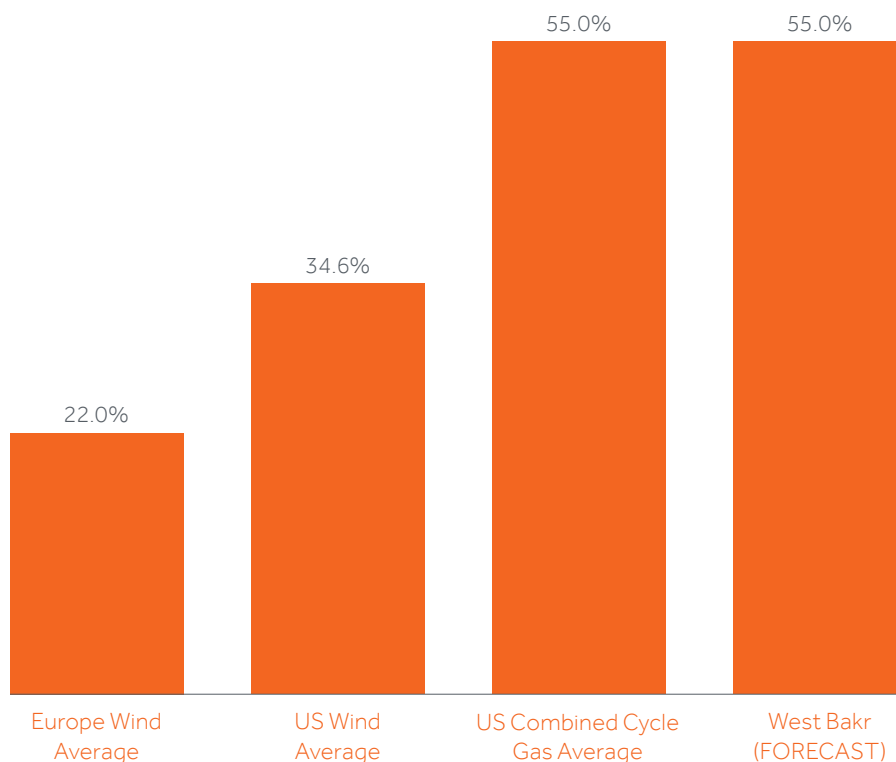
Mainstream teams worked seamlessly together with Lekela's only employee at the time, CEO Chris Antonopoulos, to submit a bid for a 250MW wind project in Egypt. Even contending with a late EPC offer and an uncooperative printer, the team managed to submit the offer before the deadline, but narrowly came second to a consortium led by Engie, for a record-breaking tariff.

Things looked bleak for a moment but, never deterred, Sherif ElKholi (Actis Partner and Head of the Middle East & North Africa), critical to the project throughout, discussed with the Egyptian authorities the merits of awarding a second project on the same terms given the extraordinarily low prices achieved for the country. The MoU for the West Bakr project was signed in London during President Sisi's visit to the United Kingdom. The race was back on.

Since the submission of the tender bid, the Lekela team has grown considerably from 1 to 43 people in three offices, including 6 in Lekela's Cairo office. After countless meetings with Eng. Lamya Abdel Hady, Egyptian Electricity Transmission Company ("EETC") Head of Studies and Design, and Eng. Eman Rashad, EETC Head of Private Sector Projects, whose never-ending good intellect, humor, patience and diligence were critical for the success of the project, Lekela finally signed the PPA with EETC in February this year thanks to support and co-operations from the Egyptian Ministry of Electricity and Renewable Energy, and the Egyptian Ministry of Investment.

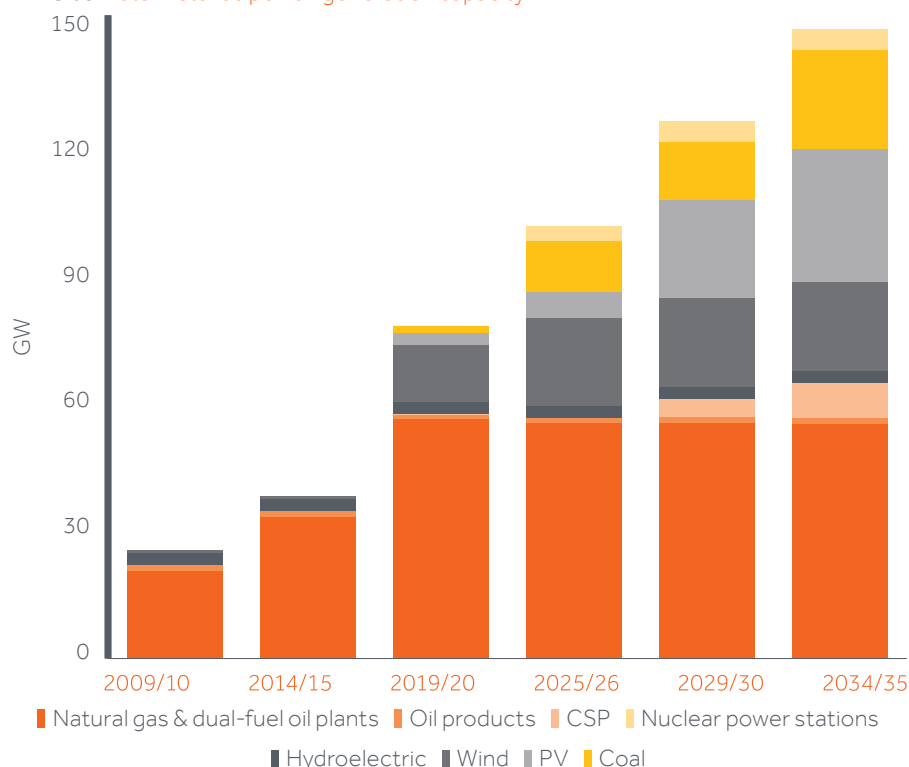
Lekela then had just five months to achieve Financial Close for the project with three development finance institution lenders. Overseas Private Investment Corporation ("OPIC"), the US Government development finance institution, The European Bank for Reconstruction and Development ("EBRD") and the International Finance Corporation ("IFC"), part of the World Bank Group, providing senior debt, including a first financing in the country for OPIC. To further complicate matters, shortly after signing the PPA, concerns emerged regarding the projects preferred EPC contractor (who subsequently entered insolvency). Lekela had only five months to re-select a new contractor, negotiate terms, update environmental studies and permits, and sign the EPC contract.

Exhibit 2: 2018 Annual Average Capacity Factors




Source: US data is EIA, Europe data is WindEurope

Exhibit 3: Total installed power-generation capacity



Source: Under Scenario 4b, IRENA (2018), Renewable Energy Outlook: Egypt, International Renewable Energy Agency, Abu Dhabi



Lekela, supported by Actis and Mainstream, and in close collaboration with The Ministry of Electricity and Renewable Energy, the EETC and New and Renewable Energy Authority ("NREA"), then worked tirelessly over the next five months. The EPC contract was completed in record time going from firm offer to signing over 1000 pages with Siemens Gamesa in only four months.

Finally, on the eve of the PPA deadline after thousands of pages of loan documents had been meticulously negotiated, the rather frantic and sleep deprived team in Egypt managed to submit the final document moments before the receiving official's bus left EETC's offices for the weekend. The project reached financial close in July and issued NTP in early September.

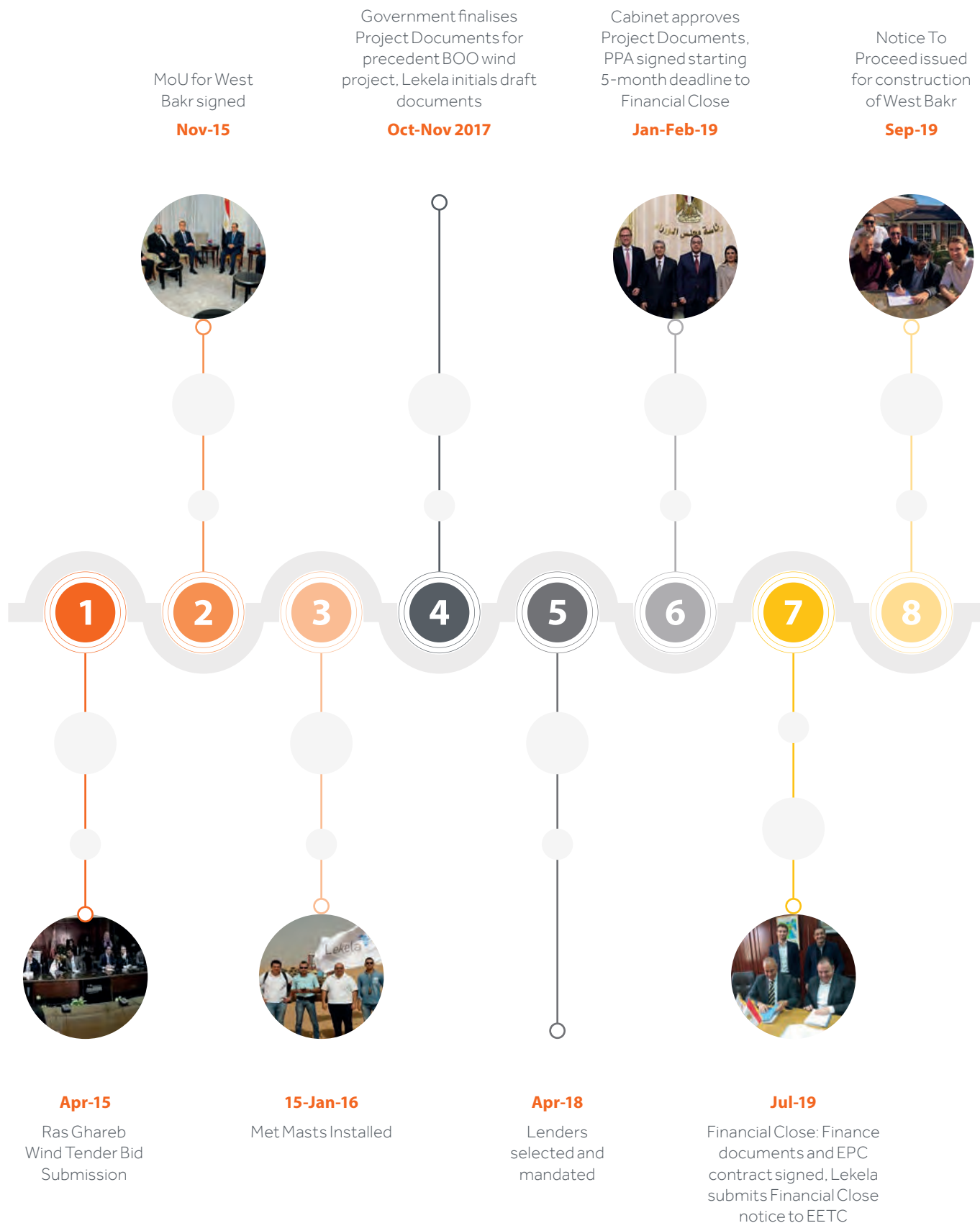
This was no mean feat. With the baton passed, shared, sliced and diced, the West Bakr project has been a truly spectacular team effort over time, demonstrating the power of the Actis platform at its best, bringing to bear cross asset class collaboration. The project is now in construction under the management of Lekela and its partners, with operations planned to commence from September 2021.

The West Bakr project proves that good regulation and policy support can bring foreign investment at a competitive price for a growing economy. The project will provide over 1,000GWhs of clean electricity per annum, avoiding 550,000 tons of CO₂ equivalent, and providing more than 500 jobs during construction. Its community investment plan will focus on building technical skills in the renewable energy industry, including bird monitoring, and include a focused inclusion and diversity component.

Once West Bakr and projects in Senegal and South Africa are complete, Lekela will be an operating platform of more than 1,000MW of wind power, with more projects to come. Actis and Lekela are not done, we are working on future opportunities and look forwards to supporting the Egyptian Government's target to supply 20% of electricity from renewables by 2022, 42% by 2035, and beyond. And, naturally, perfecting our kite surfing technique at the same time.



Exhibit 4: Project Timeline





Actis Adapts: Storing up the future

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What would happen if all 6 billion people or approximately 85% of the world's population living in an emerging market country had access to affordable, reliable and clean electricity for 24 hours a day and throughout a year? Apart from improving quality of life and lifting millions of people out of darkness and poverty, this would provide unlimited new opportunities for social and economic development across these markets.

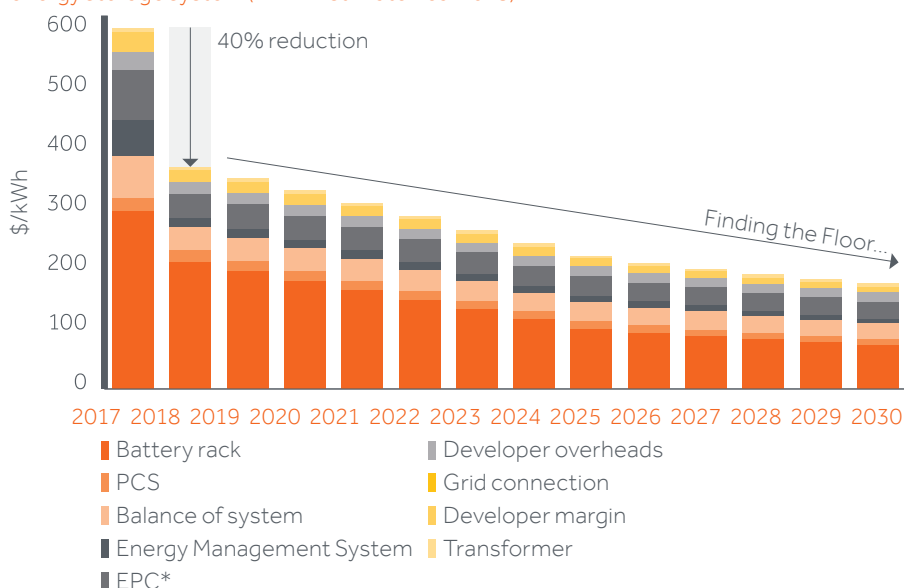
Renewables today enjoy grid parity in many emerging markets and achieved 2 of the 3 key objectives for electricity supply – affordability and sustainability. However, given the intermittency of wind and solar supply, renewables have to date fallen short on meeting the 3rd key objective – supplying reliable electricity round the clock.

Competitive battery storage systems provide a feasible solution to overcoming intermittency issues (load shifting and renewable smoothening). They would enable majority or even 100% renewable electricity by 2050 – up from around 26% today¹. Given the constraint for battery storage to store electricity for long periods of time (seasonal limitation), we believe the future energy mix will still require some baseload thermal or nuclear capacity in addition to renewables.

Storage systems deliver integration of more renewables, and also help utilities, grid and systems operators to solve several critical and high-value issues such as grid stabilization (frequency regulation and voltage support), optimizing (spinning and non-spinning) reserve capacity, efficiently managing variable demand response and providing blackstart capabilities for main and micro grids.

Batteries (Thomas Edison commercialized batteries in early 1900s) and battery storage have been around for a while (one of the world largest battery energy storage system of 46MW was installed in Alaska, USA to mitigate blackouts and has been operational since 2003²). So, what's new this time?...Well, it's

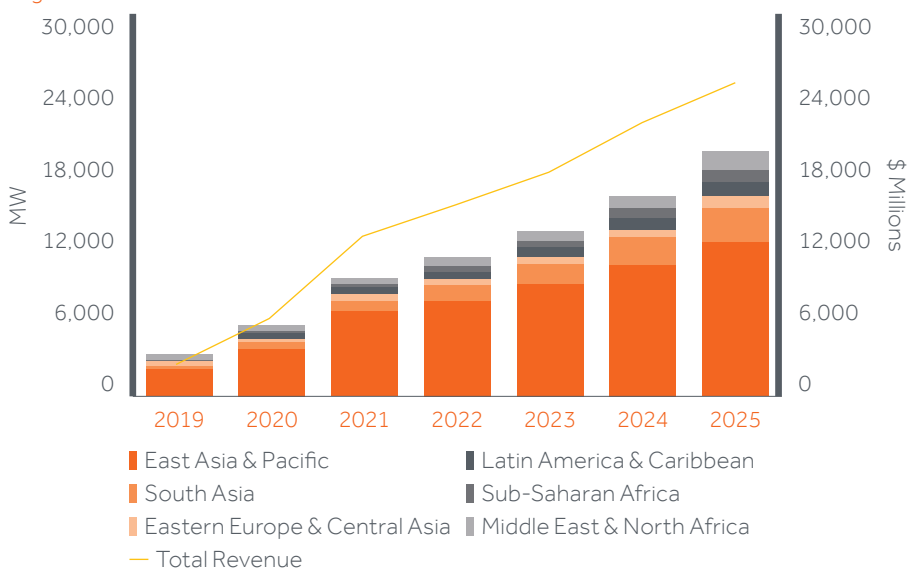
Exhibit 1: Turnkey EPC costs for a fully-installed nameplate 20MW/80MWh (4hr) AC energy storage system (BNEF Estimate Real 2018)



* Excludes warranty costs, which are often paid annually rather than as part of the initial capital expenditure. These costs do not explicitly include any taxes and are for a brownfield development so excludes grid connection costs. Includes a 10% EPC margin and developer margin set at 6%. Does not include salvage costs or project augmentation.

Source: Bloomberg NEF

Exhibit 2: Energy storage capacity and revenue projections across six major developing regions



Storage Market: 20GW (c. 60GWh) & \$25bn Revenue by 2025

Source: IFC Energy Storage Report, 2017

1 Bloomberg, BloombergNEF, and LUT University in Finland and the Energy Watch Group (EWG)

2 Bloomberg, Big Batteries are all the rage, but this one's 16 years old

the rapidly declining cost of batteries and timing in relation to the global focus on decarbonisation.

For battery storage, the timing of falling cost for battery packs has perfectly coincided with the declining cost of renewables, increased focus on decarbonisation and ever-growing challenges of improving grid stability and meeting fluctuating short-term peak demands. This has resulted in battery storage quickly becoming a competitive, attractive solution to several challenges across the electricity supply chain (generation, transmission and distribution).

Battery cost trend and future

In less than a decade, Lithium-ion battery pack prices have declined by over 85%, in real terms to \$176/kWh in 2018³. Riding on the back of strong demand for batteries from consumer electronics, electric vehicles and energy storage, we expect a further 60% reduction in Lithium-ion battery pack prices by 2030 (\$70/kWh)³. Future price reductions for battery systems are expected to be driven by:

1. **Economies of scale** – Anticipating demand, companies have announced four-fold growth in new lithium-ion cell production capacity by 2025. Estimates are that every doubling of capacity delivers a near 20% reduction in battery prices.
2. **Improvement in energy density** – Battery manufacturers are improving existing chemistry by modifying cathode, anode and electrolyte materials to achieve higher energy density, which would further drive lower battery pack prices.
3. **Recycling and second-life applications** – Battery vendors are increasingly focused on improving battery recycling processes for extracting rare metals (cobalt, lithium etc.) and re-integrating them in supply-chain. The second-life battery applications from electric vehicle to utility-scale applications also presents as a potential answer to sustainable deployment of batteries.

The emerging market battery storage opportunity

Cheaper batteries, maturing technology and improved understanding of battery storage economics are opening a host of opportunities to utilize battery storage for a variety of utility-scale applications across the electricity supply chain of generation, transmission and distribution. The global energy storage market is all set to grow by 100 fold plus, adding cumulative capacity of 1,095GW/2,850GWh by 2040 from 9GW/17GWh in 2018, attracting US\$662 billion of investment³ (This figure accounts for only equipment and installation costs, not the revenue opportunity).

In emerging markets, **the energy storage market is expected to grow to 20GW/60GWh with a US\$25 billion revenue opportunity by 2025**⁴. The majority of the new utility-scale battery storage capacity is expected to be for firming renewable production, managing peak capacity, deferring the cost of reinforcing aging network infrastructure, and providing grid ancillary services.

With global reach, Actis is strategically placed to support the creation of a regulatory framework for battery storage and participate in attractive investment opportunities to enable early adoption of the storage solutions as recent initiatives in India and sub Saharan Africa attest.

The evolution of battery storage in emerging markets

The rapid evolution of battery storage solution is helping power industry players – utilities, system operators, and independent power producers – to identify and tap new opportunities for investments or improve returns on existing investments. There are several opportunities and enablers that are expected to accelerate the investment in battery storage solutions, as listed below:

- **More renewable auctions are expected to come with some form of storage component** to increase renewable integration in the energy mix. In 2019 alone, the Solar Energy Corporation of India (a Government of India company responsible to procure renewable energy) has announced tenders to procure about 4GWh of battery storage capacity mainly to

eliminate diesel fuel based generation and provide reliable power supply to its remote isolated regions and island states. Tender opportunities in Jordan and Madagascar along with plan to increase scope of Scaling Solar programme to include storage help with incorporating storage in the energy mix.

- **Battery Storage is reaching parity with Gas Peakers & HFOs in several markets** creating cheaper, cleaner alternatives to building new peaking power plants
- **Value add or Operational Improvement on existing assets** whether by reducing emissions for thermal assets or reducing curtailment for renewable assets or participating in capacity markets is a viable opportunity
- **Standalone battery storage auctions** such as South Africa's 1200GWh Distributed Battery Storage Project are expected to become more frequent in growth markets as it helps with displacing expensive diesel power plants and support ageing network infrastructure
- **Regulatory support in emerging markets is positive** with India and Chile being more advanced and expected to lead, whilst other markets will quickly follow the successful framework to incorporate storage in the energy mix
- **Attractive returns** are achievable with several Tier-1 suppliers ready to offer full-wrap construction and operations and maintenance solution for 20–25yrs, which removes the construction and operational risk with battery storage solutions.
- **Sustainable and responsible procurement of batteries is possible.** Actis is working with Tier-1 suppliers who can demonstrate that reasonable steps are being taken to trace the source of rare metals such as Cobalt and Lithium. Actis' ESG team continues to work with Tier-1 suppliers not only on responsible procurement of rare metals for batteries but also evaluating batteries which don't use rare metals such as Lithium or Cobalt, recycling and second-life applications for batteries.

³ Bloomberg New Energy Finance, Bloomberg NEF 2018/2019 Long Term Storage Outlook

⁴ IFC and Navigant Research, Energy Storage Trends and Opportunities in Emerging Markets

Contracting structures for battery storage assets

Given the dynamic potential of the battery storage solutions, the business case is often more complex than for thermal or renewable generation asset. For example, a Gas plant transforms a gas molecule in to an electron whereas battery storage accumulates electrons which could be dispatched as several different dispatch profiles (10MW in 1 hr resulting in 10MWh or 5MW in 2hrs resulting in 10MWh) or for various functions such as load shifting, capacity reserve, grid frequency or voltage stabilization amongst several others. Hence, battery storage economics often consist of a value-stack of services incorporating a range of functions, which are then used for both (i) sizing the batteries and associated balance of plants (inverters, transformers) and (ii) formulating a contractual structure for the battery storage asset.

Different contractual structures could be adopted for battery storage assets depending on some key factors, apart from the value-stack considerations, such as rights on battery services, dispatch control (authority to charge and discharge), standalone or co-location with generation asset (renewable or thermal) and single, blended or time bound tariff/ fee structure.

Battery Storage is the next frontier

16:52:33.490., these nine consecutive digits won't mean much outside of the UK's energy sector, but is definitely an important victory stamp for battery storage when it came to the rescue the UK national grid on 9 August 2019, when a single lightning strike sparked a cascade of events that caused the UK's first major blackout in more than a decade. As per Energy Storage News⁵, the blackout caused power outages and significant disruption affecting more than one million people and large swathes of the country's rail network was temporarily taken out of action.

It is estimated that battery storage not only helped to restore the UK grid stability but also reduced the response time – helping the grid to restore its frequency four-times faster than the grid blackout that occurred in 2008.

Hence, the dynamic ability of battery storage will not only will help to integrate renewables into the energy mix but also manage frequent blackouts and brownouts for grid, making it an attractive, remunerative and unique solution.

With Actis aiming to supply clean, affordable and reliable electricity to billions of people, battery storage is no longer a limited technology but a competitive, mature and present-day enabler for the global energy transition towards a more sustainable and decarbonised future.



Exhibit 3: Contractual structures for battery storage

Contract or PPA	Right on battery services	Authority to charge/discharge (dispatch rights)	Tariff or fee structure
Energy Storage Tolling Agreement	<ul style="list-style-type: none"> – All battery services are sold to Utility or Offtaker 	Offtaker	Fixed Fee and Variable (Energy) Fee
Capacity Sales Agreement	<ul style="list-style-type: none"> – Capacity & capacity attributes are sold to Utility or Offtaker – Sponsor could sell other Battery Services to Third-Party or Merchant 	Project Sponsor	Fixed Fee
Hybrid Power Purchase Agreements (For e.g., India's 1200GW/ 3600GWh SECI Hybrid PPA)	<ul style="list-style-type: none"> – Sale of bundled products 	Two subsets: <ul style="list-style-type: none"> – Project Sponsor - If PPA dictates battery function for RE Smoothing only – Offtaker – If PPA allows Utility/Offtaker to use batteries for more services 	Blended Tariff (Generation plus storage capability) or Time-bound Tariff

Source: DNV GL and Orrick's Energy Storage Update 2018



The Street View:

Tech saves the day for Indian welfare



Pratik Jain

Private Equity, India

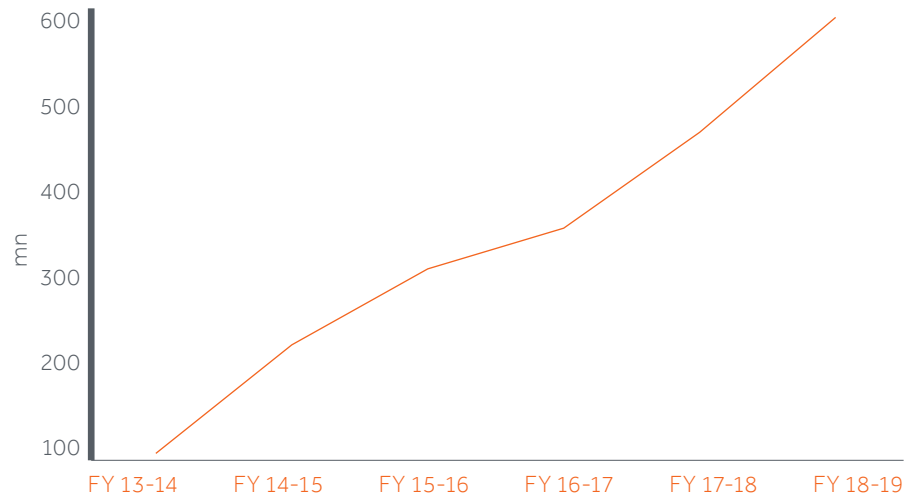
pjain@act.is

India spent \$38bn in FY2018-19 on a host of welfare programs primarily related to food, fuel and fertilizers for agriculture. Spending on welfare benefits has grown at 10-12% annually over the last few years, but has been beset by a number of problems. Large scale corruption and inefficient administration have undermined the effectiveness of welfare programs, leading to significant leakages and denial of benefits to intended recipients. Technology is helping tackle this head on enabling effective transfers and reduced corruption. The savings can be recycled into lower taxes, increasing investment and consumption. Near 360 million bank accounts have been opened in the last 6 years, a tenfold increase.

Direct Benefit Transfers:

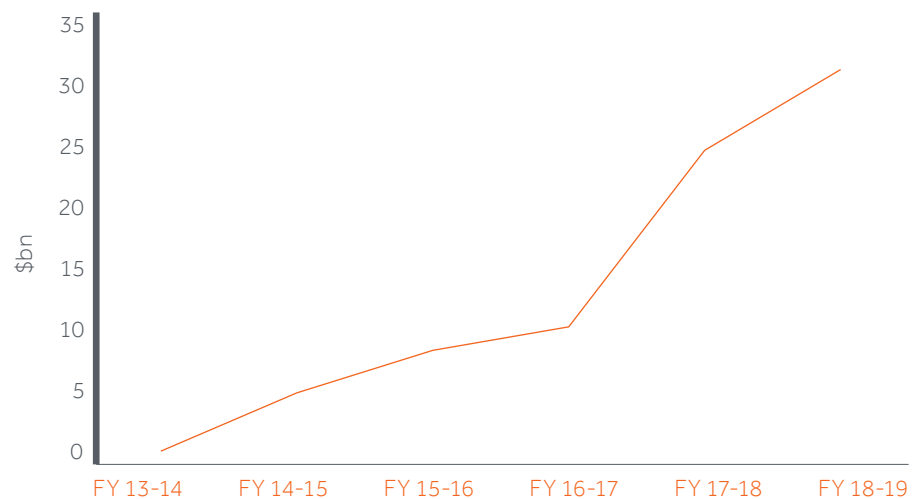
In order to reform the delivery of state welfare benefits, India launched Direct Benefit Transfers (DBT) in 2013 to pay cash benefits such as wages, subsidies and incentives directly into bank accounts of beneficiaries through electronic systems. The main advantages of DBT include plugging of leakages as the government directly transfers funds to the recipient and better targeting of benefits by eliminating fraudulent

Exhibit 1: No. of beneficiaries under DB



Source: Government of India

Exhibit 2: Fund transfers under DBT



Source: Government of India

and fictional beneficiaries. This is in sharp contrast to the prior process of providing welfare goods at subsidized prices in public shops, which was clunky and inefficient, and had no reliable means for identifying eligible beneficiaries.

DBT was initially rolled out as a pilot project over two phases with the objective of covering 536 programs across 65 ministries of the Government. The implementation is being phased in and covers 439 schemes currently.

Technology has played a pivotal role in the complex task of delivering DBT. The three key pillars underpinning the technology architecture for DBT include bank accounts for universal financial inclusion, Aadhar numbers as a means for identification and authentication of beneficiaries, and mobile banking which offers an alternative mechanism of payment and withdrawal.

The Three Pillars

1. Financial inclusion

The first step in enabling DBT was to provide access to a bank account to the intended beneficiaries of welfare schemes. India had a very low penetration of bank accounts in 2013, especially in rural areas. To tackle this issue, the government launched a financial inclusion program in August 2014 to expand and provide affordable access to financial services such as bank accounts, remittances, credit, insurance and pensions. Under this program, a no frills bank account was opened for citizens based on bio metric identification and all DBT transfers were to be made directly to these bank accounts.

As part of the financial inclusion program, 15 million bank accounts were opened on the first day of its launch and 30.2 million accounts were opened within a month. To date, 361 million bank accounts have been opened, including 214 million account holders from rural and semi-urban branches.

2. Aadhaar (Biometric identification)

India's national biometric database which has enrolled more than a billion citizens is estimated to be ten times larger than any other biometric database in the world and termed by the World Bank as the "world's most sophisticated digital identity scheme". The biometric identification project called Aadhaar – meaning "foundation" in Hindi was launched ten years ago with the express objective of plugging leakages in India's social welfare payments.

At the time of its launch in 2009, only sixty million out of 1.3 billion Indians had a passport and hundreds of millions either had no official identification at all or a weak form of it, issued by local authorities. Consequently, they were unable to open bank accounts or receive state services. A decision was made to create a national biometric database, which would enroll all



Indian citizens and collect their names, addresses, phone numbers, fingerprints, photographs, and iris scans. Each one of the citizens would be assigned a random twelve-digit number that is unique to him or her.

Unique Identification is a mandate for cash transfers as it enables the effective delivery of benefits directly. Government is able to transfer the benefit directly to the bank account to which the Aadhaar number is attached, which removes the space of intermediaries and plugs leakages in delivery.

3. Mobile Banking

Mobile penetration in India is c. 85% with 1.1bn mobile phone subscribers. Given this high level, mobile banking offers the potential for significantly improving the usage of banking services in India by enabling DBT beneficiaries to transfer money and make payments without having to visit a bank branch.

An impressive success

As per government data, since its implementation in 2013, DBT has been expanded to cover 439 welfare schemes. Transfers of \$30bn were made directly to the bank accounts of 590 million individuals during the year. The direct transfer of benefits to genuine beneficiaries generated savings of \$7.4bn in FY2018-19 alone.

On an aggregate basis, since 2014, the government has transferred \$92bn in subsidies directly to the bank accounts of the poor through DBT and generated savings of \$20bn through plugging leakages by eliminating intermediaries and middlemen.

More to be done

Even though the DBT scheme has been a significant success for the country by enabling more targeted delivery of state welfare programs and eliminating wastages, the scheme has its critics primarily on account of denial of benefits to eligible citizens because of their inability to procure an Aadhaar card. In some cases, citizens who are elderly or disabled are unable to walk to the distribution sites to verify their identities and remain outside the coverage of the scheme.

On the other hand, DBT has received criticism for being too slow in its implementation and not being extended to cover all welfare programs in India, the largest of which, food subsidy, still remains outside of its coverage.

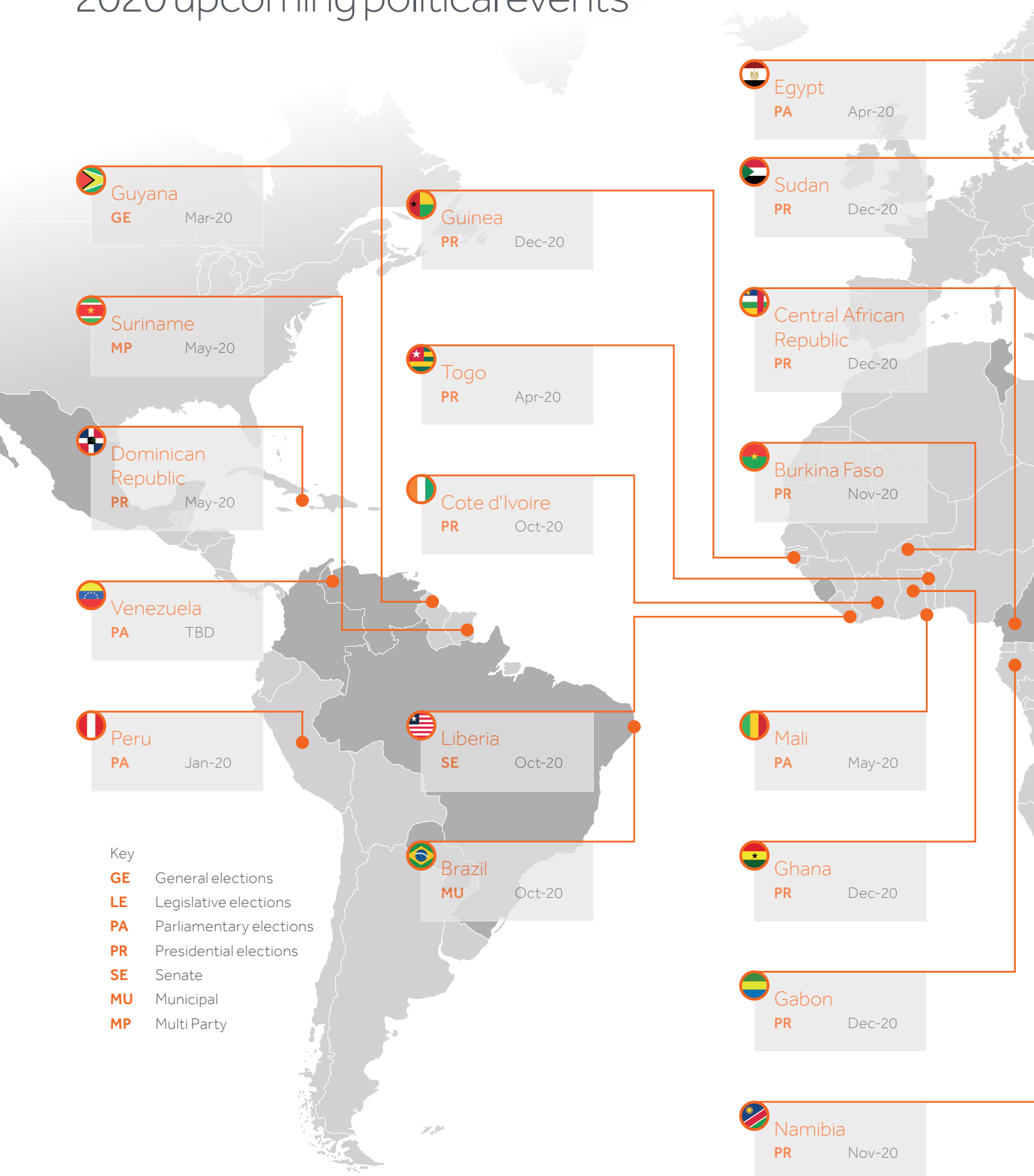
Notwithstanding these criticisms, it is quite evident that DBT has materially altered the landscape of benefits delivery in India and holds the promise of much more. From starting as a pilot project in 2013, to generating material financial savings for the government, DBT's journey has been quite impressive. A more robust financial and payments system is driving financial inclusion and a deepening economy and a lower country risk premium.

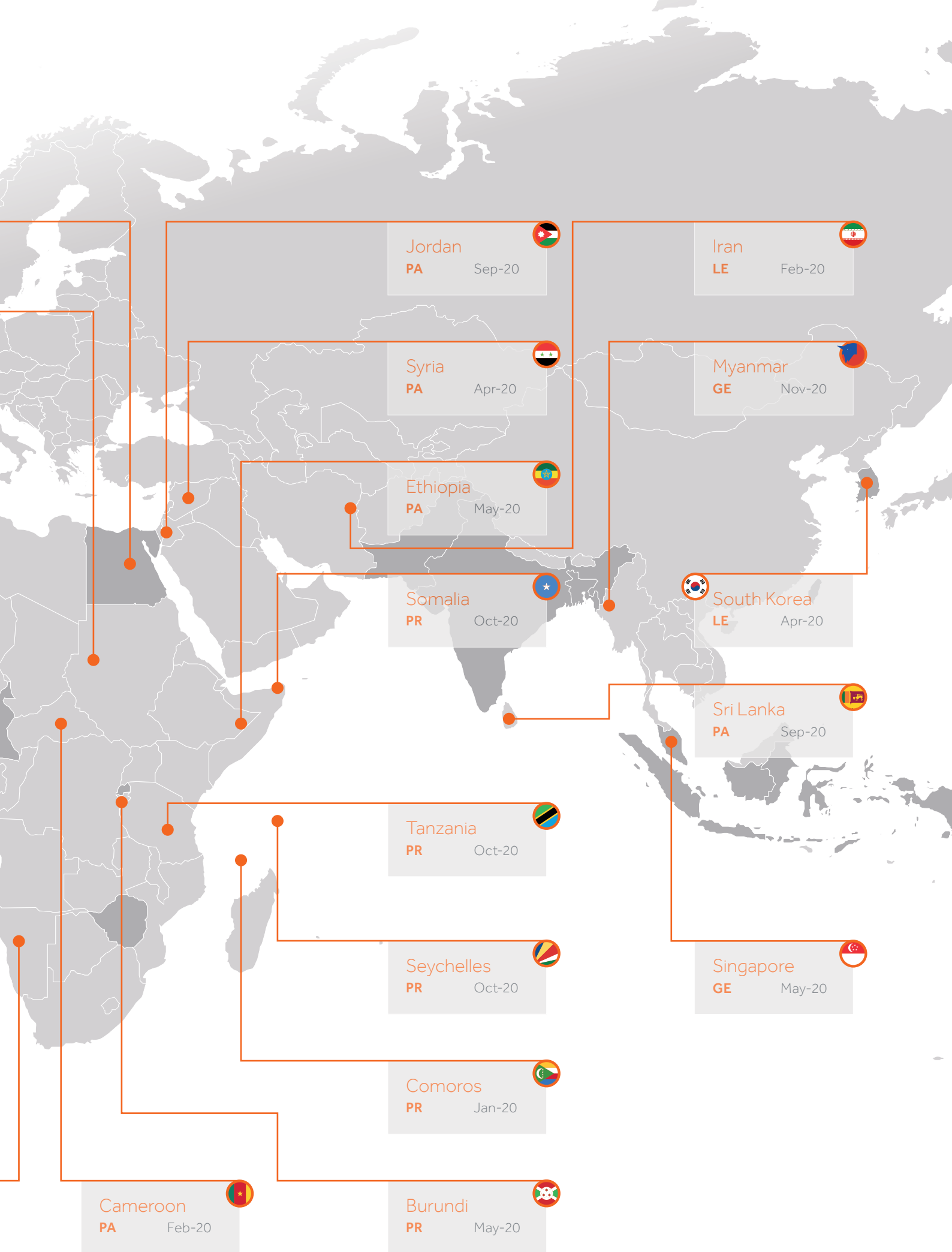




Actis data

2020 upcoming political events







Members of local community at Kipeto site receive keys to new house post-resettlement

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