



CREATING A PROFITABLE BALANCE

CAPTURING THE \$110 BILLION AFRICA POWER-SECTOR OPPORTUNITY WITH PLANNING

INSIGHT BRIEF

October 2019

EXECUTIVE SUMMARY

Eric Wanless
ece@rmi.org

Contributing Authors:
James Mitchell
Anthony Teixeira
Stephen Doig
Devi Glick
Claire Henly
Selena Wang-Thomas
All authors from
Rocky Mountain Institute

More than 600 million people across sub-Saharan Africa lack access to reliable electricity, creating significant cost for homes, businesses, and utilities. Understandably, this has translated into aggressive national installed capacity targets, with nations across East and West Africa aiming for increases of between 1.3 and eight times by 2020.

Our analysis of only those projects very likely to be completed by 2023 (i.e., in or near financial close) and projected as a trend to 2030 suggests that the cost of capacity imbalance will exceed \$180 billion, or more than two-and-a-half times the 2016 gross domestic product of Kenya. Two factors contribute to this unfortunate outcome: 1) a fragmented, project-focused approach that does not consider whole power system dynamics, including bottlenecks in transmission and distribution, and 2) overly optimistic demand forecasts that are not accompanied by strong programs to create productive demand for power. **Simply procuring more power supply does not lead to realizing the value of electricity nor to increased rates of access.**

Fortunately, there is a solution that reduces costs, frees up capital for other urgent needs, makes electricity more affordable, and ensures continued strong investment in the region. Recent work by Rocky Mountain Institute (RMI) and the Tony Blair Institute for Global Change (TBI) shows that taking a plan-based investment approach in the power sector will save more than \$110 billion across East and West African nations if planned investments are changed from 2023 on. If more immediate action were taken, the value of planned-based investments would rise by an additional \$68 billion to over \$180 billion. And these are conservative estimates—much larger savings could be realized from true integrated resource planning that utilizes a full set of on- and off-grid resources.

ELECTRICITY IS CRUCIAL FOR DEVELOPMENT

Electricity is fundamental to human and economic development; it frees up time spent on manual labor and money spent on kerosene and other fuels, improves education by allowing students to study by safe electric light, and enables growth in businesses and productive commerce. Yet, more than 600 million people in sub-Saharan Africa lack access to reliable electricity and it is the only region in the world where population growth is outstripping growth in access—the percentage of people in the region with access to electricity is *set to decline*.¹

This lack of access has a significant cost. The World Bank estimates that historic supply shortages and resulting blackouts and brownouts have cost more than 2 percent of GDP in lost economic output.² Power utilities themselves lose up to a quarter of their revenue due to outages in the

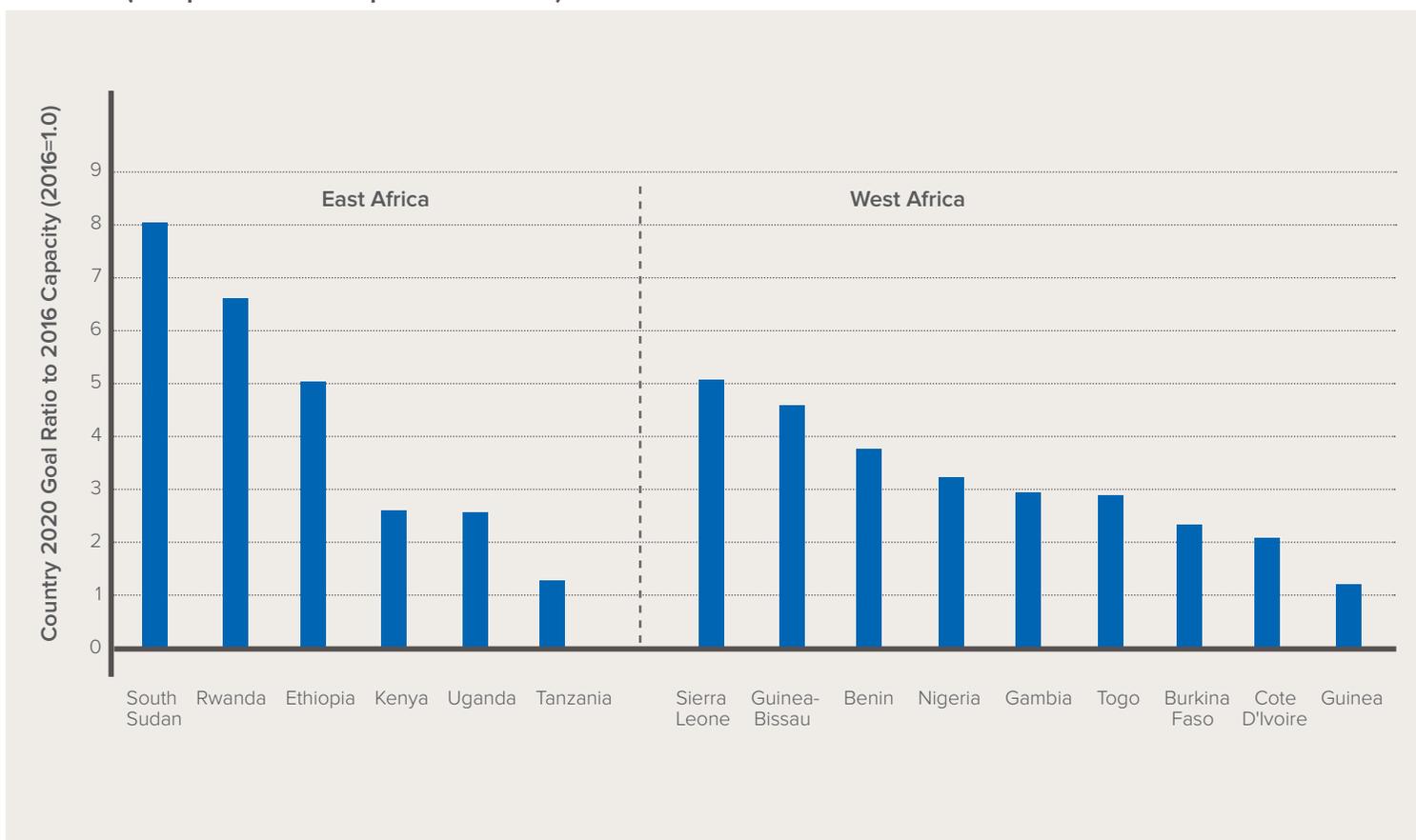
¹2015 World Energy Outlook and Africa Progress Panel, 2015

²World Bank Enterprise Surveys, data from 2002–2009

region.³ In Nigeria alone, homes and businesses spend \$14 billion each year on fuel for small backup and full-time generators because the power grid is not meeting their needs.⁴

Understandably, governments have set aggressive targets for adding power supply and are working to close deals quickly to address chronic historic shortages. Across East and West Africa, governments are aiming to increase their installed power capacity by between 1.3 and eight times their current capacity by 2020 (see Figure 1). Investment has also been flowing into the power sector to meet the challenge head on. Investment in independent power projects in sub-Saharan Africa (excluding South Africa and Chinese EximBank funding) has grown from a mere \$20 million per year in 1994 to more than \$700 million per year in 2013, a 20 percent compound annual growth rate (see Figure 2).⁵

Figure 1: 2020 capacity goal indexed to 2016 installed capacity for countries in East and West Africa with stated goals (interpolated or extrapolated to 2020)

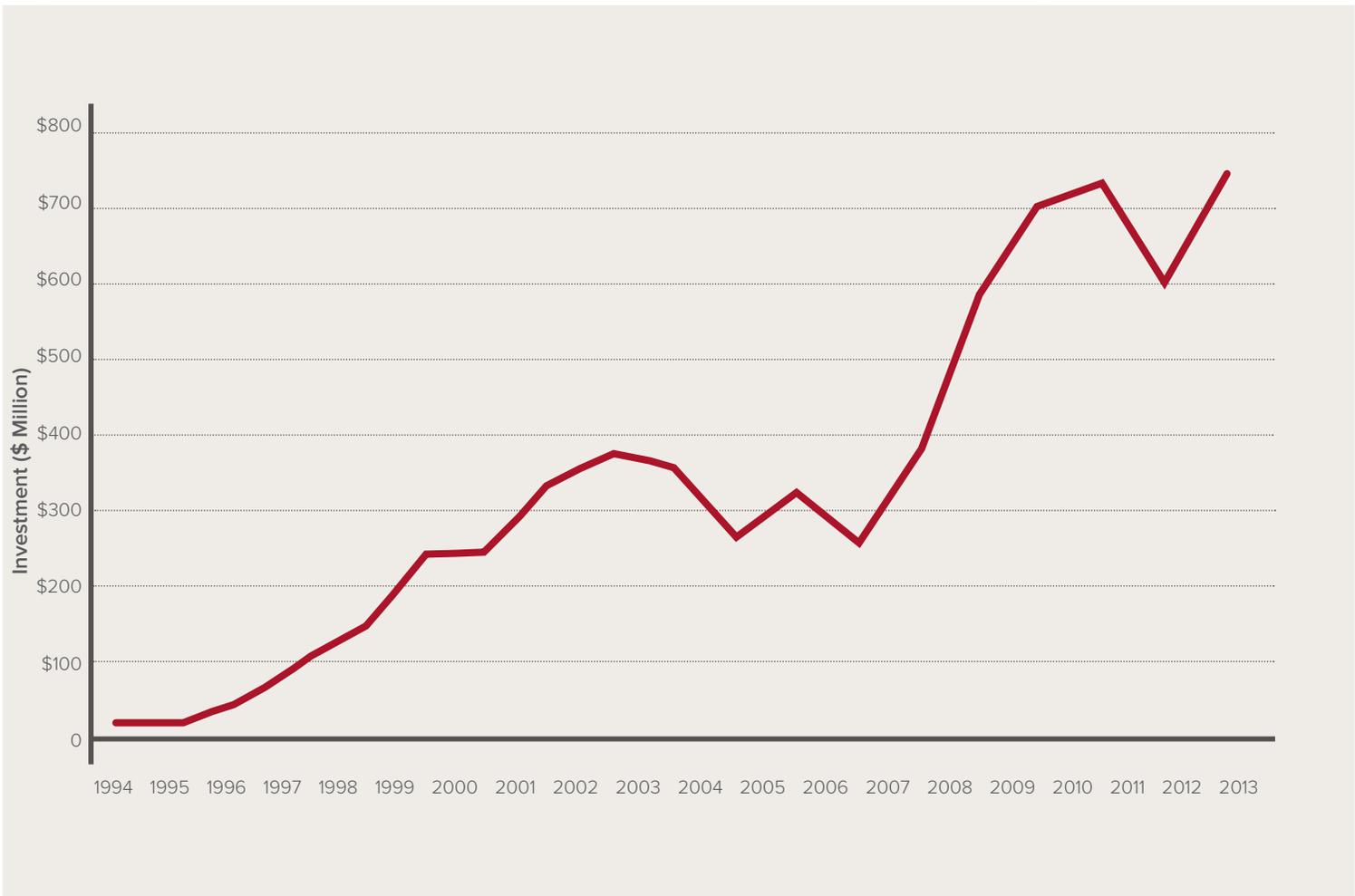


³World Bank Enterprise Surveys, data from 2002–2009

⁴RMI analysis in collaboration with the Nigeria Rural Electrification Agency

⁵Eberhard, Anton, Katherine Gratwick, Elvira Morella, and Pedro Antmann. “Accelerating Investments in Power in Sub-Saharan Africa,” *Nature Energy*, February 2, 2017

Figure 2: Annual investment in independent power producers in sub-Saharan Africa (excluding South Africa)



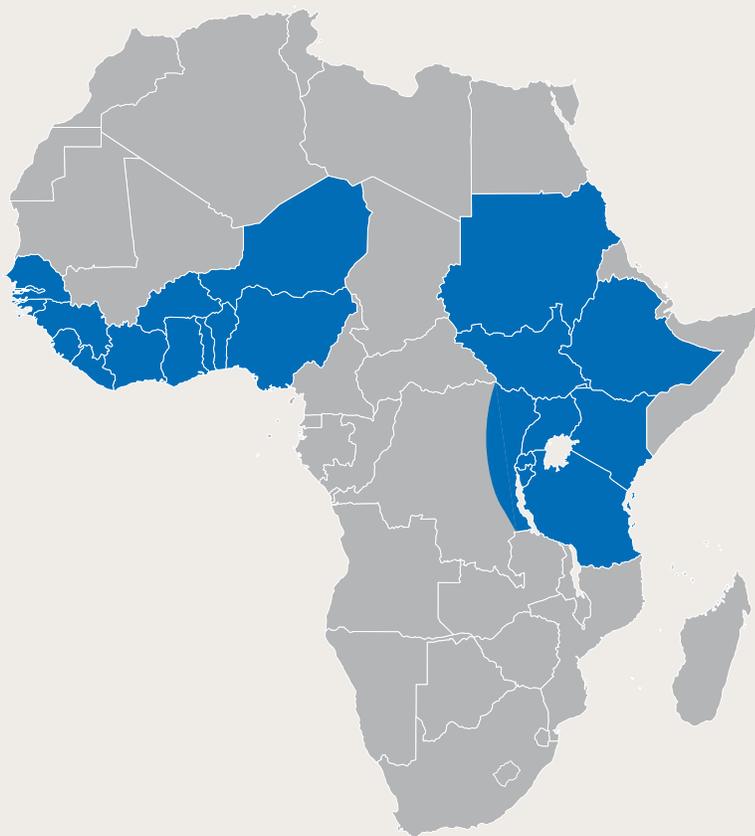
IIII INVESTING IN POWER SUPPLY IS NOT ENOUGH

While aggressive targets for and commensurate investment in power supply are necessary, they are not sufficient. **Simply procuring more power supply does not lead to realizing the value of electricity nor to increased rates of access.** For example, investing in a solar power project without storage may do little to address electricity shortages that occur in the evening hours, when the sun is not shining. Similarly, a coal power plant may provide little to no useful electricity if it is separated from demand by a congested transmission line or if it is operating in a system where the real limiting factor is distribution network capacity. And if customers do not have access to affordable and efficient appliances or there is no promising commercial and industrial activity, customers will not be able to use electricity productively and will not be capturing the value of new supply.

Getting supply-side investments right by considering their place in a broader system is critical. In regions without fully developed wholesale power markets, such as East and West Africa, the most common way to de-risk projects and secure financing is to use a take-or-pay contract structure in which purchasers are obligated to pay for most of the electricity that could be produced by a project regardless of whether they can use it.

Today's focus on investing in individual power supply projects without thoughtfully considering the role that they play in a country's power system (or the power pools they join) is leading countries in sub-Saharan Africa to a tragedy of the energy commons, in which all investments must function.⁶ RMI and TBI have undertaken extensive analysis of a subset of investments in power supply across the East and West African nations shown in Figure 3 that expands on recent Power Africa funded work. With a combined population of 750 million, these nations represent approximately 73 percent of sub-Saharan Africa's population.⁷

Figure 3: Countries included in the analysis



Note: Countries included in the analysis are Benin, Burkina Faso, Burundi, Côte d'Ivoire, Democratic Republic of Congo, Ethiopia, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Sudan, Sudan, Tanzania, Togo, and Uganda

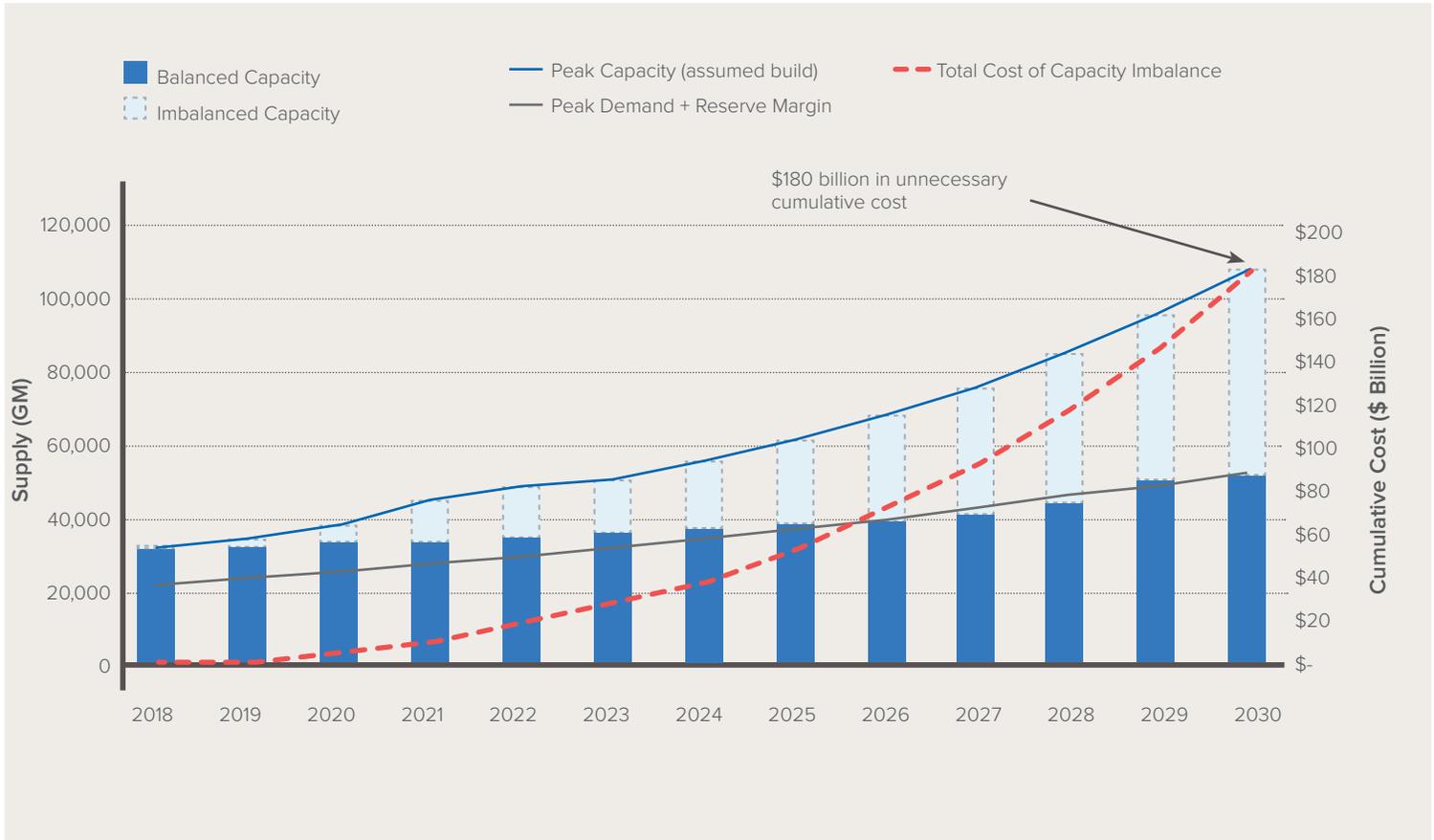
* The eastern portion of the Democratic Republic of Congo is represented on the map because it is within the territory of the Eastern Africa Power Pool, which was included in the analysis.

⁶ "Tragedy of the commons" describes a situation in a shared-resource system where individual users acting independently according to their own self-interest behave contrary to the common good of all users by depleting or spoiling that resource through their collective action.

⁷ United Nations Department of Economic and Social Affairs, Population Division. "2017 World Population," November 28, 2017

Accounting only for projects very likely to be completed by 2023 (i.e., in or near financial close) and projecting this build trend from 2024 to 2030, the total cost of capacity imbalance will exceed \$180 billion, more than two-and-a-half times the 2016 gross domestic product of Kenya (see Figure 4). This is due to a combination of projects not being the right size or type of supply, being in the wrong location, and not being coupled with critical co-investment in transmission, distribution, and stimulation of productive consumption of electricity.

Figure 4: Cumulative cost of capacity imbalance in East and West Africa (2018–2030)



These unnecessary costs could be invested in other equally important infrastructure or programs such as transportation, value-added agricultural processing, and mining. As the unnecessary costs accumulate, they lead to a tragedy of the energy commons, in which the focus on individual project investments without consideration of the broader system leads to unsustainable contract obligations that impair a government’s ability to make timely payments to investors and independent power producers. Not only will this lead to reduced return on investment for individual project funders, it may strand capital, ultimately reduce overall investor confidence in the region, and burden countries with unnecessarily high electricity costs, which has serious implications for economic development.

|||| BENEFICIAL INVESTING WITH SOLID PLANNING

Fortunately, there is a simple solution that will reduce unnecessary cost in the power sector and reduce associated risk for power project investors—plan-based investments that consider what a power sector really needs (from a supply, demand, and transmission and distribution perspective) and the role that specific projects play in meeting those needs. RMI and TBI estimate that there is a more than \$110 billion cumulative savings opportunity across East and West Africa through plan-based investment in the 2024–2030 period (Figure 5). This value assumes that projects that have reached financial close or are currently well underway will come online between now and 2023 regardless of planning changes. If an immediate change were made, the value of plan-based investment would increase by a further \$68 billion to over \$180 billion (Figure 6). And these are conservative estimates—much larger savings could be realized from true integrated resource planning that utilizes a full set of on- and off-grid resources.

Figure 5: Valuing a plan-based investment approach in East and West Africa

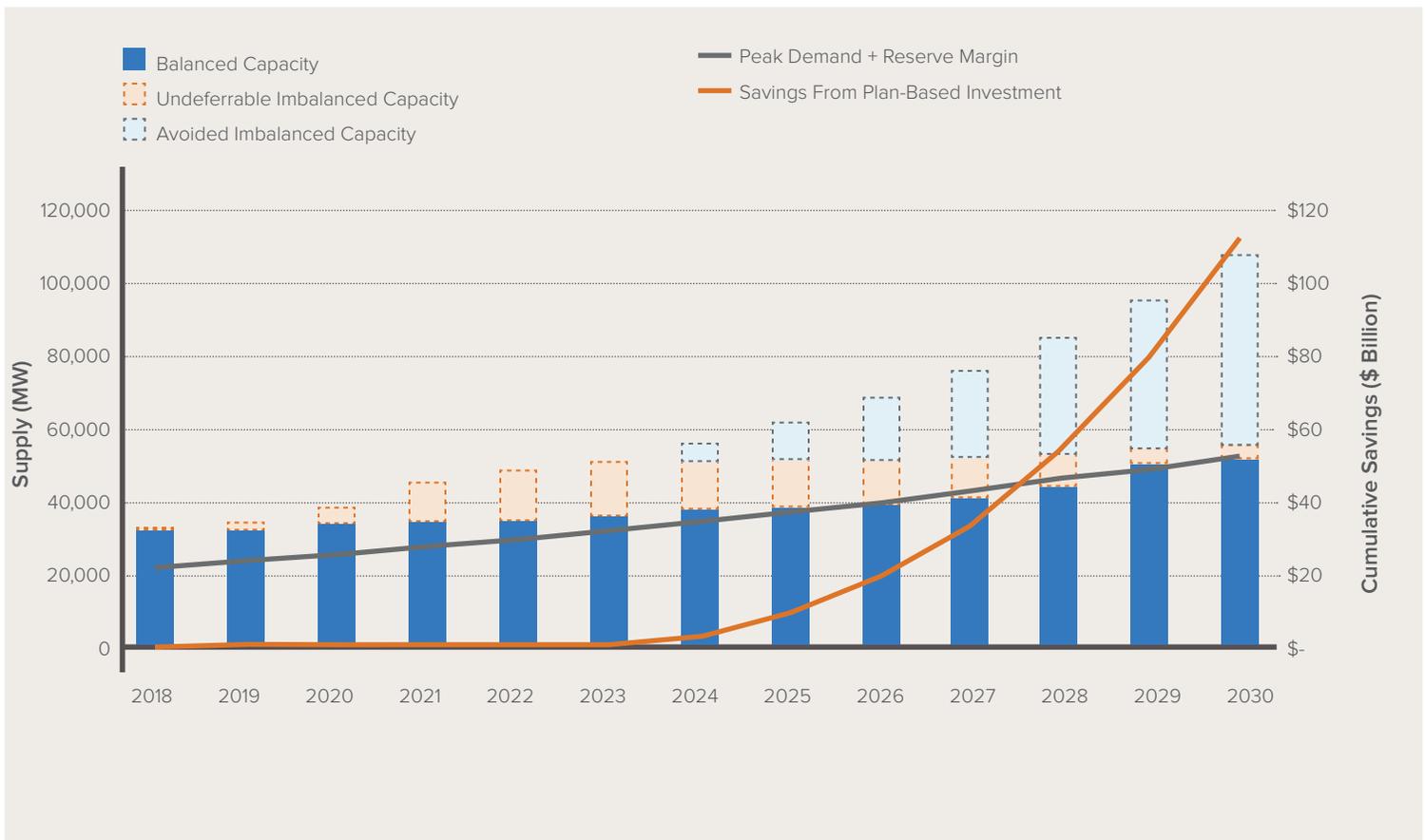
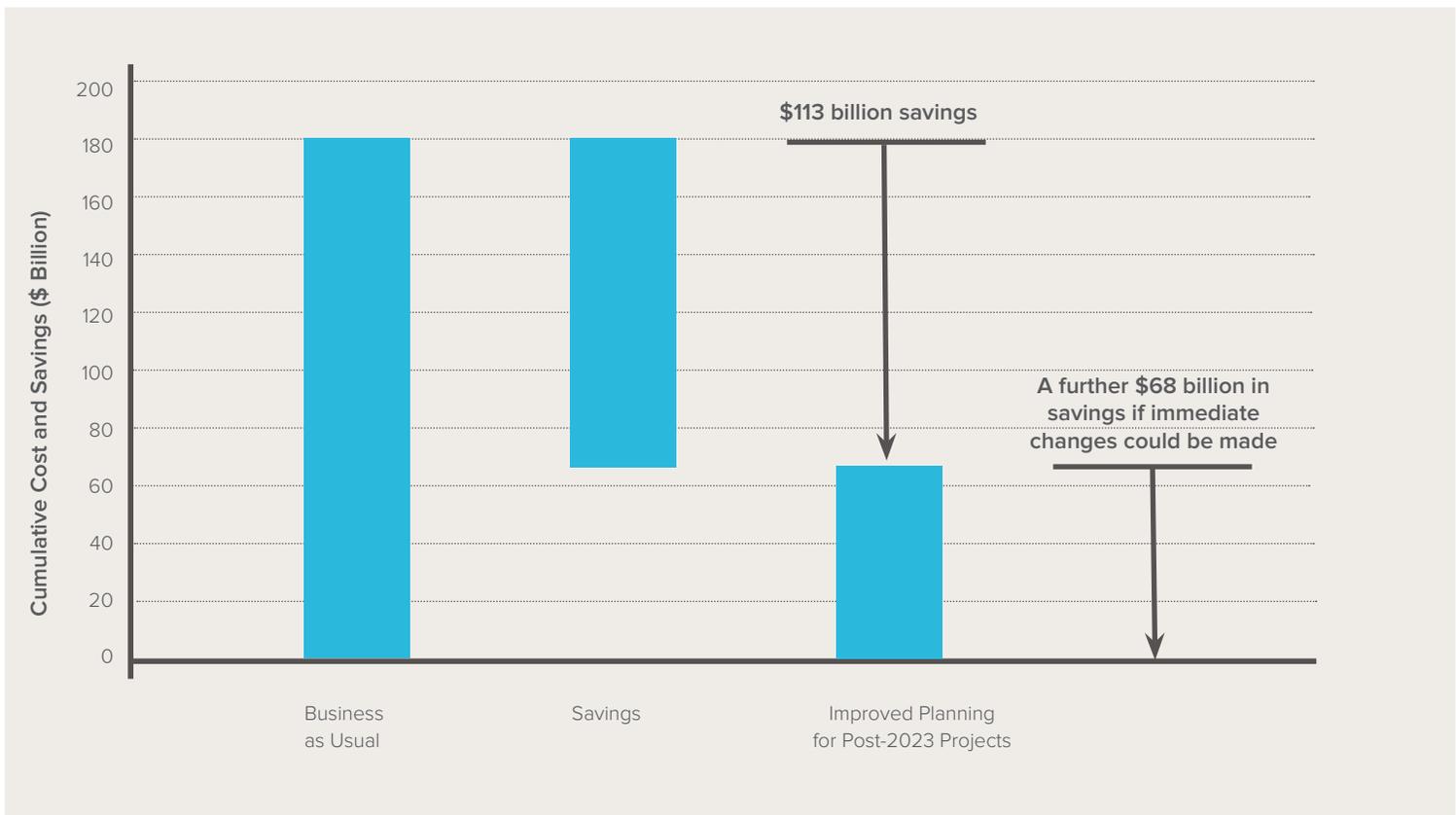


Figure 6: Cumulative savings from plan-based investment in East and West Africa (2018–2030)



African governments must play a large role in catalyzing these savings, which TBI articulates well in its work but investors (both private and development partners) have a role to play, too. Before committing to specific projects, prudent investors can:

- Challenge project developers to clearly articulate how their project fits into the overall system need, and what steps they are taking to reduce risk in addition to securing government guarantees and/or take-or-pay contracts (such guarantees will mean little in a tragedy of the energy commons scenario)
- Encourage and support governments in developing a transparent, collaborative, and regular planning process if none exists or if those that do exist aren't grounded in on-the-ground realities
- Diversify investments in the power sector to include critical transmission and distribution and enablers of regional trade and integration and encourage governments to do the same
- Explore investments that stimulate productive consumption of electricity to complement investments in traditional supply and other power infrastructure to ensure that power can be sold to consumers and that it will enhance human and economic development
- Consider the role of cost-effective, modular, and scalable projects, including off-grid technologies and distributed energy resources

Effective planning and associated plan-based investments require intensive collaboration across governments, utilities, investors, development partners, and project developers. Yet, the benefits are immense. Providing access to electricity that can actually benefit consumers can improve education, health care, and quality of life, while also improving the bottom line for utilities and rates of return for investors. Raising the awareness of and stimulating interest in plan-based investment is just the first step.

|||| ABOUT THIS ANALYSIS

The analysis that underlies the findings presented here was conducted jointly by RMI and TBI. RMI developed the analytical methodology using our experience working with governments and utilities in the region, and TBI created a detailed assessment of country-specific power projects as inputs into the model. TBI is publishing a complementary paper that frames the implications and recommendations of our collective findings for governments and development partners.

Methodology

A detailed methodology is available [here](#).

ABOUT ROCKY MOUNTAIN INSTITUTE

Rocky Mountain Institute (RMI)—an independent nonprofit founded in 1982—transforms global energy use to create a clean, prosperous, and secure low-carbon future. It engages businesses, communities, institutions, and entrepreneurs to accelerate the adoption of market-based solutions that cost-effectively shift from fossil fuels to efficiency and renewables. RMI has offices in Basalt and Boulder, Colorado; New York City; the San Francisco Bay Area; Washington D.C.; and Beijing.

ABOUT THE TONY BLAIR INSTITUTE FOR GLOBAL CHANGE

The Tony Blair Institute for Global Change aims to help make globalisation work for the many, not the few. We do this by helping countries, their people and their governments address some of the most difficult challenges in the world today.