U.S. Policy and Tradeoffs in Promoting International Access to Energy

Testimony before the House Energy and Commerce Committee
Subcommittee on Energy and Power
Dr. Todd J. Moss
Senior Fellow and Chief Operating Officer
Center for Global Development
February 27, 2014

Thank you, Chairman Whitfield, Ranking Member Rush, and other members of the Subcommittee. I appreciate that the Subcommittee is holding a hearing on energy access, which is now a leading development issue and increasingly relevant to American business and foreign policy interests in the fast-growing emerging markets.

As a development policy scholar and former State Department official, I will focus my testimony on the international dimensions of energy access and what the United States can do to expand it. I am testifying in a personal capacity, but my organization, the Center for Global Development, is an independent, non-partisan, non-profit, research organization dedicated to reducing poverty and promoting economic opportunity around the world.[1]

I have three points to make: (1) energy gaps are huge and harmful; (2) the United States can and should be a leader in expanding energy access abroad; and (3) to succeed, we have to make clear and consistent policy choices, and be honest about how those choices affect the world's poor.

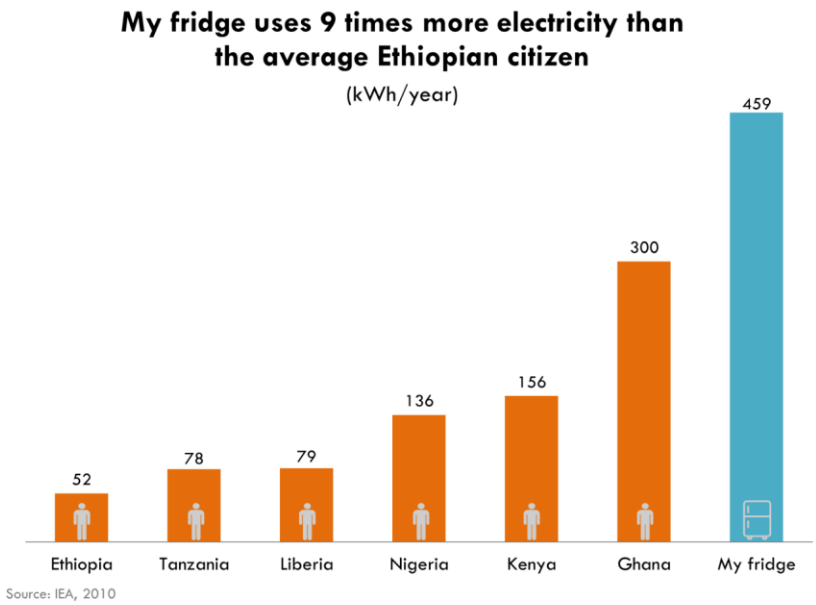
[1] www.cgdev.org

First, the lack of access to electricity is immense, striking, and extremely harmful. Today, at least a billion people live without electricity. The ability to turn on a light, heat our homes, use a computer, or keep food and medicine cold is something that we in the United States do not view as a luxury but rather as a simple convenience of modern life. When the power goes out, the American public panics—and often complains to their congressional representatives. But for many people around the world, this lack of power is an everyday reality.

In Africa, where the power shortages are the most severe, the majority of people, some 600 million, live with no electricity at all.

According to the International Energy Agency, the average American uses more than 100 times as much energy as the average Nigerian. The average person in Tanzania and Liberia uses less than 80 kWh per year, versus more than 12,000 kWh for an American. I was recently reminded of what 80 kWh really means when I was shopping for appliances and saw the yellow Energy Star tags. My new refrigerator uses 459 kWh per year – or more than five times as much as the average Tanzanian or Liberian (Figure 1).

FIGURE 1



The harm to people of living without electricity is very real. A major study on global disease burden in the *Lancet* estimates that indoor air pollution from biomass contributes to 3.5 million premature deaths per year.[2] In other words, cooking with wood or charcoal is killing more people worldwide than AIDS and malaria combined. Furthermore, some 60 percent of refrigerators used in health clinics in Africa have unreliable electricity, compromising the effectiveness of vaccines and pharmaceuticals used to fight these and other diseases.[3]

Living without power also affects education and jobs. Students cannot study at night without lights. And surveys conducted by the World Bank have consistently pointed to the lack of

---

[2] Lim S.S et al., 2012, A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010, *Lancet*, 380: 2224-60.

[3] GAVI Alliance, 2012, *National Ownership of Innovative Supply Chain Technologies*. Partners Forum 2012.. http://www.gavialliance.org/library/pf2012-sessions/11-%E2%80%93-national-ownership-of-innovative-supply-chain-technologies/.

reliable electricity as a top constraint to business growth.[4] In fact, in Nigeria, 97 percent of large firms surveyed have their own generators.[5] This is grossly inefficient, costly, polluting, and undermines competitiveness. With a growing population of unemployed youth in Nigeria and all other African countries, helping to build job-creating industries is in both our economic and security interests.

Second, the U.S. Government has a clear role to play in closing the energy gap. For the reasons outlined above, nearly all African governments have prioritized investing in and expanding access to electricity. Many are putting ambitious action plans on the table. In response to this demand, the Europeans, the Chinese, and other nations have increased their commitment to expanded energy access. Indeed, the United Nations has set a goal to provide universal access to energy services by 2030.

Now is the time for the United States to play its part too. In our own history, our government has been critical in supporting the expansion of electricity to underserved areas and to ensuring that American industry has sufficient and affordable energy supplies to be competitive. We can make a modest but important contribution to this effort globally in a way that benefits Africans and American businesses.

[4] Ramachandran V., Gelb, A., and Shah, M. K. 2009, *Africa's Private Sector: What's Wrong with the Business Environment and What to Do About It*, Center for Global Development, Washington DC.

[5] See enterprisesurveys.org.

In June 2013, President Obama launched the Power Africa initiative, which mobilizes a range of U.S. government agencies to help support a doubling of energy access on the continent.[6] Initially focusing on six countries (Kenya, Tanzania, Ethiopia, Nigeria, Ghana, and Liberia), Power Africa is a timely idea and already off to a promising start. If followed through in a practical and realistic manner, the United States can play a constructive role in bringing electricity to millions of people living without it.

However, Power Africa's ultimate success, as both a development and diplomatic effort, will depend on overcoming several obstacles. As long as it exists as a White House initiative and spread across at least a dozen agencies, its long-term success is in doubt. Without a clear champion and home agency, Power Africa could become yet another high-profile presidential effort announced with great fanfare, then allowed to die a quiet death.

Even more troubling, the agency best positioned to lead this effort, the Overseas Private Investment Corporation (OPIC), is hamstrung by outdated policies and legislation. This little-known but high-performing government agency supports the private sector though insurance and project financing. What OPIC needs is not more money, but additional authorities and flexibility to fulfill its mission.[7]

---

[6] White House, June 30, 2013, "Fact Sheet: Power Africa." Office of the Press Secretary. http://www.whitehouse.gov/the-press-office/2013/06/30/fact-sheet-power-africa.

[7] Benjamin Leo, Beth Schwanke, and Todd Moss, "OPIC Unleashed: Strengthening US Tools to Promote Private-Sector Development Overseas," Center for Global Development, August 2013. http://www.cgdev.org/publication/opic-unleashed-strengthening-us-tools-promote-private-sector-development-overseas

Fortunately, the Electrify Africa Act, introduced last year by House Committee on Foreign Affairs Chairman Ed Royce and Ranking Member Eliot Engel, is being marked-up this week. This bill would promote energy access on the continent in a strategic, transparent way that marshals the U.S. government agencies that operate abroad. Congressional action is important because it will further empower OPIC and other government agencies, while providing a long-term policy foundation that can ensure these efforts outlive the current Administration.

While momentum in Congress is encouraging, it is concerning that other U.S. policies are moving in the opposite direction. Just as the U.S. is seeking to expand energy access, other policies are increasing restrictions on financing for natural gas and hydropower. This comes at the exact moment when many African countries are discovering natural gas and want to use part of their reserves to produce electricity at home. Indeed, all six of the Power Africa focus countries are either producing, developing, or exploring for oil and gas.

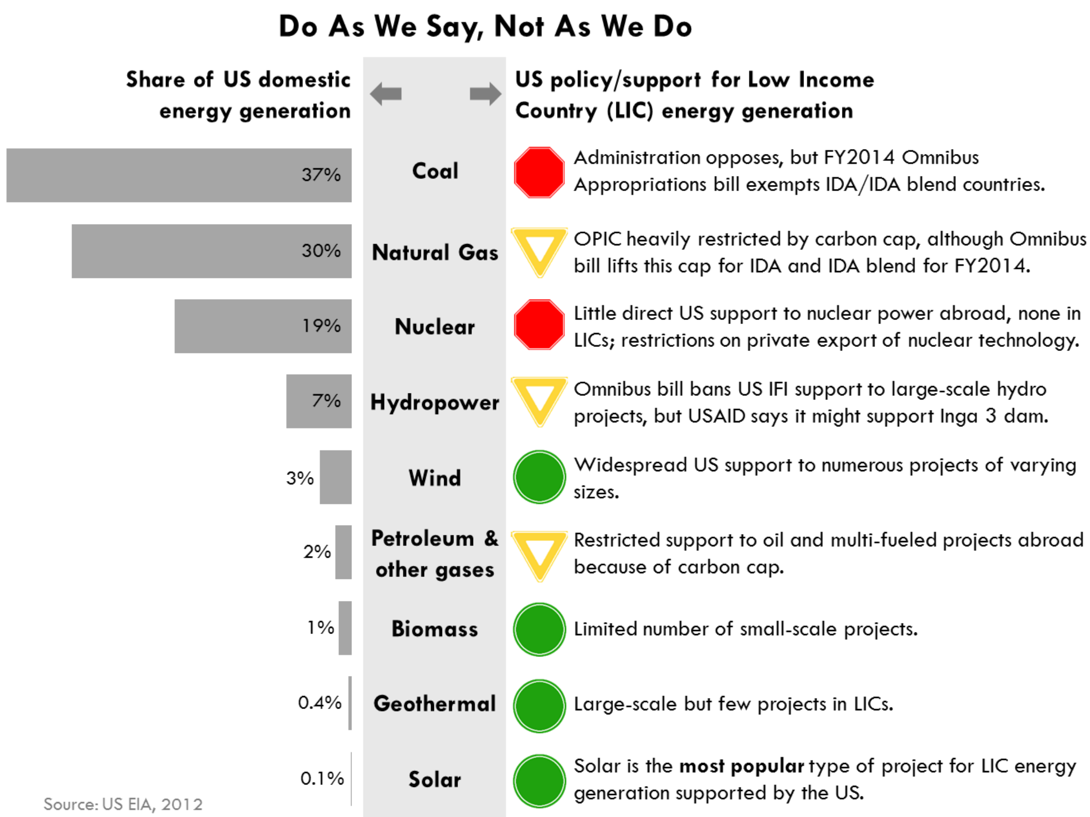
Ghana is a good example. The country is a close U.S. ally which recently discovered natural gas and would like to use this resource to expand access and grow its industry. Yet current U.S. policy restricts our ability to assist them in building any new gas plants and many advocacy groups want to prevent Ghana from generating additional power via natural gas out of concern over potential greenhouse gas emissions. As we consider the U.S. position on this, it is worth keeping in mind that we currently have more than 3,400 power plants running on fossil fuels in the United States.[8] Ghana has two.

---

[8] *Electric Power Annual*, U.S. Energy Information Administration, Table 4.1. Count of Electric Power Industry Power Plants, by Sector, by Predominant Energy Sources within Plant, 2002 through 2012, http://www.eia.gov/electricity/annual/html/epa_04_01.html

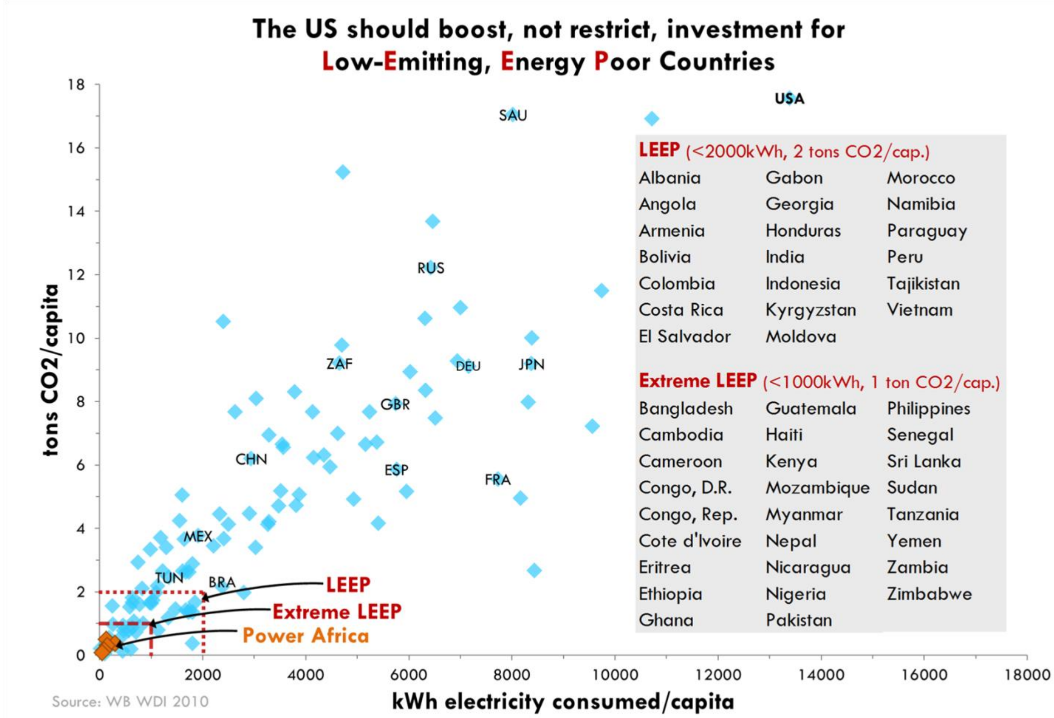
The United States is thus sending conflicting signals by taking active steps to prevent other countries from using the very sources that provide 93 percent of our own domestic electric power generation (Figure 2).

FIGURE 2



If an all-of-the-above approach is good enough for the United States, how can we in good conscience stand in the way of the world's poorest countries using their own resources to provide electricity for their own people? At the very least, we should make an exception to restrictions for the countries most in need. One option is to exemption countries designated as low-emissions, energy poor (LEEP) from any restrictions on public finance (Figure 3).

FIGURE 3



My third and final point is that we cannot avoid the direct tradeoffs of our energy policy choices. An emphasis on clean or low-carbon energy is a good idea where it is feasible and appropriate. We must encourage the next wave of technology and business models to create new ways of producing and delivering energy. Off-grid renewable power is viable and cost-competitive in some places and deserves our support. But the scale of the energy gaps in the world and the realities of energy poverty also mean that such approaches are far from enough.

Many argue that it makes no sense to build power plants at scale on the mistaken premise that those living without power in other countries primarily reside in isolated villages, far from any grids. This is false. Today, some 200 million Africans without electricity live in cities and towns. More than half of the poor residents of major cities like Nairobi and Dakar do not have power. Connecting these fast-growing urban areas will require more power generation and expansion of the grid. This may not be trendy, but it is still the most efficient way to provide modern energy for concentrated populations.

Another widely held misperception is that, like cell phones, new technology will make power plants and grids irrelevant. It is true that solar lamps are one way to provide light and perhaps charge a cell phone. But few consumers would be satisfied with this minimal amount of power.[9] And no country would accept solar lamps in lieu of a modern, large-scale energy system required to generate growth and jobs.

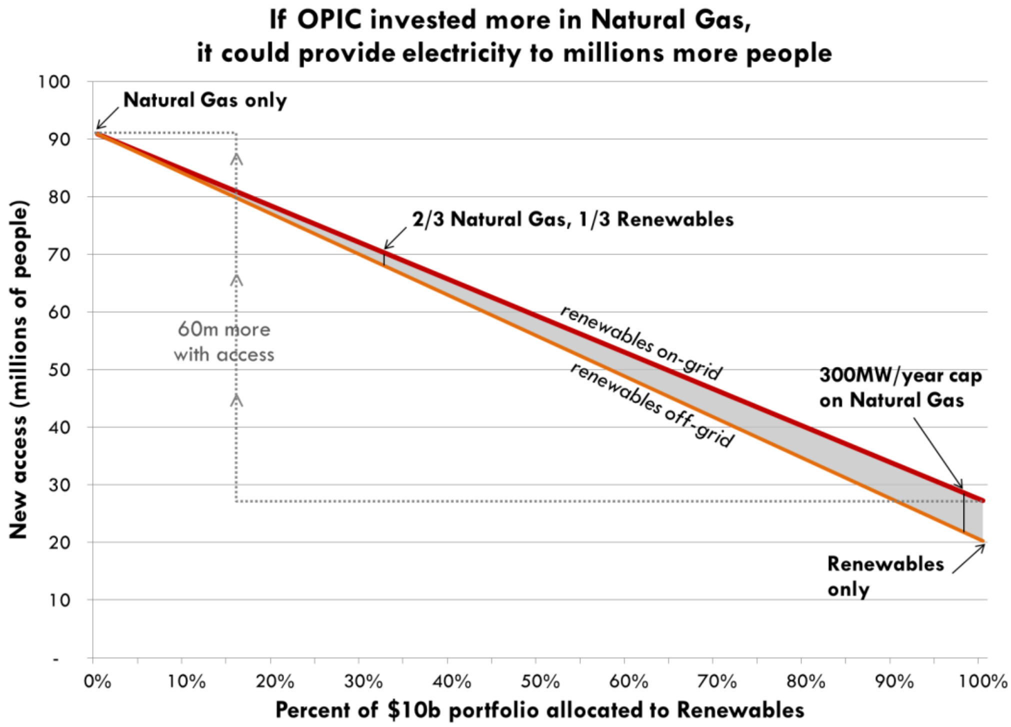
A final common mistake is assuming that universal energy access can be achieved entirely through renewable sources. Based on prices and capital markets today, this is incorrect. In the real world of limited resources, there is a direct tradeoff between strictly focusing on renewables and expanding access. For example, my colleague Benjamin Leo and I estimate that allowing OPIC to invest in natural gas power projects could provide access to 60 million more people than the number reached by a renewables-only portfolio (Figure 4 and Appendix 1). This difference is driven by the higher cost of renewables per megawatt of generation and the ability to leverage greater private capital for natural gas projects.[10]

---

[9] Morgan Bazilian and Roger Pielke, Jr., "Making Energy Access Meaningful," *Issues in Science and Technology*, Summer 2013. http://sciencepolicy.colorado.edu/admin/publication_files/2013.22.pdf

[10] Todd Moss and Benjamin Leo, "Maximizing Access to Energy: Estimates of Access and Generation for the Overseas Private Investment Corporation's Portfolio," Center for Global Development, January 2014. http://www.cgdev.org/publication/maximizing-access-energy-estimates-access-and-generation-overseas-private-investment

FIGURE 4



To conclude, no one would openly argue that we should fight climate change on the back of the world's poor. But we must be careful not to burden the poorest nations with romantic notions of an energy future that does not yet exist. If the United States is serious about closing the huge gap in energy access, we need to work in partnership with American businesses to extend our experience, capital, and innovation in generating abundant and affordable electricity for all.

Thank you.

Attachment:

Todd Moss and Benjamin Leo, "Maximizing Access to Energy: Estimates of Access and Generation for the Overseas Private Investment Corporation's Portfolio," Center for Global Development, January 2014.

APPENDIX 1:

Maximizing Access to Energy: Estimates of Access and Generation for the Overseas Private Investment Corporation's Portfolio

Todd Moss & Benjamin Leo[11]

January 2014

Summary

We conservatively estimate that more than 60 million additional people in poor nations could gain access to electricity if the Overseas Private Investment Corporation were allowed to invest in natural gas projects, not just renewables.

Policy Context

Boosting energy access is a major development objective and a policy priority for the United States. More than 1 billion people worldwide and the majority of people living in sub-Saharan Africa lack access to even basic electricity. This energy poverty affects health (household air pollution from solid fuels used for lighting, heating, and cooking contribute to 3.5 million premature deaths per year), education (most African schoolchildren attend school with no electricity and cannot study effectively in the dark), and jobs (lack of reliable and cost-effective electricity is among the top constraints to growth).

President Obama's Power Africa initiative, launched in June 2013, aims to increase electricity generation and access to modern energy services in six low-income countries. The success or failure of this effort will be determined in large part by the investment decisions of a dozen or so US government agencies that may be operating under potentially conflicting mandates. The Overseas Private Investment Corporation (OPIC), the main US development finance institution, will play a central role. How it selects projects will affect outcomes in Africa for the Power Africa initiative and OPIC's activities in other low-income countries.

A critical policy question for the administration is how the fuel mix in OPIC's portfolio might affect the generation and access targets for the world's poor. In this note, we draw on publicly available data from the International Energy Agency (IEA), the Congressional Research Service (CRS), the US Department of

[11] We thank Stephanie Majerowicz for the original data work, Madeleine Gleave for additional analysis, and Jonah Busch for comments. Any errors are solely those of the authors.

Energy, and OPIC, to provide a rough estimate of the tradeoffs as an input to the fuel-mix debate. We focus specifically on the affect that allowing investment in natural gas would have.

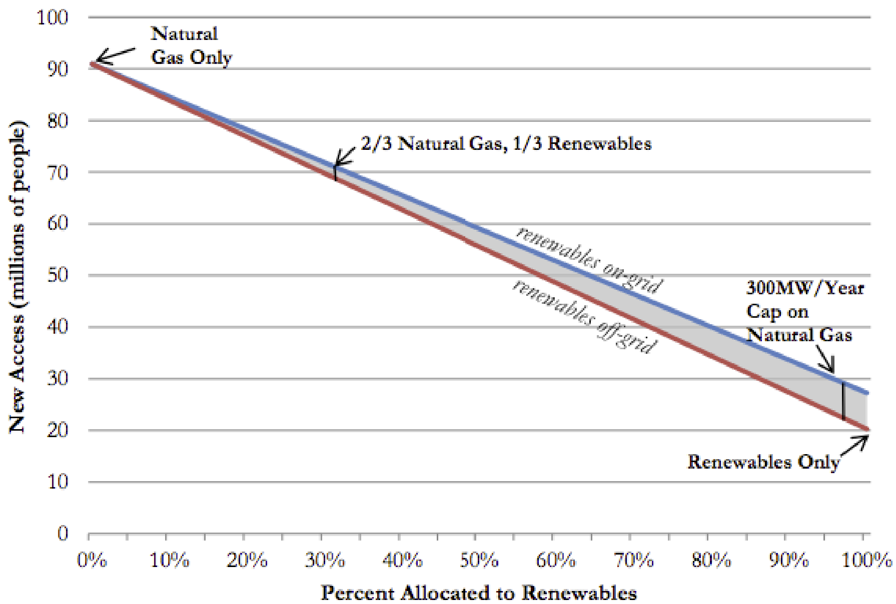
There has been a general bias toward using OPIC to invest principally in solar, wind, and other low-emissions energy projects as part of the administration's effort to promote clean energy technology. An explicit policy capping the total greenhouse gas emissions in OPIC's overall portfolio has further pushed the organization's investments heavily toward renewables. Indeed, over the past five years, OPIC has invested in more than 40 new energy projects and all but two (in Jordan and Togo) are in renewables.

The 2014 omnibus appropriations legislation lifts the greenhouse gas restriction on OPIC's portfolio for projects in low-income countries for the current fiscal year, but the medium-term policy is under debate. Congress will also likely consider a version of the Electrify Africa Act again in 2014. Meanwhile, many African countries have significant natural gas deposits and have declared their desire to utilize that resource for domestic power generation. Of the six countries in Power Africa, four are already producing or developing natural gas and two are exploring its use (see annex A).

Energy Investment Tradeoffs: Additional Access and Generation Simulations

Figure 1 shows estimates of access based on the allocation of a $10 billion portfolio (what OPIC might reasonably commit over multiple years given modest additional administrative budget) to a mix of natural gas and renewable energy projects. A natural gas–only portfolio could provide electricity access to 90 million people versus 20–27 million people with a renewables-only portfolio. Thus, we estimate that more than 60 million additional people in poor nations could gain access to electricity if OPIC were allowed to invest in natural gas projects, not just renewables.

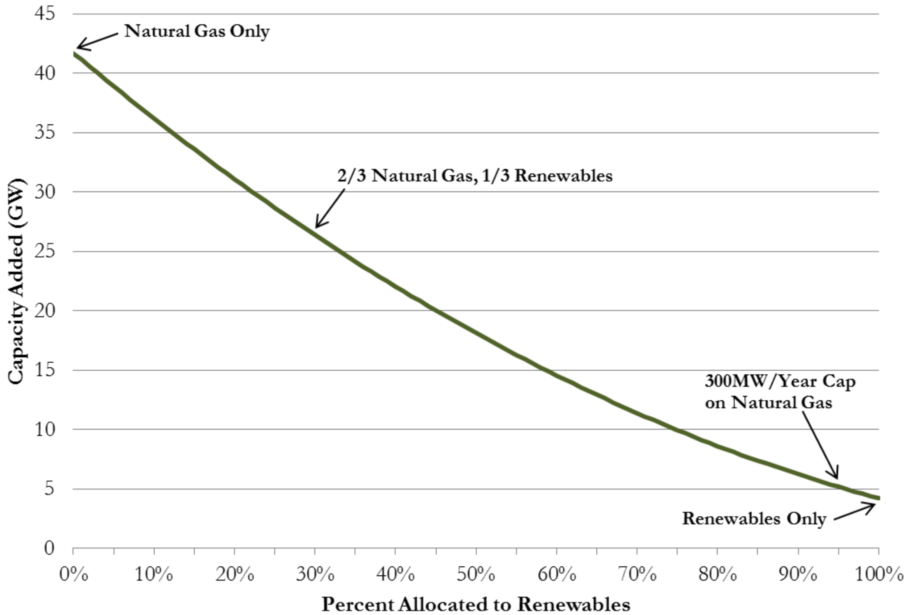
Figure 1. Tradeoff Between Access to Electricity and Focus on Renewable Energy



The result is driven principally by the higher private investment leveraging ratios of natural gas projects (5:1 versus 1.5:1 based on OPIC's historical portfolio). Projections of deploying on-grid and off-grid options are based on IEA estimates ($550 and $740 per person, respectively). Additional methodological information is contained in Annex B.

Figure 2 shows estimates of additional generation capacity based on the allocation of the same $10 billion portfolio to a mix of natural gas and renewable energy projects. A natural gas–only portfolio could provide an additional 42,000 MW of electricity versus 4,200 MW in a renewables-only portfolio. Thus, we estimate that about 38,000 MW of generation is at stake. This is equivalent to about three times the entire installed capacity of all six countries in the Power Africa initiative (see annex A).

Figure 2. Tradeoff between Capacity Additions and Focus on Renewable Energy



The result in this case is driven by both higher private investment leveraging ratios for natural gas projects and conservative estimates of capital costs per megawatt ($1.2m/MW for gas and $3.5m/MW for renewables). Additional methodological information is in annex B.

Potential Policy Compromise – Balancing Renewables and Access Objectives

A potential policy compromise, which is highlighted in both graphs, could support both OPIC's continued investment in renewable energy and substantially boost access for the poor. A targeted mix of two-thirds gas and one-third renewables would increase access for 70 million people and generate approximately 25,000 MW of additional capacity. (By comparison, the United States uses coal and gas for two-thirds of its own power, with the balance principally hydro and nuclear.) Reaching this two-thirds natural gas target for OPIC, however, would require additional policy flexibility, including a revision of the emissions cap or how it is calculated.

There are other reform options, which may enable expanded access while also continuing to encourage OPIC to invest in the next generation of renewable energy. These options are the subject of a forthcoming paper.

Annex A

	Access to electricity	Millions w/o access	Installed capacity (MW)	Estimated demand (MW)* 2010	2030	Gas production
Liberia	0.5%	3.9	200	1118	705	Exploring
Tanzania	14.8%	38.3	840	10916	9835	Producing 30 Bcf; new discoveries estimate reserves of 28.7 Tcf
Kenya	18.1%	33.5	1700	9908	7681	Exploring; small initial discoveries
Ethiopia	23.0%	67.1	2060	18933	14404	Estimated reserves 4 Tcf; beginning to develop gas fields
Nigeria	50.3%	79.4	5900	24139	33489	Producing 1.1 Tcf; 182 Tcf proven reserves (10th largest globally)
Ghana	60.5%	9.6	1990	3241	3630	800 Bcf proven reserves; building pipeline

Sources: WDI, US EIA

*Demand is estimated using average consumption levels for Tunisia (1260 kWh per capita). See http://www.cgdev.org/blog/how-much-power-does-power-africa-really-need for full explanation of estimation.

Annex B

Table 1: Access and Capacity of $10 billion in OPIC Investment in Power

Scenario:	Total capital ($bn)	New Access (million people)	Capacity Additions (MW)*
(1) Renewable only	15.0	20-27	4,200
(3) Renewable 1/3, Gas 2/3	38.3	67-70	25,000
(2) Natural Gas only	50.0	90	42,000
(4) Cap Only 1500MW gas	16.3	22-30	5,600

**Based on conservative estimates from CRS study*

Table 2: Incremental Access Efficiency Estimates

Type	Annual Investment ($ bn)	People Gaining Access annually (m)	$/person gaining access
On-grid	11.0	20	550
Mini-grid	12.2	19	642
Off-grid	7.4	10	740

Source: IEA, World Energy Outlook, 2011, pg. 31.

Methodology

$$\textit{New Access} = \textit{Investment} * \left(\frac{(\%\ \textit{on-grid} * \textit{multiplier}_{on})}{\textit{efficiency}_{on}} + \frac{(\%\ \textit{off-grid} * \textit{multiplier}_{off})}{\textit{efficiency}_{off}} \right)$$

I. Investment: Assume a baseline OPIC investment of $10 billion.

II. New Access Per Dollar of Investment (*efficiency*): The International Energy Agency estimates that the amount of investment required to achieve access to electricity for all households. Their estimates of annual investment needed by type (on-grid, mini-grid and off-grid), along with their projections of the number of people this would give access to, yields a simple per capita average cost of extending access (see table 2 above). Because reaching the last million people without energy access will almost certainly cost more than the first million, using an average cost provides a conservative estimate. The IEA incorporates this diminishing returns principle in their estimates for cost per person gaining new access (see IEA World Energy Outlook 2011, pg. 31, for details).

III. OPIC Leveraging Ratios (*multiplier*): Based on past and current energy projects for which data is available, OPIC has historically financed on average 20 percent of the total cost of natural gas projects and 60–70 percent of renewable energy projects. Assuming ratios of 1/5 and 2/3 for natural gas and renewable energy respectively yields crowding-in multipliers of 5:1 and 1.5:1. Following the IEA's assumption that on-grid investment will be 2/3 fossil fuel, 1/3 renewable, we estimate a leveraging ratio for on-grid of 3.83 [equal to 5(2/3)+1.5(1/3)] and for off-grid (presumed, as per IEA, to be only renewables) of 1.5.

Table 3: Overnight Capital Costs per MW by Technology (USD/MW)

Average	Sample of OPIC historical portfolio	DOE Meta-Study	CRS Estimates (US sample)
Natural Gas	591,909	768,750	1,200,000
Renewables (weighted average)*	3,726,049	3,650,250	3,567,000
Wind	1,383,333	1,700,000	2,100,000
Geothermal	8,260,000	3,825,000	3,200,000
Solar Thermal	5,650,892	4,883,333	3,400,000
Solar PV		6,000,000	6,600,000
Hydro	na	na	na
Biomass	2,952,976	3,012,500	3,000,000

Sources: CRS, DOE, author calculations based on public data from OPIC.

**Weighted renewables average calculated using IEA predictions for renewables mix most suited for extending energy access (28% wind, 36% solar, 21% biomass, 8% hydro, 7% others). Weights adjusted to account for lack of data on hydro technologies.*

IV. Capacity Additions Per $ of Investment: We examined three different estimates of cost per MW of additional capacity, both on aggregate and by energy source: averages from OPIC's own energy project portfolio, a Congressional Research Service (CRS) study on power plants, and a Department of Energy (DOE) meta-study.* For the projections included in table 1 and model in figure 2, we use the most conservative assumptions as contained in CRS.

*Stan Kaplan, "Power Plants: Characteristics and Costs," Congressional Research Service Report, November 13, 2008; Tidball, Rick, Joel Bluestein, Nick Rodriguez, and Stu Knoke, "Cost and Performance Assumptions for Modeling Electricity Generation Technologies," National Renewable Energy Laboratory, Department of Energy, November 2010; OPIC estimates based on author calculations using available data from OPIC.gov.