noca CLEAN ENERGY

Canada

POWER AFRICA

Digital Magnetic Inducer Generator

Focus

Noca Clean Energy is a Canadian-based company positioned to be an industry leader by providing clean, cost-effective, efficient, and viable alternative energy technology to markets that have limited access while simultaneously creating a working sustainable environmentally friendly power generation for years to come.

Enviroment

Generating zero-emissions, No radiation, No sulphur, No heat, high-efficiency, and scalable energy solutions through advanced innovations in engineering

Maintenance

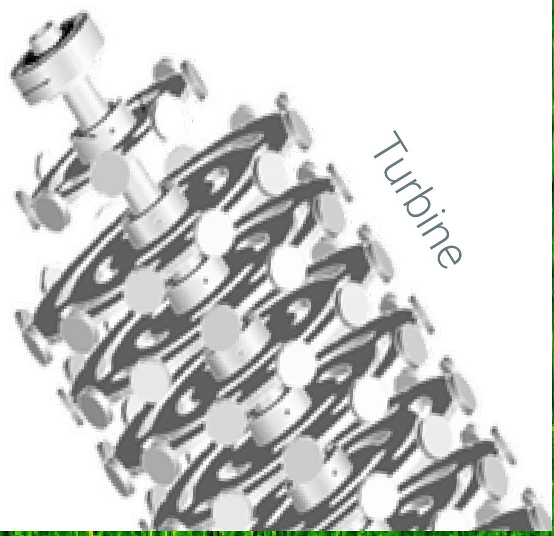
Routine maintenance ensures efficient power generation with no down-time. Upon purchase, a maintenance contract will be catered specific to your organizational needs. For additional information and pricing regarding our maintenance program

Client Support

Our customers seek maximum performance and minimum down- time. Therefore, Noca Clean Energy delivers the necessary support to power our customers forward.

Troubleshooting and Remote Assistance:
Although technical issues are rare, simple technical problems can be fixed by consulting our troubleshooting guide. Alternatively, our trained technicians can provide over the phone service to solve issues that may arise.

Field Support and Training Programs:
In some cases, especially in remote locations, it may be necessary to consult a local technician. We offer an extensive training program and educational seminars to a local team so that they can provide maintenance and repairs on our technologies when needed.



The Digital Magnetic Inducer Generator

Noca Clean Energy partners has developed a technology that will redefine the electrical energy generation sector. The Digital Magnetic Inducer Generator (DMIG) provides access to an inexpensive, continuously available, and non-polluting method for generating electrical energy in a format that is applicable in both small and large-scale, fixed and portable, energy scenarios. The DMIG is currently available in several models with generation capacities starting at 5MW respectively, and is easily customizable to larger scales.

Flexibility and functionality are two key elements of the DMIG technology that make it ideal for many energy generation scenarios. The DMIG can be affixed to existing energy grids as a method to improve energy efficiency in urban areas, or used to develop mini-grids in rural areas that lack access to energy. The DMIG can also function as a standalone energy source for mining companies, medical facilities, research centres, construction firms, as well as other industrial and commercial enterprises operating in remote locations.

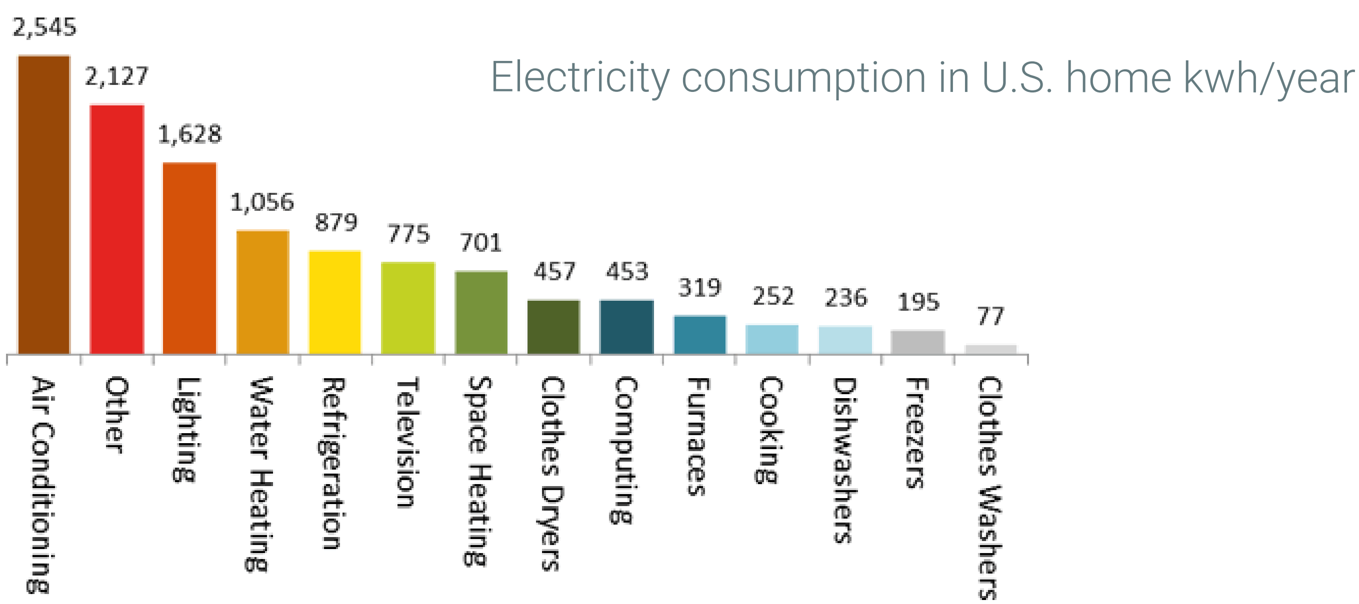
Potential Applications:

Utilities (grid and mini-grid): The DMIG is the ideal technology to affix to existing energy grids as a method to improve energy efficiency, increase energy capacity, and to ensure reliable, clean, and continuous energy in urban areas. The DMIG is also suitable for developing mini-grids in rural areas that lack access to reliable, clean, and efficient energy. Noca Clean Energy is building strategic partnerships with utility providers that are suitable for adopting DMIG units into their energy mix or to have a complete DMIG power plant.

Commercial and Industrial Ventures (off-grid): The DMIG also provides a highly efficient and practical solution as a standalone energy source. Due to the low cost, versatility, and portability of the technology, Noca Clean Energy is targeting mining companies, research centres, medical facilities, construction firms, as well as other commercial and industrial enterprises operating in remote locations as ideal customers.

Power Consumption

In 2014, the average annual electricity consumption for a U.S. residential utility customer was 10,932 kilowatt-hours (kWh), an average of 911 kWh per month. Louisiana had the highest annual consumption at 15,497 kWh per residential customer, and Hawaii had the lowest at 6,077 kWh per residential customer.



Installation

Noca Clean Energy personnel will be present for installation in order to ensure units are properly engaged and generating electricity. Service and maintenance operations will be catered to the specific needs of individual clients and will outlined in a maintenance contract.

Although technical issues are rare, simple technical problems can be fixed by consulting our troubleshooting guide. Alternatively, our trained technicians can provide over the phone service to solve issues that may arise. In some cases, especially in remote locations, it may be necessary to consult a local technician. We offer an extensive training program and educational seminars to a local team so that they can provide maintenance and repairs on DMIG units when needed.

DMIG Housing

All shelters should meet the following specifications and standards:

a. Uniform Building Code
b. BOCA National Building Code
c. Standard Building Code
d. Local Basic Building Codes
e. ANSI-A.58.1
f. UL 752 requirements for low, medium and high power rifle
g. National Electric Code latest addition
h. IEC - Illuminating Engineering Society

Figure 1 (High water level)

In the event that two specifications conflict, the more stringent shall apply.

Concrete Compressive strength shall be 4000 PSI at 28 days. Mix design of 114-118 lb/cu. ft. structural lightweight concrete expanded shale or expanded clay aggregate is preferred. Mix shall be homogenous. Seeding of aggregate for exposed aggregate finish is not allowed. Cement used in concrete shall be standard Portland cement conforming to the requirement of the “Standard Specifications for Portland Cement”, ASTM Designation C150. Concrete aggregates shall conform to one of the following specifications: 1. “Specifications for Concrete Aggregates”, ASTM Designation: C33. 2. “Specifications for Lightweight Aggregates for Structural Concrete”, ASTM Designation C30.

Figure 2

2.0 SPECIFIC CONDITIONS

2.1 The shelter (s) shall be designed to meet the following conditions.

(a) Seismic Zone 4

(b) Ambient temperature of 70o C (158oF) to -55o C (-67o F)

(c) Ambient humidity from (0 - 100) percent

(d) Winds 145 mph (235 Km/Hr) while on specified foundation.

DMIG HOUSING

3.0 SHELTER SPECIFICATIONS

3.1 The manufacturer (Noca Clean Energy) shall provide, outside dimensions , height and over all size to be constructed by the client. A typical Shelter is shown in Figure 2. Figure 1 is recommended for frequently flooded areas.

A program specific drawing will be provided when the order is placed.

3.2 Structural Loading - The shelter shall meet the following loading requirements.

(a) 200 psf floor loading while lifting or on foundation.

(b) 3000 pounds concentrated floor load over 4 square feet area

(c) 90 pounds per square foot roof live loading - 7 day duration

(d) 1000 pounds concentrated roof load over 3 feet square area.

DMIG Advantage

- More cost-effective per kWh than all other (conventional and alternative) sources of energy.
- Scalable according to the requirements of any demand load.
- Versatility, can be used in both indoor and outdoor applications and at high and low temperatures and altitudes.
- Offers unparalleled portability when compared to traditional oil and gas.
- Decentralized, requires no connection to existing infrastructure to operate.
- Emits zero harmful radiation or emissions.
- Low vibration with no noise disturbance
- The Magnetic Transducer Generator requires no fuel and emits no waste energy in the form of heat.

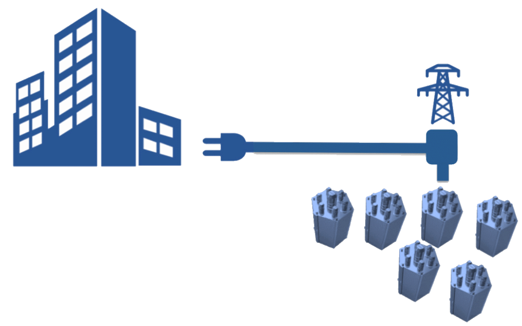
Applications

On Grid: The DMIG is the ideal technology to affix to existing energy grids as a method to improve energy efficiency, increase energy capacity, and to ensure reliable, clean, and continuous energy in urban areas. DMIG units can be connected in series to act as a power plant with a generation capacity of up to 1000MW

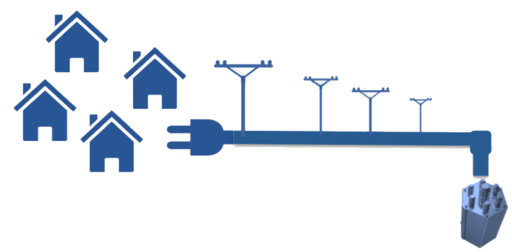
Micro-Grid: The DMIG is also suitable for developing micro-grids or hybrid micro-grids. Noca Clean Energy is building strategic partnerships with utility providers that are suitable for adopting DMIG units into their energy mix

Standalone (off-grid): The DMIG also provides a highly efficient and practical solution as a standalone energy source. Due to the low cost, versatility, and portability of the technology, it is ideal for mining companies, research centres, medical facilities, construction firms, as well as other commercial and industrial enterprises operating in remote locations.

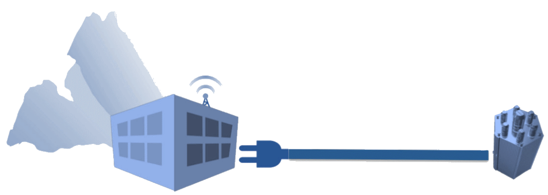
On Grid



Micro-Grid



Standalone (off-grid)



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Technology Review

The DMIG is available in 5 MW and scalable to any capacities (see Figure 1). The DMIG contains a number of rotors; each attached to a central spinning shaft. Each shaft is comprised of a series of discs with magnets attached to the perimeter of each disc.

A small source battery provides the initial voltage that engages the rotors. As the rotors spin, each magnet on the disk passes a series of copper coil assemblies that are fixed at the same rotational height to the interior of the surrounding chassis. Each coil assembly is coupled with an electronic circuit unit that collects all output and directs a portion of the voltage back to the source battery to maintain rotational charge; excess voltage is usable output.

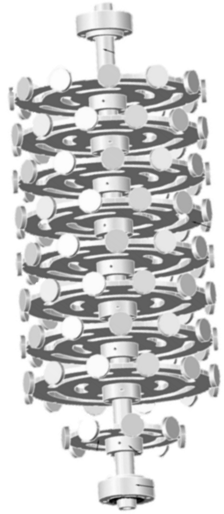

Figure 1

Competitive Advantage

An acceptable method to compare energy generation technologies is to measure their Levelized Cost Of Electricity (LCOE). The LCOE is the average total cost to build and operate a power-generating technology over its lifetime divided by the total power output of the technology over that lifetime. The following graph (Figure 3) shows the LCOE for a number of electricity generation technologies. As the graph illustrates, the LCOE for the DMIG is significantly lower than all other competing forms of electricity generation. There are two key attributes contributing to the low LCOE for the DMIG. First, unlike conventional forms of energy (such as natural gas or diesel), the DMIG does not require any fuel. Second, the Capacity Factor of the DMIG is stable (97% capacity at 100% load), unlike energy sources such as wind or solar where output depends on fluctuating weather conditions. These attributes, together with competitive numbers for capital costs, installation, and maintenance, contribute to the low LCOE of the DMIG.

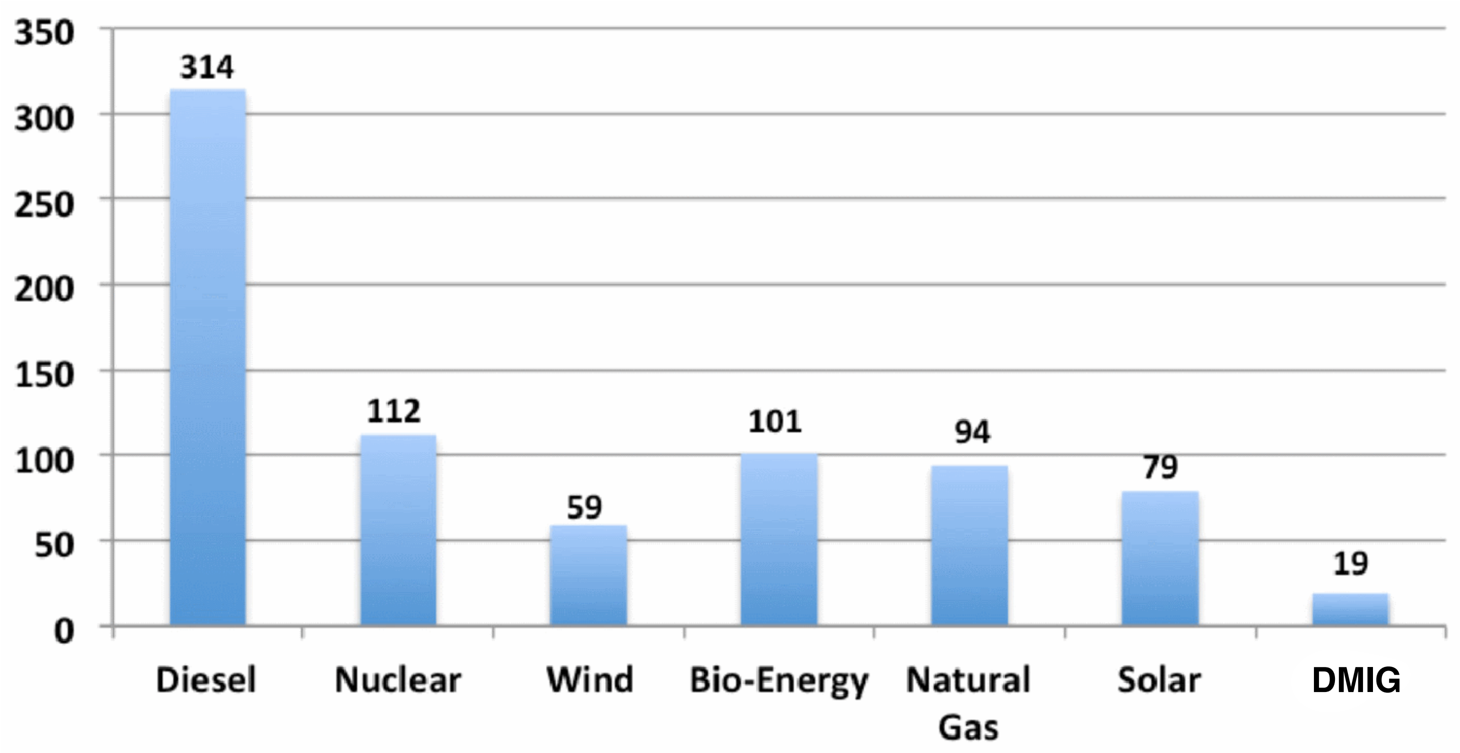

Figure 3: Levelized Cost of Electricity 2014 ($/MWh)

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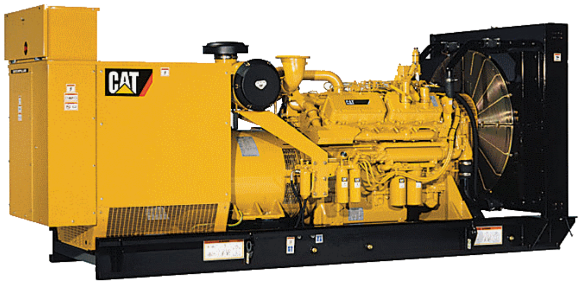
DMIG vs. Diesel: Significant Fuel Cost Savings



Diesel: Generator

	Cost of Diesel Fuel	Fuel Cost Savings Including DMIG Purchasing Cost
Year 1	$1,655,687	- $1,594,313
Year 2	$3,311,373	$61,373
Year 3	$4,967,060	$1,717,060
Year 4	$6,622,747	$3,372,747
Year 5	$8,278,434	$5,028,434
Year 20	$33,113,740	$29,863,740

Figure 4: Fual Cost Savings by Year (CAD)
(Assuming 100% Load)

DMIG vs. Wind Energy

The average American home consumes approximately 900 kWh of electricity per month depending on location. A 1.5MW wind turbine can technically produce enough energy to power at least 300 and require 100 acres to produce 1MW to households in one year. Wind power is intermittent and variable, not to mention very expensive. As a result, industry estimates suggest a 30-40% output while real world experience exhibits output in the 15-30% range*.

A 1.3MW DMIG has the capacity to 19 provide uninterrupted, clean energy 100% of the time. So, how many homes can be powered by a 1.3MW DMIG unit in a rural setting where load demand is significantly less than the average American home.

Wind Turbine

Power Africa

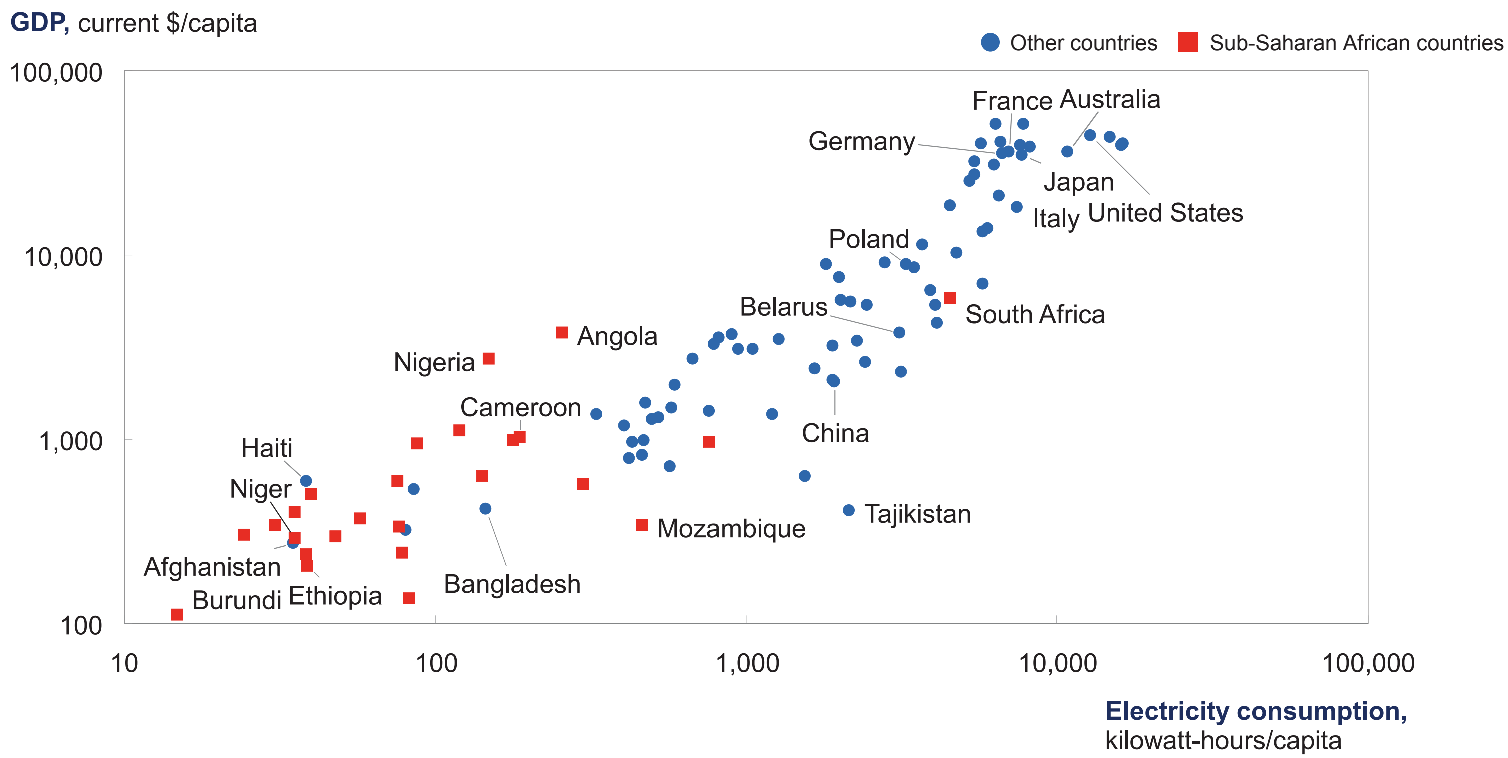
Sub-Saharan Africa is starved for electricity. The region's power sector is significantly underdeveloped, whether we look at energy access, installed capacity, or overall consumption. The fact that sub-Saharan Africa's residential and industrial sectors suffer electricity shortages means that countries struggle to sustain GDP growth.

The stakes are enormous. Indeed, fulfilling the economic and social promise of the region, and Africa in general, depends on the ability of government and investors to develop the continent's huge electricity capacity. Countries with electrification rates of less than 80 percent of the population consistently suffer from reduced GDP per capita (Exhibit 1). The only countries that have electrification rates of less than 80 percent with GDP per capita greater than $3,500 are those with significant wealth in natural resources, such as Angola, Botswana, and Gabon. But even they fall well short of economic prosperity. Whether people can obtain electricity (access), and if so, how much they are able to consume (consumption) are the two most important metrics that can indicate the degree to which the power sector is supporting national development.

Continues

Exhibit 1 Electricity consumption and economic development are closely linked; growth will not happen without a step change in the power sector.

Relationship between electricity consumption and GDP,1 2011



1 Base 10 logarithmic scale.

Source: IHS Economics; International Energy Statistics, US Energy Information Administration, 2013, eia.gov

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From an electricity-access point of view, sub-Saharan Africa's situation is the world's worst. It has 13 percent of the world's population, but 48 percent of the share of the global population without access to electricity. The only other region with a similar imbalance is South Asia, with 23 percent of the world's population and 34 percent of the people without access to electricity. This means that almost 600 million people in sub-Saharan Africa lack access to electricity. Only seven countries—Cameroon, Côte d'Ivoire, Gabon, Ghana, Namibia, Senegal and South Africa—have electricity access rates exceeding 50 percent. The rest of the region has an average grid access rate of just 20 percent. Moreover, even when there is access to electricity, there may not be enough to go around. Regarding consumption, Africa's rates are far below other emerging markets. Average electricity consumption in sub-Saharan Africa, excluding South Africa, is only about 150 kilowatt-hours per capita. This is a fraction of consumption rates in Brazil, India, and South Africa.

Our new report, Brighter Africa: The growth potential of the sub-Saharan electricity sector, explores how power demand will evolve in the region, along with the associated supply requirements; how much it will cost to supply the needed power, plus the options available to manage the expense; and what is required to ensure that the new capacity gets built. In brief, sub-Saharan Africa has an extraordinary opportunity but will have to do a lot of work to take advantage of it.

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Meeting a four-fold increase in demand

We took a demand-driven approach to better understand the likely evolution of the sub-Saharan African power sector and the resulting opportunity for the players who will help propel it. We project that sub-Saharan Africa will consume nearly 1,600 terawatt hours by 2040, four times what was used in 2010. That forecast is based on a number of important factors, including a fivefold increase in GDP, a doubling of population, electricity-access levels reaching more than 70 percent by 2040, and increased urbanization. By 2040, sub-Saharan Africa will consume as much electricity as India and Latin America combined did in 2010 (Exhibit 2).

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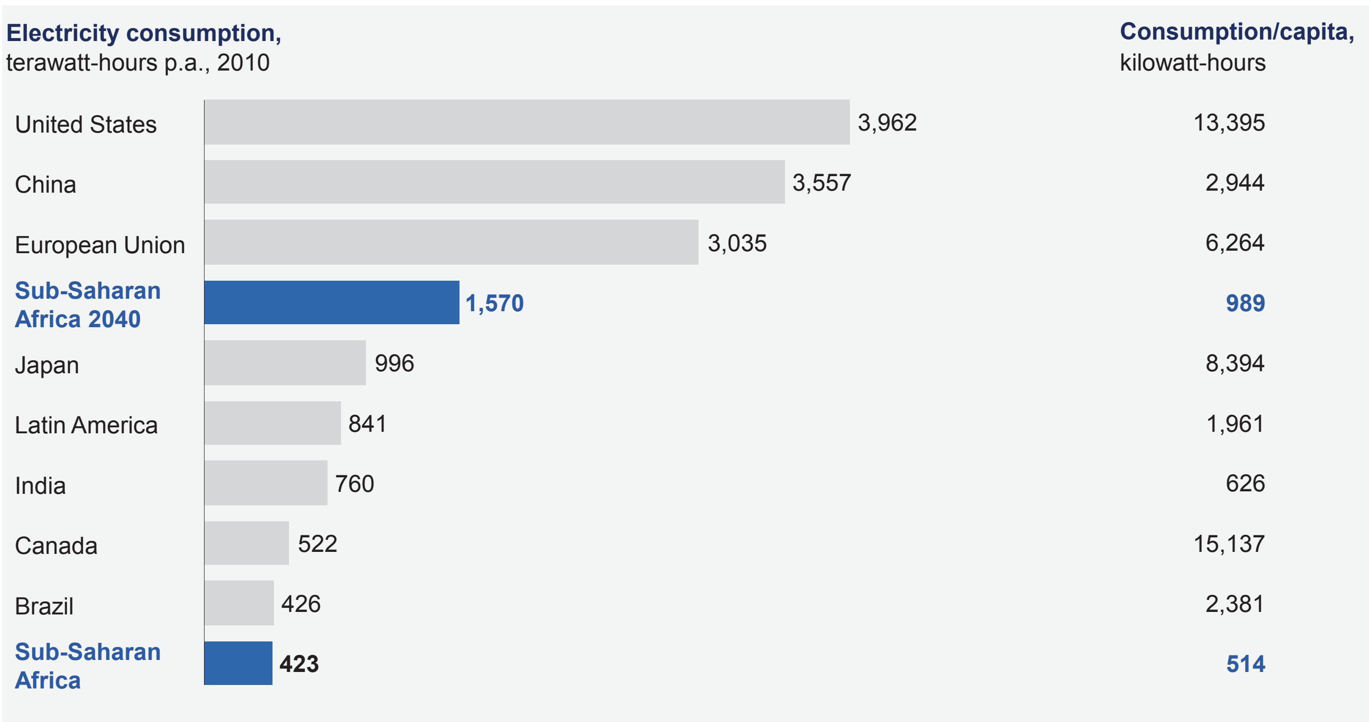
Exhibit 2 Although sub-Saharan Africa consumes less electricity than Brazil, by 2040 its demand will reach a level equal to 2010 consumption in Latin America and India combined.

POWER AFRICA



Source: Key World Energy Statistics, Organisation for Economic Co-operation and Development and the International Energy Agency, 2013, iea.org; World Development Indicators, World Bank Group, worldbank.org

Continues

Nevertheless, we forecast that electrification levels will only reach 70 to 80 percent by 2040 given the challenges associated with getting the power to where it needs to go. It takes on average 25 years to progress from a 20 percent electrification rate to 80 percent electrification rate, our research found.

We know there will be demand. What about supply? Sub-Saharan Africa is incredibly rich in potential power- generation capacity. Excluding solar, we estimate there is 1.2 terawatts of capacity; including solar, there is a staggering 10 terawatts of potential capacity or more. There is potential for about 400 gigawatts of gas-generated power, with Mozambique, Nigeria, and Tanzania alone representing 60 percent of the total capacity; about 350 gigawatts of hydro, with the Democratic Republic of the Congo (DRC) accounting for 50 percent; about 300 gigawatts of coal capacity, with Botswana, Mozambique, and South Africa representing 95 percent of this; and 109 gigawatts of wind capacity, although it is relatively expensive compared with other sources. The proven geothermal resource potential is only 15 gigawatts, but this is an important technology for Ethiopia and Kenya, which hold 80 percent of it.

Continues

Gas would account for more than 40 percent of the electricity generated from 2020 onward, with hydro remaining a very important technology. Solar would take off significantly after 2030, representing 8 percent of the generation mix by 2040 and more than 30 percent of capacity additions between 2030 and 2040. Even in the absence of active incentives, more than 25 percent of total energy in 2040 would come from clean sources—geothermal, hydro, solar, and wind—compared with 21 percent today, almost all of which is from hydroelectric sources. Southern Africa will continue to build coal capacity, but its overall importance in the continent's fuel mix will diminish from 51 to 23 percent. We found that the average levelized cost of energy generated would be about $70 per megawatt-hour with relative emissions of 0.48 tons[1] of CO_2 per megawatt-hour in 2030, dropping to 0.43 tons of CO_2 per megawatt- hour in 2040.
If every country builds what it needs, we estimate that the region would require about $490 billion of capital for new generating capacity, plus another $345 billion for transmission and distribution.

Continues

Also, we studied ways to facilitate the development of the sector and the trade-offs they entail. Regional integration, such as power pools, and promotion of renewable generation are game changers that could shape the energy landscape in sub-Saharan Africa over the next 25 years. We found that significantly increasing regional integration could save more than $40 billion in capital spending, and save the African consumer nearly $10 billion per year by 2040, as the levelized cost of energy falls from $70 per megawatt-hour to $64 per megawatt-hour. Higher levels of integration would result in larger regional gas options being favored over some of the smaller in-country solar and wind additions, leading to an increase in carbon emissions.

If sub-Saharan Africa aggressively promotes renewables, it could obtain a 27 percent reduction in CO2 emissions; this would result in a 35 percent higher installed capacity base and 31 percent higher capital spending (or an additional $153 billion).

To move ahead on development of the sector, national governments should take the initiative in a number of areas. For one, they could focus on ensuring the financial viability

Continues

POWER AFRICA

of the power sector. Four points matter here: electricity tariffs should reflect the true cost of electricity, costs should be transparent, the country should make the most of what it already has in the sector, and officials should pursue least cost options in investments.

A second imperative involves creating an environment that will attract a broad range of funding mechanisms. Private-sector involvement is critical and central to effectively delivering new capacity. To attract the private sector, it is necessary to provide clear, consistent regulations; allocate risks to the parties best suited to carry them; ensure that a credible buyer (off-taker) exists; and seek support from external institutions to guarantee the risks.

Last, it is important for governments to demonstrate political will. To do this, they can prioritize efforts, keep an eye on the long term, and focus on the regulations and capabilities needed for the sector to thrive, not just on the plants and associated infrastructure.

Continues

While the sub-Saharan African power sector faces many challenges, there is real momentum for change. For example, the UN program on Sustainable Energy for All is sparking private-sector activity in many different parts of the value chain. The region has the ability to take development of the sector to the next level. Success will propel economic growth of the continent and greatly enhance the lives of hundreds of millions of people, as well as potentially create a thriving electricity-supply industry and an associated 2.5 million temporary and permanent jobs across the continent.

Physical Specifications

- Maximum Height 91 inches
- Diameter 79 inches Aluminum structure Light grey (NCS 2703-G84Y)

Conformance Regulatory Approvals CUL Listed, FCC Part 15 Class A, ISO 14001, ISO 9001, UL 1778, UL. Continuous Use - CE Approved

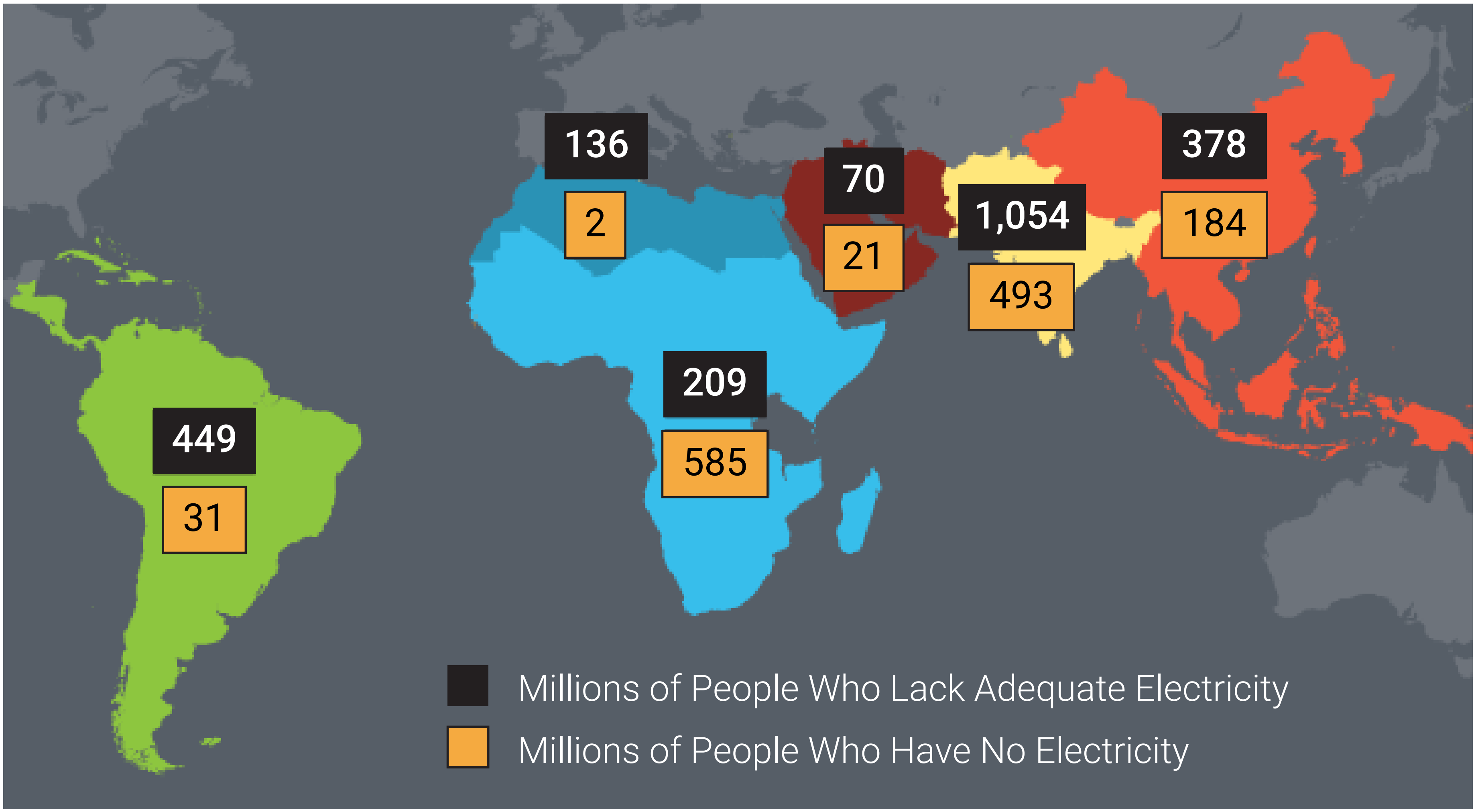
Energy Efficiency

Load	ficiency
o 25%	o 94.1%
o 50%	o 96.3%
o 75%	o 96.9%
o 100%	o 97.0%

Technical Specifications

- Output Power Capacity, 5 MW / 4.9 MVA
- Max Configurable Power, 5 MW / 4.9 MVA
- Nominal Output Voltage, 480V 3PH Output
- Voltage Distortion, Less than 5% at full load
- Output Frequency (sync to mains), 60 Hz - programmable +/- 0.5 / 1 / 2 / 4 / 6 / 8%
- Crest Factor, Unlimited Topology, Delta
- Conversion On-Line Waveform Type, Sine wave Output Connections, (1) Hard Wire 4-wire (3PH + G) Bypass, External Static Bypass Safety

3.6 billion people have no or only partial access to electricity



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