



Table of contents

1. Introduction The global challenge of energy poverty	2
The global challenge of energy poverty	4
International action Maximizing the business contribution	
2. The role of business	6
Delivering universal access to energy Business as a primary solution provider	
3. Scaling up the business contribution	12
Strategic and commercial drivers Barriers and risks Key opportunity areas The importance of collaboration and partnerships	
4. Business model innovation	15
Electricity grid extension Distributed/renewable energy systems Products and appliances	
5. Enabling policy frameworks	23
Incentivizing business investment and private finance flows Benefits of enabling business involvement Framework for action Planning, coordination & prioritization Investment climate	
Policy & regulation to support solution implementation	
6. Financing mechanisms	27
, , ,	27

Notes and references



Key messages

- Addressing the lack of access to clean, reliable and affordable energy services for billions of people is one of the world's most critical development challenges. Lack of access to energy is a major barrier to economic and social progress and must be overcome to achieve the Millennium Development Goals.
- Business has demonstrated it is a primary solution provider for expanding access to energy. The World Business Council for Sustainable Development (WBCSD) Access to Energy Initiative is seeking to maximize the business contribution to achieving universal energy access through focusing on key opportunity areas: business model innovation, enabling policy frameworks, and financing mechanisms.
- Business model innovation shows how companies are expanding energy access by providing more affordable and reliable products and services; overcoming market barriers or failures; and increasing the profitability and scalability of sustainable engagement in low-income energy markets. There is significant scope for these new business models to be scaled and replicated with additional policy and financing support.
- Well-designed and stable policy and regulation are critical for facilitating business participation in the energy sector and the expansion of access to energy.
 Policy-makers need to focus on prioritizing energy access in national development planning, improving the investment climate and implementing enabling measures to promote the primary energy access solutions.



- Meeting universal energy access targets
 will require mobilization of significant
 additional financial resources. Public
 and development finance mechanisms
 should be specifically designed to leverage
 additional private investment. The
 broader financing architecture must give
 appropriate consideration to the quality
 of the regulatory and investment climate,
 which impact risks and returns associated
 with private investment.
- Partnerships and cross-sector approaches are essential to make these opportunity areas successful. Effective public-private partnerships (PPPs) will be particularly important drivers of progress toward universal access to energy. The WBCSD supports the recommendations to strengthen PPPs developed by UN-Energy and the Global Sustainable Electricity Partnership.
- The WBCSD is keen to work with key stakeholders to support effective action to deliver universal access to clean, reliable and affordable energy. The WBCSD Access to Energy Initiative will pursue this engagement through 2012 – the International Year of Sustainable Energy for All – and beyond.

Introduction

The global challenge of energy poverty

Addressing the lack of access to clean, reliable and affordable energy for billions of people is one of the world's most critical development challenges. Lack of access to energy is a major barrier to economic and social progress and must be overcome to achieve the Millennium Development Goals (MDGs)¹.

Worldwide, approximately 2.7 billion people rely on traditional biomass for cooking and heating and about 1.3 billion have no access to electricity² (see Figure 1). Up to a billion more have access only to unreliable electricity networks³. The 'energy-poor' suffer significant economic disadvantages from insufficient power for productive income-generating activities and receive a reduced quality of essential social services as energy is critical for providing effective education and healthcare. Furthermore, the World Health Organization estimates that approximately two million people die prematurely every year as a consequence of indoor air pollution from inefficient biomass combustion⁴, with women and girls disproportionately affected⁵.

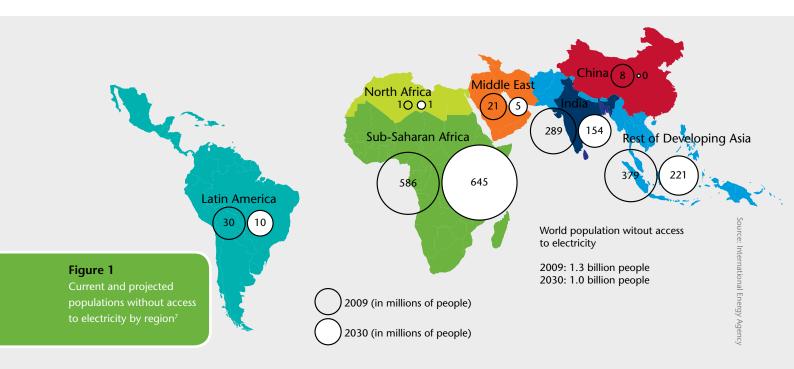
While good progress has been made in some countries and regions, on current projections, there will still be 1 billion

people without access to electricity in 2030 and 2.7 billion people still relying on traditional biomass⁶.

International action

The 2010 Report of the United Nations (UN) Secretary-General's Advisory Group on Energy and Climate Change (AGECC) recommended that the global community adopts a goal of universal access to energy by 20308. This goal has now been included as one of the three objectives of the UN's **Sustainable Energy for All Initiative** and the year 2012 has been declared the International Year of Sustainable Energy for All to bring a greater level of attention to the issue9. The WBCSD strongly supports the adoption of this universal energy access goal.

It is also recognized that the actions and investments to support the transition of developing countries to a low-carbon development path also present a major opportunity to expand access to energy. For many poor people, electricity and cooking fuels from renewable or lower-carbon energy sources will be the best solution to meet their energy needs. This creates possibilities for developing countries to use



climate-investment flows to simultaneously address access to energy and climate change mitigation and adaptation objectives. As a result, energy access is now a more prominent consideration in international climate discussions and in the design of climate-financing mechanisms.

Maximizing the business contribution

Business is a critical actor in addressing global energy challenges. Business is a primary solution provider, bringing to the table innovative products and services, efficient service delivery, essential technologies, management and technical capabilities, and financial resources. WBCSD member companies are some of the leading innovators in the main solution areas for delivering access to energy: electricity grid extension, distributed/renewable energy systems and products and appliances. These actions in partnerships with governments, communities and other stakeholders, are increasing access to energy and improving the lives of hundreds of thousands of people.

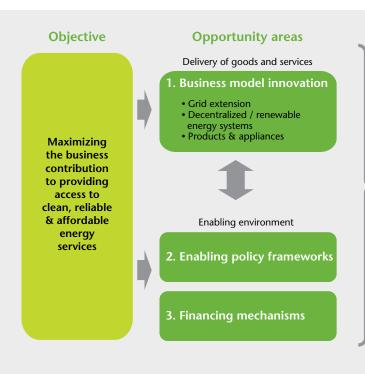
However, given the importance of the business role and the magnitude of the challenge, additional action must be taken to scale up the business contribution. Companies cannot do everything; there are a number of areas where investment and service provision need to come from governments and other stakeholders. Maximizing the opportunity for commercially-viable and sustainable

investments to support energy access will:

- Help mobilize private capital and reduce the financial burden on governments and development assistance;
- Allow energy access objectives to be achieved efficiently and effectively; and
- Catalyze the role of business as a primary solution provider within the energy system.

The WBCSD has launched the Access to Energy Initiative to help business and other key stakeholders understand how to maximize the business contribution to access to energy. This publication is the first output of the WBCSD initiative and presents the following:

- Business role. Demonstrating the critical role that business
 plays in enhancing access to energy and, more broadly, in
 the expansion and transformation of national energy systems
 to deliver clean, reliable and affordable energy for all.
- Opportunities and risks. Highlighting the potential strategic and commercial drivers for the provision of energy services to the poor but also the major barriers and risks that often make it unattractive for business investment and private finance flows.
- Maximizing the business contribution. Describing the key opportunity areas for maximizing the business contribution to access to energy (summarized in Figure 2) and providing recommendations on how to enable these opportunities.



Collaboration and partnerships

(with governments, financing institutions, development agencies, communities, social entrepreneurs, NGOs etc.)

Figure 2 Maximizing the business contribution to access to energy

The role of business

Delivering universal access to energy

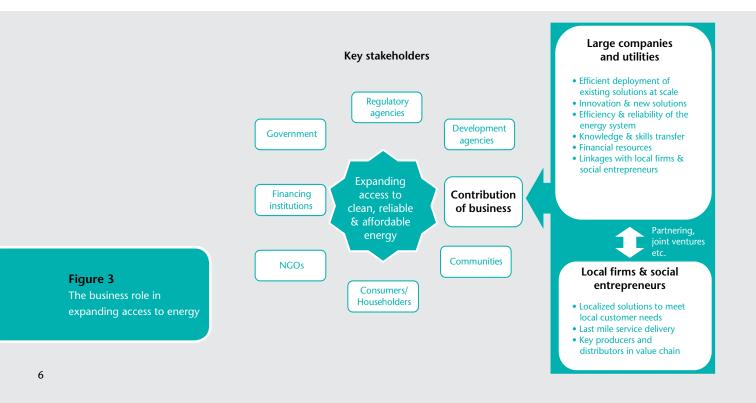
Meeting the challenges of providing universal energy access while also reducing carbon intensity will require a major expansion and transformation of the energy system of most developing countries¹⁰.

It will also require the involvement of many stakeholders including: governments, regulatory agencies, business, development agencies, financial institutions, NGOs and community organizations, and the customers themselves. Companies of different sizes and areas of expertise should play an important role in this transformation to deliver clean, reliable and affordable energy services to all (see Figure 3).

Business as a primary solution provider

Business is a **primary solution provider**, bringing to the table innovative products and services, efficient service delivery, essential technologies, management and technical capabilities, and financial resources. This role includes not just extending the reach of energy services, but also supporting the *quality and reliability* of the services that are delivered, which significantly increases the benefits that energy access has for low-income consumers and producers.

Business can also support governments in developing effective policies for the energy sector by bringing insights and knowledge that are essential for effective policy making. The specific nature of the business contribution will vary depending on the country and context. Table 1 provides a general overview of how companies can contribute to expanding access to energy, supported by case studies from WBCSD members.



GDF SUEZ (LYDEC)

Access to electricity in Greater Casablanca

In 1997, LYDEC, a subsidiary of GDF SUEZ, took charge of the management contract for the provision of electricity, water and sanitation services for the Greater Casablanca region in Morocco. Key challenges faced in delivering this contract included a lack of access to services in urban shantytown areas of Casablanca and illegal electricity connections, which posed serious safety risks and affected the quality of electricity for customers. Working with the local authorities, LYDEC decided that addressing these challenges would be an important initial priority.

In just five years, the LYDEC electrification program was able to provide safe electricity to 30,000 poor households covering 75% of the city's poor neighborhoods. The key innovations and success drivers of the program include:

- A partnership between LYDEC, the Delegating and Greater Casablanca Authorities and the National Initiative of Human Development launched by His Majesty King Mohammed VI, who made the eradication of shantytowns and social exclusion a national priority.
- A community connection model, where LYDEC supplies electricity to one community representative who then sells this electricity to twenty households in the block, reducing the capital and operational costs of providing services.

Customer contributions to support

- years to improve affordability. Reduction of capital costs through the use of trained local electrical contractors and adaptation of equipment standards.
 - A partnership model for project design and implementation to ensure buy-in of local communities, and ongoing dialogue between partners on performance, decisions and accomplishments.

Eni

Providing access to electricity and reducing gas flaring in the Republic of the Congo

Eni is a leading global energy company with operations in 79 countries and activities in oil and gas production, refining and marketing, electricity generation and sale, petrochemicals, oilfield services construction and engineering.

In Africa, Eni has a flaring down strategic plan that seeks to address the dual challenge of fighting energy poverty while tackling climate change. In three years, Eni has reduced flaring by over 30% (compared to 2007), and is investing in new energy infrastructure to bring this figure up to 80% by 2014. When fully implemented, the program will recover around 5 billion cubic meters of gas per year. Where the associated gas is used to supply the local market and produce electricity, the population gains access to a continuous supply of reliable and safe energy. This, in turn, acts as a catalyst for social and economic development.

Eni has been active in hydrocarbon exploration and production in the Republic of the Congo since 1968. In 2007, Eni signed an agreement with the government to develop two electricity power stations and eliminate gas flaring by 2012. The agreement envisages the construction in Djeno of the new Centrale Electrique du Congo power station (300 MW, planned for a future output of 450 MW) and the revamping of the existing 50MW Centrale Electrique de Djeno power station. The agreement also includes the exploitation of gas from the M'Boundi oilfield, which is collected and transported through a 55 km pipeline to Djeno. The two new power stations will now provide 60% of the country's installed capacity and expand access to electricity for approximately 700,000 people. Average per capita electricity consumption in the area serviced by Eni's investment rose to 350 KWh in 2009 and 462 KWh in 2010, compared with the national average of just 137 KWh per year.



Case 3

Eskom

Electrifying South Africa

Eskom, the national electricity utility of South Africa, has helped to electrify 4 million homes since the start of a national electrification program in the 1990s. From 1994 to 2011, the number of South African households with electricity has increased from 36% to 83%. Eskom now has set the ambitious target of achieving universal electrification in South Africa by 2020.

A key feature of Eskom's electrification activities has been innovative program management and technological developments that have served to increase the efficiency, effectiveness and cost performance of the program. These have included: optimization of planning and supply chain management, development of appropriate design specifications for rural electrification, modular component design, and technological innovations such as single phase lines and pre-payment metering. As a direct result of these measures, Eskom was able to electrify 1.5 million homes over five years while halving the average cost per connection.



Contribution areas

WBCSD company case study examples

(see accompanying cases for more detailed information)

1. Efficient deployment of existing solutions at scale

Efficient and effective deployment of proven energy access solutions (e.g. grid extension programs) is a key business capability. Leveraging this capability further will not only accelerate the rate at which access to energy is provided to millions of un-served customers, but can also reduce the cost to governments and consumers through capturing economies of scale.

- Eskom's electrification program connected 1.5 million households in a 5-year period while reducing per unit connection costs by 50%.
- GDF SUEZ expanded electricity and other basic services to 30,000 informal households in Casablanca in Morocco while also reducing connection costs.
- Eni has invested in new power generation capacity and improved transmission and distribution infrastructure for the Republic of the Congo, providing access to electricity for 700,000 people.
- Chevron has invested in the development of Indonesia's geothermal resources, which has substantially increased the supply of clean reliable electricity available through the national grid.

2. Innovation and new solutions

Business plays a key role in the research, development and deployment of new technological and commercial solutions to energy challenges. This includes specific programs focusing on developing and tailoring products and services for low-income markets, or more broadly the development of new technologies that have applicability for energy access challenges.

- Through a comprehensive process of technology development and user testing, the Bosch and Siemens Home Appliances Group (BSH) has developed the Protos, an affordable stove that runs on clean burning plant oil and is now in commercial production in Indonesia.
- Novozymes is a partner of the CleanStar Mozambique venture, which has developed an integrated model for supplying clean-burning ethanol fuel for cooking in urban areas, while supporting reforestation and small farmer livelihoods in rural areas.
- The ABB Access to Electricity Program has delivered significant and measurable developmental benefits to partner communities in Tanzania and India and has demonstrated a successful public-private partnership model for expanding distributed energy solutions for rural communities.
- Schneider Electric has launched In-Diya, a highly energy-efficient LED-based lighting system, to provide lighting to people living with no or unreliable electricity in India and other countries.
- The Energy Access Partnership, which is supported by Eskom, Vattenfall and the WBCSD, is working to develop effective business models to support rural electrification in Africa
- In rural Kenya, the OSRAM (Siemens) solar-powered Energy Hubs supply charging services for high quality battery-based lighting systems, which are rented to provide both reliability and affordability.

3. Efficiency and reliability of the energy system

Business provides products and services that support the improved efficiency and reliability of the energy system. These improvements are critical for enhancing the affordability of energy as well as the quality and reliability of the services delivered to poor consumers.

- Alstom assisted Eskom in upgrading the Arnot power plant to improve efficiency and increase plant life, providing a cost-effective solution for expanding power availability for South Africa.
- Eni is working with the Government of the Republic of the Congo to upgrade transmission and distribution infrastructure and to enhance the Network Code regulations governing the system's efficient expansion.

4. Knowledge and skills transfer

The lack of local capacity and skills is a major barrier to expanding energy access. Business supports the development of capacity through: engagement and support to governments, locally-based research and development (R&D), supplier development programs, workforce training activities, etc.

- Alstom is training 800 South Africans as technicians, engineers and managers to overcome critical skills shortages in the energy sector.
- In India, Schneider Electric and Alstom have established local R&D centers to address local energy challenges linked to lighting and hydropower respectively.
- Through the BipBop program, Schneider Electric is providing training focused on longterm employment in the electrical trades for 10,000 young people.

Contribution areas

WBCSD company case study examples

(see accompanying cases for more detailed information)

5. Financial resources

Business can bring its own financial resources and/ or deploy its expertise to package projects that are 'bankable' and attract investment from other sources. Furthermore, a number of companies have developed innovative investment funds to provide capital and expertise to local entrepreneurs and small- and medium-sized enterprises (SMEs).

- Chevron and Eni have developed large scale clean electricity generation projects and have secured carbon finance under the Clean Development Mechanism (see Table 3).
- Examples of companies with financing funds include GDF SUEZ's Rassembleurs d'Energies, Schneider Electric's Energy Access Fund and ERM's Low Carbon Enterprise Fund.

6. Linkages with local firms and social entrepreneurs

Large companies frequently build linkages with local firms and social entrepreneurs as suppliers, contractors and/or distributors. These linkages enhance the ability of larger companies to source inputs and to reach customers, while benefiting these local firms through capacity development. Mutually-beneficial linkages with local financial institutions, NGOs and community groups can also be important components of many business models.

- In developing the distribution network for the Protos stove, BSH ensures they have strong relationships with local partners to ensure they provide both training on the use of the stove and reliable access to customer service.
- The funding mechanisms of Schneider Electric, GDF SUEZ and ERM also provide technical and managerial support to assist the capacity development of local entrepreneurs and SMEs.

Eni

Partnerships to support access to electricity in the Republic of Congo

In the Republic of Congo, Eni signed a collaboration agreement with the Société Nationale Energétique, the Congolese Ministry of Energy and Enel, a private Italian company to modernize key elements of the country's electricity transmission and distribution infrastructure. The construction of medium-voltage stations will ensure electricity can be supplied to both the main Congolese cities and numerous smaller towns.

Because local workforce capacity building is critical for supporting the success of access to energy initiatives, Enipower is offering technicians and engineers from the Congolese national power company the opportunity to work in Italy for two years to acquire skills to manage projects independently. Enipower is also advising the Congolese Government on enhancing the Network Code, which are the technical regulations governing the country's electricity infrastructure.

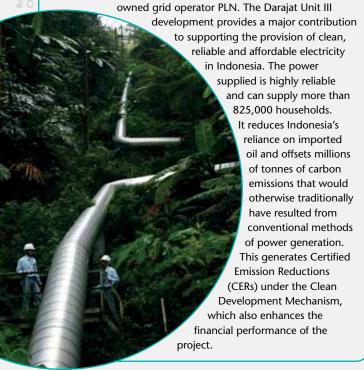


Chevron

Generating clean, reliable and affordable electricity in Indonesia from geothermal energy

Chevron is one of the world's leading integrated energy companies, with subsidiaries that conduct business worldwide. The company is the world leader in geothermal energy production used for electricity and has developed 25% of the world's capacity in this area. Chevron has been investing in Indonesia's geothermal sector since the 1980s.

In partnership with the state oil company Pertamina, the company commissioned the Darajat Unit III geothermal power station in 2007. Darajat Unit III generates over 110MW of electricity sold under a power purchase agreement to the state-



Alstom

Energy efficiency to supply increasing demand in South Africa

In 2006, Alstom undertook the upgrade of the six units of Eskom's Arnot Power Station, while at the same time improving efficiency and extending the plant's lifetime. The project included retrofitting turbines and boilers to increase capacity from 350 MWe to 400 MWe per unit.

The Arnot project, the first project in South Africa to result in a capacity increase through retrofit, is a good example of how a technology developer, Alstom, is working with a plant owner, Eskom, to optimize an existing plant and exploit its potential for enhanced performance. This project was a cost-effective solution to bring more electricity to the grid quickly, supporting both economic growth and energy access.



Case 7

Alstom

Supporting local skills and technology development

In South Africa, the skills shortage in the electricity sector can raise the costs and slow the rate of project delivery and the expansion of energy access. In 2007, Alstom established a Project Execution Centre in Johannesburg to coordinate activity across major projects in the country, as well as to manage relationships with customers and develop the local supply chain. This has also provided a platform for investment in human and material resources, with support for training, education and the development of local industrial capacity. By 2015, Alstom will have trained over 800 South Africans as technicians, engineers and managers in a range of disciplines including manufacturing, project management, sourcing, quality assurance, sales, engineering, construction and contracts. These long-term investments directly support economic growth while also enhancing the company's supply chain, enabling projects to be delivered more quickly, safely and efficiently.

In South Asia, hydropower will be a key energy source for delivering clean, reliable and affordable energy solutions. However, in much of the region, the high silt content of hydro resources requires the adaptation and upgrading of turbines to withstand high levels of abrasion. In November 2008, Alstom inaugurated the Global Technology Center at its existing Vadodara hydro manufacturing site in Gujarat, India. The Vadodara site employs around 800 people in a range of technical and managerial roles and focuses on the particular technical needs of this market. The Vadodara facility includes: a manufacturing facility, a specialist workshop providing a range of services, and a technical laboratory to carry out diagnostics and develop innovative integrated products and technologies. In particular, the Vadodara laboratory has developed a scale-model test unit to enable research into abrasion effects on turbine blades in hydropower facilities.

For universal access to be achieved efficiently and effectively, larger companies will need to provide essential functions as utilities, power producers, technology providers, project developers and investors. However, individual entrepreneurs, small and medium sized enterprises (SMEs) and social businesses also play a critical role in meeting the energy needs of poor consumers. Some of the key energy access success stories have come from these types of firms – notable examples include Selco and Husk Power in India, and Grameen Shakti in Bangladesh. These firms have pioneered some of the business model innovations presented in Section 4, often in response to circumstances where official models of energy supply were unable to meet the needs of poor consumers.

The experience of WBCSD members indicates that comprehensive business solutions to energy access challenges will in many instances require partnerships and linkages between large companies and smaller locally-based enterprises and/or social businesses. Table 2 presents a summary of the complementary relationship between large companies and local enterprises. These relationships can be formalized through subcontracting, joint ventures, franchising models, partnership agreements, etc.

Table 2 Complementary	relationship between large companies and local enterprises	
	Management and technical expertise	
What large companies bring	Broad distribution networks	
	• Financing	
	• Economies of scale	
	Capability to scale models proven at the local level	
	Skills and capacity development	
What local enterprises bring	Management and technical expertise	
	• In-depth knowledge of local needs and spending patterns to tailor energy solutions	
	Local distribution networks and 'last mile' market access	
	Reduced transaction costs	
	Enhanced local economic and social development benefits	
	Local community engagement, dialogue and buy-in	

Scaling up the business contribution

Strategic and commercial drivers

Responding to the challenge of access to energy is emerging as a strategic and commercial driver for many companies seeking to build or expand businesses in emerging economies and/or low-income countries. The specific business case will depend on the company's products and services and the context, but could include the following elements:

- Markets for provision of goods and services to consumers.
 The aggregate size of the market for supplying energy services to the four billion people at the 'base of the pyramid' (BoP)¹¹ is significant and was recently estimated at more than USD 500 billion per year¹².
- Infrastructure and management services. Expanding
 access to energy will also require substantial investments
 in new infrastructure, equipment and supporting
 management services. The International Energy Agency
 (IEA) recently estimated that the investment requirements
 to achieve universal household access by 2030 are
 approximately USD 1 trillion¹³.
- Competitive advantage for utility companies. Proven capabilities in expanding access to energy may be a source of competitive differentiation for companies bidding for concessions or management contracts.
- Markets for distributed low-carbon technologies. Access to energy for many people will require the wide-scale deployment of distributed low-carbon technologies. As resources flow to support access to energy objectives, this will become an important market for these technologies. This market may also provide an ideal environment for developing and deploying new low-cost energy technologies as there are often no incumbent technologies or service providers to compete against. These technologies may have applications in other markets, opening the possibility for 'reverse' innovation.

Companies are engaging in expanding access to energy using a range of models as:

- Direct providers of goods, services and infrastructure;
- Investors or partners with local firms or other stakeholders; and/or
- Social investors and/or through implementation of corporate social responsibility (CSR) programs.

There are also possibilities for hybrid approaches, which combine elements of core business involvement integrated with CSR investments and activities. The actual strategy or approach chosen will depend on a combination of internal (e.g. organizational goals, capabilities, experience in developing markets) and external (e.g. policy guidelines, regulatory structure, access to finance) factors.

Barriers and risks

Despite the potential opportunities and size of the market, involvement in expanding access to energy for the poor is often highly challenging or commercially unattractive for business. Key barriers include:

- Poor regulatory and investment climate in many countries. In many countries where energy poverty is most acute, the nature of the regulatory and investment climate discourages business from investing, particularly in larger-scale infrastructure and capital equipment. This can be exacerbated by a lack of political will for reform and insufficient public investment in the energy system, especially the elements that support expansion of services to poor communities.
- Fragmented and immature markets and lack of information. The markets for the direct provision of energy goods and services are often fragmented and immature, with few intermediaries to describe the market, aggregate

demand, and provide finance or technical assistance. These problems are compounded by a general lack of information for planning purposes regarding location/distribution of customers, electricity load profiles, etc.

- Existing infrastructure. Existing infrastructure both energy infrastructure such as electricity transmission and distribution systems and supporting infrastructure like roads and telecommunications – is often of poor quality or non-existent, adding significantly to the costs and difficulties of expanding access.
- Lack of knowledge and capacity. There are often significant gaps in local knowledge and capacity throughout the value chain including lack of consumer awareness, technical skills and capabilities of the local workforce.
- Dispersed rural populations. The challenges of energy poverty are most severe in rural areas where many of the issues listed above are particularly problematic.
 The expansion of infrastructure services to dispersed rural communities will seldom be financially attractive, necessitating some level of public investment or subsidy.
- Solutions vary with the local context. There are also difficulties in scaling up solutions because energy requirements and appropriate solutions can vary with geography, culture, season and whether the customers are rural or urban.

Key opportunity areas

Given the importance of the business role and the magnitude of the energy access challenge, it is clear that additional action must be taken to expand the business contribution. Business certainly cannot do everything; there are a number of areas where investment and service provision need to be done by governments and other stakeholders. However, maximizing the opportunity for commercially-viable and sustainable investments to support energy access will:

- Help mobilize private capital and reduce the financial burden on governments and development assistance;
- Allow energy access objectives to be achieved efficiently and effectively; and
- Catalyze the role of business as the primary solution provider within the energy system.

The WBCSD Access to Energy Initiative has identified three key opportunity areas that are critical for maximizing the potential for commercially-viable and sustainable action by business to expand access to energy (see Figure 2). Business model innovation, a core capability of business, can overcome a number of the barriers and challenges to providing affordable energy services to poor consumers profitably and at scale. However in many countries where energy access is a major challenge, the establishment of enabling policy frameworks and financing mechanisms will be essential for promoting additional business investment and participation. These three opportunity areas are described in more detail in the remainder of this publication.



Box 1

The importance of collaboration and partnerships

It is critical to highlight that the opportunity areas require coordination, collaboration and in many instances partnerships between stakeholders (see Figure 3). Collaborative arrangements and partnerships play a crucial role in enabling the business contribution through reducing costs and risks, improving access to knowledge and resources, and allowing companies to contribute through their core competencies. All the WBCSD member company case studies featured in this document involve partnerships of some form.

Specific areas where partnerships are crucial include:

- Public-private partnerships (PPPs). Effective PPPs will be particularly important drivers of progress toward universal access to energy. They leverage the efficiency, delivery capacity and resources of the private sector to support government objectives in expanding access and delivering clean, reliable and affordable energy services. PPPs are a well-established and proven model in many parts of the world for financing and delivering infrastructure services. The WBCSD supports the recommendations to strengthen PPPs developed by UN-Energy and the Global Sustainable Electricity Partnership¹⁴.
- Effective business models. The vast majority of business model innovations for energy access rely on a range of collaborations and partnerships to develop, produce, distribute and maintain products and services. Many of these involve local SMEs, social entrepreneurs and non-traditional commercial partners such as NGOs and community groups.
- Financing. Well-structured partnerships for financing access projects (whether through PPPs or other models) can significantly improve the attractiveness for business participation by reducing the risk profile and financing costs.
- Coalitions for advocacy and action. A number of major multi-stakeholder partnerships, such as the Energy For All Partnership (see Box 1) and the Global Alliance for Clean Cookstoves (see Box 2), provide platforms for facilitating business involvement and action with other key stakeholders.

Energy for All Partnership

Launched in June 2009 at the Asia Clean Energy Forum by the Asian Development Bank, the Energy for All Partnership is a regional response to the challenge of expanding access to energy in the Asia-Pacific region. The Partnership provides a platform for cooperation, knowledge and technical exchange, innovation, and project development, bringing together key stakeholders from business, financial institutions, governments, and non-government organizations.

The Partnership is focused on action, with a goal to provide access to clean and modern energy to 100 million people in the Asia-Pacific region by 2015 through:

- promoting exchange of knowledge, ideas, and information;
- demonstrating and mainstreaming appropriate financing mechanisms;
- replicating and scaling up proven approaches; and
- building partnerships to develop, finance and implement access to energy projects.

The WBCSD is a member of the Steering Committee of the Energy For All Partnership.

For more information, see: www.energyforall.info

Box 2

Global Alliance for Clean Cookstoves

The Global Alliance for Clean Cookstoves is a new public-private partnership to save lives, improve livelihoods, empower women, and combat climate change by creating a thriving global market for clean and efficient household cooking solutions. The Alliance's 100 by '20 goal calls for 100 million homes to adopt clean and efficient stoves and fuels by 2020. The Alliance is working with public, private, and non-profit partners to help overcome the market barriers that currently impede the production, deployment, and use of clean cookstoves in the developing world.

WBCSD member companies Shell and BSH Group (Siemens) are members of the Alliance, as is Novozymes' CleanStar Mozambique venture (see Case Study 16). The WBCSD is an official Alliance Champion.

For more information, see: http://cleancookstoves.org

Business model innovation

Business model innovation – encapsulating technology, product and service innovation – and subsequent replication can overcome many barriers and challenges to providing energy services to poor consumers profitably and at scale.

In simple terms, a business model is how a company creates, delivers and captures value¹⁵. It is an integrated concept which includes the product or service offered to customers, the technology deployed, the distribution channels used to engage with customers and the cost structure and revenue model. The innovation process of designing and implementing successful business models (i.e. models that achieve sustainable returns through delivering desirable products and services for customers) is a fundamental component of business strategy.

In the last decade, the possibility of adapting business models that can enable the poor to participate in economic activity has been identified as a major opportunity for business to address poverty. These 'base of the pyramid' or inclusive business models¹⁶ are improving the lives of millions of poor producers and consumers in a range of sectors. In the energy domain, business model innovation and replication is expanding access to clean, reliable and affordable energy through:

- Developing and bringing to market more affordable and reliable products and services;
- Overcoming or circumventing many of the market barriers or failures described in Section 3; and/or
- Increasing the profitability and scalability of servicing poor customers lacking access to energy.

This is a major area of action and progress by a range of actors including business, social entrepreneurs, development organizations and NGOs. Member companies of the WBCSD are among the leading large-company innovators in this space.

The following sections examine in more detail business model innovations for three main types of energy access solution: electricity grid extension, distributed/renewable energy systems, and products and appliances. The sections present the challenges associated with these solution types and how innovation can overcome these challenges. The purpose of the analysis is to highlight best practice, but also to note

the limitations, signaling where action from other stakeholders – most notably governments – is required to support further business action. The analysis draws on the experiences of WBCSD member companies and a growing body of knowledge of the characteristics of successful business models targeted at expanding access to energy (see Box 3).

It is important to note that expanding access to energy is not primarily about finding new technologies. The technologies, solutions and equipment that can deliver clean, reliable and affordable energy even in the most demanding geographies are available and proven. The main innovation challenge is to build the supporting commercial models and broader enabling environment that can encourage the deployment of these solutions.

Box 3

Access to energy: business model analysis

- Access to energy for the Base of the Pyramid (2009)¹⁷. A
 joint project of Ashoka and Hystra with the support of GDF
 SUEZ, Schneider Electric and Total.
- 2. Solar lighting for the Base of the Pyramid Overview of an Emerging Market (2010)¹⁸. A market analysis prepared by Dalberg Global Development Advisors for the Lighting Africa Initiative, a joint initiative of the International Finance Corporation and the World Bank.
- 3. Business models for energy access (2010)¹⁹. A report prepared by the ETC Foundation for the Enabling Access to Sustainable Energy (EASE) Network.
- 4. Energize the BoP Energy business model generator for low-income markets (2011)²⁰. A practitioners' guide prepared by Endeva with the support of the German Federal Ministry for Economic Cooperation and Development, GIZ and E.ON.
- Business models for scaling up energy access (2011)²¹.
 A publication prepared by the International Finance Corporation.

BCSD Argentina

Energy access innovation in Argentina

Member companies of BCSD Argentina have been actively working to develop business solutions to energy access challenges in Argentina.

EDENOR, which distributes and markets energy to 2.5 million customers in Northern Buenos Aires, has developed measures to assist low-income families in maintaining access to electricity and to reduce illegal connections. The company has transitioned many customers to pre-paid meters, providing them with more direct control over their electricity use and avoiding payment difficulties associated with standard 60-day billing. The company has complemented these measures with a household energy efficiency program aimed at helping customers reduce their consumption. The overall impact of these measures has produced average cost savings of 37% for customers without affecting quality of service.

Gas Natural Fenosa has developed an inclusive business model to support extension of the natural gas network in low-income neighborhoods on the periphery of Buenos Aires. The model involves working with a respected local foundation to mobilize the local community to establish a community trust, which provides a collective guarantee to pay for the extension of services as well as supporting the network extension. The model also helps individuals obtain access to microcredit to help them pay for their individual connection costs. The program supported extension of service to 11,000 people in its first five years. It resulted in significant reductions in household energy expenditure (from 13.8% to 3% of income) which demonstrates the benefits for households and provides the additional revenue to support their investment in a network connection. The connection to the network also increases the value of customers' housing.

Energy Access Partnership

Developing new models for energy service provision in rural Africa

Jointly with Eskom, Vattenfall and others, the WBCSD is a founding member of the Energy Access Partnership (EAP), a not-for-profit company to accelerate energy access in rural Africa, based in Johannesburg. The company aims to act as a broker between private sector utilities, governments, international finance institutions and local end-user communities to identify and develop sustainable and scalable models for energy service provision.

The EAP concept involves the development of locally-based and operated distribution models (e.g. cooperatives, associations, municipalities, private concessions) for servicing remote communities, utilizing renewable resources wherever possible.

Investments in generation are preferably to be private or in a public-private partnership (reducing the need for public funding



combination with end-users paying the full cost of operation and maintenance of electricity provided, and with a strong focus on productive uses of electricity consumption to assist economic development.

The EAP partnership is nearing the completion of its first major pilot project in Lesotho with two main pillars: grid extension of up to 1,500 units (some 8,000-10,000 people) in the rural Mphaki area combined with the installation of up to 350 solar home systems for remote households. A local distribution company (The Mphaki Electricity Distribution Association) will operate and maintain the distribution infrastructure and the solar home systems to provide electricity services to its members on a cost-recovery basis. This pilot has already generated useful lessons regarding the provision of rural energy services including:

- It is highly challenging to attract private funding for investments in rural transmission and distribution networks.
 For the Lesotho pilot, the funding for the infrastructure was provided through a soft loan from the African Development Bank (which took significant effort to mobilize).
- The establishment of a new locally-based distribution company requires a large quantity of technical assistance and training.

As a new operational concept, it also required significant awareness-raising within the national electricity sector establishment. This particularly related to the implementation of a model based on commercial supply of energy to members of the association rather than blanket electrification without cost recovery.

Electricity grid extension

For locations close to existing grids that can deliver extra supplies reliably, extending this grid is almost always the best option for expanding access to electricity²².

However, there are a number of major challenges associated with extending electricity grids to poor consumers, particularly the affordability of connection charges and the ability and willingness of customers to pay²³. This situation is often further exacerbated by difficulties of connecting households with no property rights and addressing the difficult issue of managing existing illegal connections. There are now a number of key innovations to overcome these barriers (see Figure 4) which have been developed by a number of leading utilities around the world. These include²⁴:

- Reducing connection costs through technical innovations and optimization of planning and program implementation.
- Allowing customers to pay back connections in installments.
- Employing pre-pay technology to reduce losses and increase customer payment convenience.
- Supporting customers to improve their efficiency of energy usage.
- Using community connection models and community associations to leverage the power of organized residents.
- Building complementary businesses (e.g. sale of appliances)
 based on payment history to increase total revenue.

These innovations are evident in the national electrification program undertaken by Eskom in South Africa (Case Study 3), LYDEC's slum electrification program in Morocco (Case Study 1) and the energy access programs of EDENOR and Gas Natural Fenosa in Argentina (Case Study 8). The Gas Natural Fenosa example also shows how these innovations can be applied to natural gas networks as well.

These innovations are particularly relevant to informal urban settlements and peri-urban areas. Currently one in three people live in developing world cities, with approximately one billion people living in slums. The global slum population is expected to grow further in the coming decades, necessitating that urban grid extension innovations will be an important component of the solution set for achieving universal access by 2030.

There are limitations with these models, particularly for servicing the poorest of the poor and/or extending connections to rural areas. In rural areas, the higher capital costs of providing connections and additional grid infrastructure cannot be realistically covered by customer revenues alone, so it is difficult to mobilize private investment (see Case Study 9). This requires consideration of public investments, well-designed subsidies to support connections (discussed further in Section 5) and/or distributed solutions.

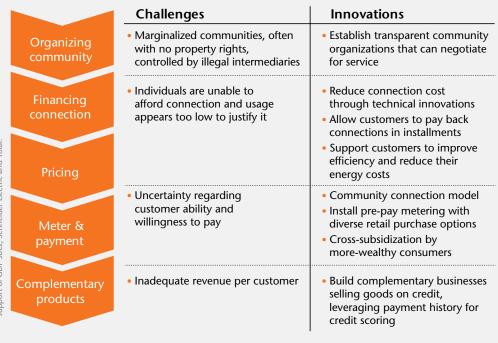


Figure 4 Innovations for extension of electricity grid to poor consumers

Distributed/renewable energy systems

Given the high costs of extending centralized energy systems to many rural communities, distributed energy systems are often a more appropriate and cost-effective strategy for providing access to energy. 85% of those without energy access are located in rural areas and the IEA estimates that 70% of rural populations without access will require distributed solutions to receive electricity²⁵.

These systems can provide both electricity through 'minigrids' and/or fuel for cooking. They have additional benefits in terms of costs and reduced need for imports (for renewables-based systems), the possibility of rapid deployment, the opportunity for local employment and income generation, and are not dependent on installation of additional centralized generation capacity – a significant challenge for many low-income countries²⁶. As these systems are often based on low-carbon energy, they can support climate change mitigation objectives. Mini-grid electricity networks can also be designed to be connected to the centralized grid at a later point in time.

Distributed systems are often amenable to management by local enterprises serving their own communities. However larger companies and utilities can play an important role in establishing and scaling up such systems and their supporting business models, as well as bringing critical technical, operational and managerial expertise.

Case Studies 10, 11 and 12 feature projects by large technology providers to develop sustainable models for providing distributed energy. The lessons from these projects

and the field experience of other WBCSD member companies suggest several success factors for these business models:

- A partnership approach with local government and communities.
- An appropriate finance model, which includes investment assistance to mobilize capital costs and financial contributions from customers linked to their ability to pay.
- The establishment where possible of a local company to manage, operate and maintain the service, with targeted training and capacity building for staff.
- A dialogue with governments to ensure there is a transparent and stable regulatory and institutional framework governing the operation of distributed energy systems.
- The use of multiple energy sources to effectively meet local energy demands (i.e. households, collective, commercial and productive uses).
- The application of locally appropriate technologies and management methods.

Despite the benefits and versatility of this approach, many challenges still remain. Establishing a pricing and service model that is sustainable but matches the needs of customers can be difficult and may take substantial investigation, market research and negotiation. Distributed systems also have high up-front capital costs, with a tradeoff between the cost and the operational reliability of the system. Even with well-structured business models, it is often highly problematic to finance capital costs solely from user contributions necessitating investment from governments or other sources. Many system operators also experience difficulties in finding and retaining local expertise to manage, operate and maintain the systems.

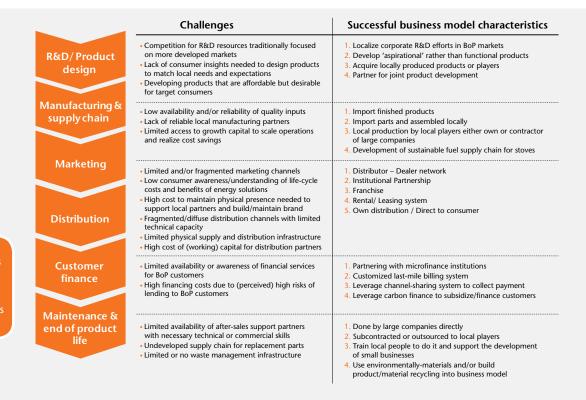


Figure 5
Business model innovations for BoP energy markets:
Addressing challenges in the value chain for products and appliances

ABB

Access to Electricity Program

ABB, a global leader in power and automation technologies employing more than 130,000 people in 100 countries, developed its Access to Electricity rural electrification program in 1999. The program is designed to be more than simply a series of rural electrification projects. The aim is to encourage different stakeholders – governments, companies, NGOs, aid agencies, and representatives of civil society – to bring their complementary skills to a project and work together.

There are now two main projects – one in the deserts of Rajasthan, India, and one in a remote area of southern Tanzania. The project in India – based on a public-private partnership – has brought together ABB, the state government of Rajasthan and a NGO to provide distributed power to desert hamlets. The program started in 2005 when one hamlet was provided with power generated by solar panels placed on hut roofs, and this has now been extended to several more hamlets with 1,100 households covering more than 7,000 people. The other project, in the remote village of Ngarambe in Tanzania, is also based on a public-private partnership. ABB teamed up with local authorities and the global conservation organization WWF in 2004 to set up a mini-grid, which provides the villagers – mainly subsistence farmers – with four hours of electricity a night.

These two projects have had significant and measurable development benefits for the communities, including increased productive activities and incomes, improved health service

delivery and extended hours for children's study. More broadly, they also serve to demonstrate some of the key success drivers for decentralized rural electrification projects and the requirements for scale. Of particular importance are: the public-private partnership model, the need to work with communities to build a sense of



Products and appliances

Products and appliances are important and proven solutions to providing poor consumers with access to key energy services such as lighting and clean cooking. Major products categories include clean cook stoves, high efficiency or solar-powered lighting and solar home systems.

Developing a successful business model needs to overcome a number of challenges through the value chain in terms of product design, manufacturing, marketing and distribution, finance, and maintenance and post-sales service. Figure 5 presents an overview of some of these challenges, along with business model success drivers in delivering energy services to the poor through desirable and affordable products and appliances. Key innovations include:

- Localizing R&D to develop products and services for local needs and conditions.
- Developing affordable products with 'aspirational' branding rather than just functional offerings that reinforce negative perceptions that the poor are less deserving than wealthy consumers.

- Using systematic approaches to identify target markets and to test and develop products with consumers.
- Developing supply and distribution channels and marketing relationships with non-traditional partners such as NGOs and microfinance organizations.
- Using carbon finance for low-carbon products, including efficient lighting and clean cooking appliances, to improve financial viability and/or reduce the purchase price for poor consumers.
- Ensuring environmentally-sustainable supply chains for fuels for clean cooking.
- Developing local capacity to provide after-sales and maintenance services.
- Engaging with policy makers to support and facilitate market creation.

Despite a growing number of commercially-successful products and appliances, this still constitutes a difficult market segment given the low margins and the requirement for often relatively complex partnerships and distribution relationships. Access to finance, both for customers and for businesses in the value chain, is also a persistent challenge.



Case 11

OSRAM

"Umeme Kwa Wote" ("Energy for Everyone") Off-Grid Lighting Project

OSRAM AG is a wholly-owned subsidiary of Siemens AG with around 40,000 employees worldwide, supplying customers in 150 countries. It is one of the world's two leading light manufacturers with 70 percent of its revenue coming from energy efficient products.

The OSRAM Off-Grid Project started in 2008 with the opening of the first OSRAM Energy Hub in rural Kenya. The OSRAM Energy Hub is an innovative business model supporting a state-of-theart product portfolio designed for the BoP market, particularly the 1.3 billion people living without access to electricity and relying on fuel-based lighting.

The Energy Hubs are the heart of an innovative solution to recharge battery-based lighting systems. Battery charging services have been available in off-grid areas for some time, but the OSRAM solution offers added value for its customers and the environment. All the energy for the charged batteries and the other requirements of the Hub is delivered by photovoltaic panels. Nearly 15 kW peak power is installed on the Hubs providing reliable, $\mathrm{CO_2}$ -free energy and sufficient power to charge 350 batteries per day. In addition, the Energy Hubs provides energy to supply of 3000 liters of clean drinking water decontaminated using UV-light disinfection.

The lamps provide high quality and durable lighting using the latest battery and lighting technologies. They are not only cleaner and safer, but even cheaper to run than kerosene lanterns in Kenya. Users can rent the whole system with a small deposit, avoiding a trade-off between quality and affordability that often constrains the use of modern technology in least developed countries.

The model has a range of additional benefits including avoiding health risks from fires, fume inhalation and skin contamination; offering new income opportunities and possibilities for education; protecting the environment; and reducing CO₂ emissions. The local operator's company is also managed as a social business, offering above-average training and income opportunities to the local population, and supporting other social projects in the communities where the Hubs are located.

After the successful completion of the first project phase, OSRAM has now partnered with the German NGO 'Global Nature Fund', joining the existing local partners in order to substantially scale up the project. The project is supported through the ACP-EU Energy Facility and the Siemens Stiftung.

Case 12

Schneider Electric

Developing distributed energy solutions for remote communities in Vietnam

Despite Vietnam's highly developed national power grid, nearly two million inhabitants still do not have access to power. This is the case, for example, of Village 61 in Quang Binh province, a mountainous region in central Vietnam. Before the Schneider Electric initiative, the remote village's 150 residents had no access to electricity and subsisted mainly on crop and animal farming, almost completely cut off from the rest of the country. Today, every household is connected to a renewable energy mini-grid that supplies electricity generated by a micro solar power plant developed by Schneider Electric, leveraging its expertise in smart energy management solutions.

In March 2010, Schneider Electric Vietnam and Cambodia, the Schneider Electric Foundation and the NGO Energy Assistance France (EAF), created by GDF SUEZ, signed a partnership agreement with the province of Quang Binh to develop renewable energy infrastructure in Vietnam. The pilot project, requiring an initial investment of nearly €120,000, got off the ground in July 2010 and was officially inaugurated in December 2010. The system, which operates continuously, generates 11 kW of electricity and supplies energy to the 35 houses in the village, the local school, the neighboring military base and a customs office.

The electricity used by Village 61 has been billed at a cost that is sufficient to pay back the initial investment within 15 years as well as helping to finance future projects in Quang Binh province. The possibility of replicating the model

in 72 other villages is currently being explored. In preparation, residents are already receiving training and education on energy management. Schneider Electric has also created jobs in the region and introduced an interest-free microcredit system that allows villagers to acquire electrical goods to benefit further from access to electricity.



Bosch and Siemens Home Appliances Group

Protos Cookstove

Bosch and Siemens Home Appliances Group GmbH (BSH) is the largest manufacturer of home appliances in Europe and one of the leading companies in the sector worldwide.

BSH, together with German and Philippine universities, has developed and optimized the Protos, the world's first plant oil cooker, to the point where it can be industrially produced and made available to consumers at affordable prices.

The design for the Protos is based on existing kerosene or petrol pressure cookers which are popular in many parts of Asia and Africa. The team developing the Protos went through a long and rigorous testing and development process to come up with a burner that could run on plant oils and be easy-to-use and affordable. BSH also paid close attention to the plant oil supply chain to ensure the overall sustainability of the product offering.

BSH has adopted a rigorous strategy for market development. It has focused on countries with sufficient plant oil already produced to internationally-accepted sustainability standards and where there is low risk of interfering with supply in edible oil markets.

BSH also ensures they have strong local partners with established local networks to ensure they can provide training on the use of the stove and access to customer service. Each partner is also required to conduct a field test with target consumers to demonstrate consumer acceptance and the success of the partnership.

The primary initial market, which meets the criteria and where BSH has focused initial efforts, is Indonesia. A local production facility has been established based on the strength of local uptake. Long term BSH sees a realistic possibility of capturing 10% of the kerosene stove market, which would mean up to 4 million burners in the market place. BSH has conducted test activities in six countries and based on those tests is now also working to establish markets in Ethiopia, Costa Rica and India.



Case 14

Shell and the Shell Foundation

Market-based solutions for clean cookstoves

The Shell Foundation was established by the Shell Group in 2000 as an independent, registered charity operating with a global mandate. Its mission is to develop, scale up and promote enterprise-based solutions to the challenges arising from the impact of energy and globalization on poverty and the environment.

In 2002, the foundation began tackling the issue of indoor air pollution (IAP) associated with a lack of access to clean cookstoves and has since helped address some of the sector's major challenges along the entire cookstove value chain. The foundation's partnership with the non-profit company Envirofit has seen Envirofit become the market leader in affordable and durable clean cookstoves in India and elsewhere, with sales of 300,000 stoves benefiting 1.5 million IAP-affected people.

In 2010, Shell, the company, also decided to enter the IAP space when they joined Shell Foundation and other private and public partners to found the Global Alliance for Clean Cookstoves (see Box 2). The Alliance wants to help 100 million homes to adopt clean cookstoves and fuels by 2020. Shell and Shell Foundation intend to help reach this goal through lending their support to market-based interventions in several developing countries, as well as through the targeted funding of Alliance-led initiatives to create the conditions for a thriving cookstoves sector, for instance through the development of standards.

Shell, the company, views its engagement as an opportunity to make a positive impact on global energy-related health and environmental challenges. Providing innovative energy solutions is

Shell's core business and is equally reflected in its social investment theme of energy access. Energy is an area in which Shell can offer its knowledge, experience, global networks and technical expertise through advocacy, mapping, standards and testing, and carbon finance.

Shell has funded the development of a Market Feasibility Toolkit that analyzes macro environments, demand, supply, distribution and financial sustainability of existing and potential cookstove programs. This toolkit can be used by other stakeholders and forms the backbone of a formula for change which can be used time and again.

Shell advocates for the use of clean-burning stoves when talking to national and local policy makers and has also financed market feasibility pilots in four countries: Brazil, Indonesia, Timor Leste and Nigeria. These countries were chosen because they have significant demand for improved cookstoves, and because they are of strategic significance to the Shell Group.
Further studies are planned for South Africa and Ethiopia.



Schneider Electric

In-Diya LED (light emitting diode) lighting system

Schneider Electric has launched 'In-Diya', a highly energy-efficient LED-based lighting system, to provide lighting to people living with no or unreliable electricity. In-Diya is a specially-designed system that can operate on main supply and/or solar panels. At the time of launch, it was the only available

LED-based lighting system which can fully illuminate a typical rural house and provide 8 to 15 hours backup.

The In-Diya system was developed at the company's dedicated Indian R&D centre. It has been designed to offer high-quality products at an affordable price. It is available in nine different variants with the basic model with

45 LEDs priced at 550 Rupees (approximately USD 12). This model is powered by an external chargeable battery which can be rented from a battery-charging station managed by a local entrepreneur. Other models can be charged through solar panels.

In addition to using Schneider Electric's network of more than 400 distribution partners, the company will partner with a range of microfinance institutions, NGOs and speciallytrained entrepreneurs to reach customers in rural areas.



Case 16

Novozymes

An integrated model for providing clean cooking fuels in Sub-Saharan Africa

Since 2008, Novozymes – the world leader in bioinnovation – has been exploring business opportunities in high-growth 'base of the pyramid' markets. Initial studies indicated an opportunity to develop sustainable agriculture to increase food production as well as produce feedstock for ethanol production to replace charcoal as a cooking fuel in urban households.

Replacing charcoal with ethanol has wide-ranging benefits. Today, household indoor air pollution causes an estimated two million premature deaths per year and sickens millions more – mostly women, infants and small children. In addition to the health impact, nearly a third of Africa's seven million square kilometres of forest has already been destroyed for charcoal production, stripping the continent of vital biodiversity and contributing to the projected 6.7 billion tons of greenhouse gas emissions that household energy use in Africa is expected to produce by 2050.

In 2009, Novozymes met CleanStar Ventures, a venture development partnership that leverages innovation to drive social development and environmental restoration, which has similar interests. The companies conducted a joint feasibility study in Mozambique, which showed an opportunity for a highly profitable and sustainable venture that could be delivered at significant scale and replicated. On that basis the companies jointly invested in the newly-formed CleanStar Mozambique in August 2010.

CleanStar Mozambique is helping smallholder farmers in Sofala province implement an environmentally- restorative agroforestry

system on their own land. Farmers benefit from increased food production for their own use, which dramatically improves family nutrition. They also sell surplus output to the company providing an opportunity to increase their incomes by over 300%. CleanStar Mozambique then makes a range of food products from the surpluses as well as an ethanol-based cooking fuel. These products are sold into urban markets, notably in Maputo. By 2014, the venture will involve 3,000 smallholders over 6,000 hectares of land, supply 20% of Maputo households with a clean alternative to charcoal (at a competitive price) and thus protect 4,000 hectares of indigenous forests per year.

Alongside Novozymes and CleanStar Ventures, the business brings together other partners, most notably the engineering group ICM Inc. that is providing the ethanol plant and Bank of America Merrill Lynch that has entered a multi-million Certified Emission Reduction financing agreement with CleanStar Mozambique.

The market dynamics underlying the business are common to many cities in developing countries – not least in Sub-Saharan Africa. It is estimated that over 50 cities in the region are experiencing similar conditions to Maputo, with increased urbanization driving demand for deforestation-based charcoal – the price of which is rising to the point where ethanol is a competitive alternative. CleanStar Mozambique is therefore seeking to demonstrate that the business model is scalable and replicable across Sub-Saharan Africa.

Enabling policy frameworks

Well-designed and stable policy and regulatory frameworks are critical for facilitating business participation in the energy sector and the expansion of access to energy.

Incentivizing business investment and private finance flows

Business model innovation improves the financial attractiveness of access to energy investments and ventures. However, mobilizing the required scale of business participation requires political will and well-designed and stable policies to overcome many of the barriers facing business action.

To encourage business investment and private financing flows, policy makers must understand how investment decisions are made and how policy supports and/or incentivizes investments. Policy and regulation are pivotal to attracting capital in the energy sector, particularly for electricity generation, transmission and the distribution infrastructure. Business investment can be increased by focusing on three key areas²⁷ in which policy has a major role to play:

Box 4

Key risks facing investors in the energy sector in developing countries²⁹

- Political/country risk e.g. risk of appropriation, breach of contract, war, civil unrest.
- Policy risk e.g. change of policy or failure to implement plans.
- Commercial counterparty risk e.g. non-payment by a major contract party such as a national utility.
- Revenue risk e.g. low demand, widespread non-payment by customers.
- Performance risks e.g. technology performance, unexpected system outages
- Currency risk foreign exchange fluctuations.

- Removing investment barriers. In some countries
 regulatory amendments are required to allow effective
 private sector participation in the energy sector.
 Additional requirements are needed for enabling smallscale private energy producers and distributors, such as
 waivers for complex licensing procedures which are often
 not applicable for small operations.
- Lowering the risks on investment. Investors in the energy sector face significant risks (see Box 4). Many of these risks are associated with the quality and stability of regulatory policy and performance and the local economic and political environment. Not only can these risks be barriers to investment, they also substantially affect the cost of capital and hence the financial performance of investments. Policy action to address the risks within the government's sphere of influence can have a major positive effect on business investment.
- Enhancing return on investments. In addition to actions
 which reduce risk and the cost of capital, further
 policy measures may be justified to improve and/or
 guarantee returns on investments. For example, the most
 appropriate access solution for many rural areas will be
 the use of renewable energy technologies. As in most
 developed countries, such technologies require incentives
 to encourage market deployment and can justify public
 investment or capital subsidies to overcome the high
 upfront capital costs.

The impact of these measures is further enhanced through long-term and appropriately-resourced government plans for the expansion and transformation of the energy system. Such plans are critical for providing investors with what the Deutsche Bank Group has described as 'TLC' – 'Transparency, Longevity, Certainty and Consistency'²⁸.

Benefits of enabling business involvement

Policy and regulatory action to support business participation requires effort, time, capacity and in some cases strong political will. It is therefore necessary to be clear about the public benefits of business involvement:

- Reduction of the public finance burden. Encouraging business involvement and innovation reduces the government's financial burden to meet investment requirements and operational expenditures for expanding access to energy.
- The critical role of business in enabling access to energy.
 As identified in Section 2, business plays a critical role in supporting efficient and reliable energy systems and expanding access to energy. However, without a basic enabling policy framework in place it may be unattractive for companies to participate in the energy sector.
- Acceleration of expansion of access. Business is often in a position to act and invest faster than the public sector, thereby significantly accelerating the expansion of energy services to poor communities. This accelerated provision of services will be critical for many countries if they are to achieve universal energy access by 2030.
- Technology cooperation. Business is a key actor in supporting the deployment of technology and the development of local absorptive capacity.
- Link to climate financing. The policy actions described in this section are central to broader reforms for encouraging private investment flows for climate mitigation and adaptation. Well-designed reforms deliver a 'double dividend' in terms of both low-carbon investment flows and expanded access to energy.

Framework for action

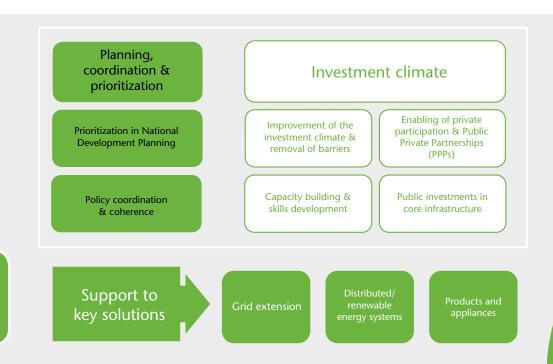
Figure 6 presents a framework of the policy and regulatory measures which support the expansion of access to energy through scaling up business investment. Specific measures and requirements will vary by country and region however the basic parameters of effective regulation are emerging through successful international experience. These elements are described in more detail in the following sections.

Planning, coordination & prioritization

At the national planning level, establishing national goals for access to modern energy services, supported by specific plans, targets and systematic monitoring is critical for country-level progress on access to energy³⁰. Successful electrification needs strategic planning and financial resources for implementation and long-term maintenance and repairs³¹. These plans and resources should be structured so that they are not subject to political agendas.

The efficiency of the existing energy system should also be a planning priority and efficiency improvements may be the most cost-effective and sustainable approach to produce additional capacity to support energy access objectives.

From a business perspective, robust government planning processes ensure clarity for investment planning and decision-making. More specifically they determine which communities will be connected to the grid and which ones require distributed solutions. This is particularly important to reinforce the investment case and customer support for distributed solutions.



Policy framework for scaling

up business investment

Figure 6

Policymakers must include quality and reliability considerations in energy access definitions and delivery plans. Quality and reliability are as important as physical access to achieve the desired development benefits. For example, the benefits of connecting people to an electricity grid are significantly diminished if the electricity is unreliable, which is a situation currently faced by more than one billion people.

There is also value in ensuring an integrated approach to broader policy making and public investment programs to maximize the effectiveness and efficiency of access expansion. Key coordination points include: integrated development programs to support enhanced livelihood opportunities and to provide health and education services; energy efficiency standards for appliances and new dwellings; and integrated planning and provision of other utility services, such as water, sanitation and telecommunications.

Investment climate

The investment climate refers to the economic and market conditions that influence investment decisions. A sound investment climate provides companies with opportunities and incentives to invest and grow and is central to sustaining growth and reducing poverty³². Specific measures relating to the investment climate for the energy sector include:

- Enabling public private partnerships. As highlighted in the recent joint report of UN Energy and the Global Sustainable Energy Partnership, the PPP model may be an efficient and effective vehicle for delivering expanded access to energy in many national and regional contexts³³. However, PPPs can be complex arrangements and do require appropriate regulatory capacity within government. For many low-income countries, this is an area where development agencies and international finance institutions can play an important supporting role.
- Infrastructure. Public investment to support the deployment of key energy infrastructure (such as transmission and distribution systems) is essential for electrification. However, other infrastructure elements,

- such as transport systems (especially rural roads) are important for enabling product and appliance distribution chains, maintenance access and reducing the capital costs of equipment deployed in remote areas.
- Capacity building and skills development. Investment in education, skills and training is critical to provide the capabilities to build, operate and maintain the key elements of the energy system. Business is an important training provider, but this does not remove the need for public basic and technical education programs.

Additional reforms to support market development and to improve the protection of intellectual property rights to promote new technology deployment may also be needed in some countries.

Policy & regulation to support solution implementation

In addition to the general enabling policy environment, there are a number of specific measures that can provide important incentives and support to the deployment of key energy access solutions.

Grid extension

As discussed in Section 4, businesses/utilities can play an important role in expanding grids in urban areas. Typically no stand-alone financial case exists for business to invest in expanding grid infrastructure in rural areas, but business may play an important implementation role through a PPP arrangement or as a contract service provider to public authorities.

Where business is involved in utility service provision and/or grid extension activities, the following policy measures are often of high importance:

Appropriate tariff policies. This is a challenging issue of balancing affordability and sufficient revenue to maintain the operational sustainability of the system. Analysis by the World Bank demonstrates poor consumers are willing to pay for electricity and often at levels that are higher than the long-term cost of supply, making a financially sustainable model possible³⁴. This is also in the context of the poor already paying significant amounts for substitutes (e.g. kerosene for lamps). A well-designed tariff policy will ensure the poorest consumers can afford to meet their basic needs, while collecting sufficient

> overall revenue to allow operational sustainability. Support for connection costs. Public support or

financing arrangements for spreading connection costs are critical for facilitating grid connections,



- particularly for the poorest community members. Tariff policies can help the poorest afford electricity but for the poor to benefit from these policies they must first be connected³⁵.
- Payment rules. Effective metering, billing and payment recovery regulations are essential for managing the revenue risk associated with new and existing connections.

Distributed/renewable energy systems

Participation of the private sector is crucial for the provision of distributed energy solutions, particularly in remote locations³⁶. Many of the key enabling policy actions presented above on grid extension also apply to distributed or renewable systems, with the additional elements:

- Investment and revenue support. As previously noted, distributed and renewable systems often require some form of capital support from public resources. A complementary approach could be to establish a robust regime for revenue support (e.g. feed-in tariffs or power purchase agreements) which allow developers to source capital based on guaranteed income streams. Supporting the local functioning of carbon markets can be another important potential mechanism for encouraging deployment of low-carbon technologies.
- Public information. Governments have an important role to play in providing clear information about distributed energy systems and particularly in addressing the perception that stand-alone power systems are inherently inferior to grid connections.

Products and appliances

The development of markets for products and appliances is perhaps less dependent on the policy environment. However policy has a role in supporting market creation and the effective functioning of markets:

- Public education of the benefits of clean cooking. Public education and awareness of the health benefits of improved cookstoves is fundamental to realizing public health outcomes and to increasing market demand for clean cooking appliances.
- Product quality standards and labeling. In many countries, markets for energy-related products and appliances have been damaged by poor-quality products eroding consumer confidence and interest. Governments can help address these issues by instituting or supporting basic product quality standards and labeling schemes.
- Fiscal measures. Basic fiscal measures can have important benefits on affordability, such as removing excessive import tariffs on key components (e.g. solar panels) that cannot be sourced locally.
- Subsidies. A key supportive policy measure to support access to clean energy is to eliminate subsidies for less sustainable substitutes (e.g. use of kerosene for lighting).
- Low-carbon products. Low-carbon products such as solar home systems, solar lanterns and some stove technologies may benefit from financial incentives and/or facilitation of linkages with climate investment flows.
- Supporting markets. Governments can avoid actions that undermine the development of markets, such as creating expectation of free giveaways of products.

Financing mechanisms

Meeting universal energy access targets will require mobilization of significant additional financial resources. Public and development finance mechanisms should be specifically designed to leverage additional private investment. The broader financing architecture must give appropriate consideration to the quality of the regulatory and investment climate, which impact risks and returns associated with private investment.

The financing challenge

Significant financing will be required to meet the goal of universal energy access. The IEA estimates USD 1 trillion of investment will be required by 2030 to achieve this goal, which translates to an additional USD 34 billion per year overand-above current spending on expanding access³⁷. Some studies have suggested that the investment requirements may be even higher depending on the assumptions used³⁸. It is likely that a full range of funding sources and mechanisms will be required to achieve universal access³⁹. The appropriate approach however will vary with different energy service needs and contextual factors.

While these figures are often viewed as costs, they are actually investments which generate social returns for countries and communities and the possibility of financial returns for business. Business is keen to play its role, and indeed recent major reports by the UN⁴⁰ and IEA⁴¹ have highlighted the critical need for business investment. These investment flows reduce the burden on public finances and development assistance, with the additional benefit of bringing key expertise and capabilities to the energy system as described in Section 2.

However, it must be recognized that mobilizing investment in this area is difficult. Electricity distribution infrastructure can have high social returns, but despite the deployment of innovative business models, infrastructure often does not deliver adequate financial returns for private investors. Project-based investments in emerging and low-carbon technologies are some of the more complex and risky investments in the energy sector. In many countries where energy access is a major challenge, the investment climate is

often not seen as conducive to business participation, and/or the cost of capital is prohibitive.

As described in Section 5, regulatory policy and performance is a core driver of the perceived risk of energy investments and has a major bearing on the cost of capital. Establishing an enabling policy environment is often an essential first step for mobilizing business investment.

When these enabling conditions are in place, public and development finance flows can be designed to leverage additional business investment, as described in the following sections. Other sources of finance that can further catalyze investment in energy access outcomes, including climate-related financing, are also discussed.

Enabling finance flows

Public finance

The opportunity for public finance measures to catalyze business investment will depend on the country and context. However several potential measures can directly leverage additional investment:

- PPP Model. The use of well-designed PPPs can leverage additional private finance flows to maximize the impact of public investment.
- Investments in core infrastructure. The positive social returns of many investments in energy infrastructure and services can provide a strong rationale for direct public investment. Governments could focus on infrastructure unlikely to attract private investment (e.g. transmission and distribution in some rural areas).

- Investment incentives and provision of finance.
 - Government may choose to take measures that directly incentivize investment ranging from fiscal measures, such as tax credits and accelerated depreciation, or more substantial financing actions through equity investments in projects, provision of concessional debt finance, subordinated debt and/or sovereign guarantees.
- Support for low-carbon technologies. Many low-carbon technologies may need public support to encourage deployment. This may involve feed-in tariffs or power purchase agreements for more established technologies (e.g. solar, wind energy) to grants and R&D support for less-mature technologies that may be effective locally.

Development finance

For many low-income countries with limited fiscal resources, public finance flows will need to be supported by development finance.

Development finance encompasses both Official Development Assistance (ODA) and support extended through development finance institutions such as the World Bank, Asian Development Bank, and African Development Bank. ODA usually takes the form of project grants or technical assistance, while the development finance institutions offer a broader range of support mechanisms.

Key development finance mechanisms include:

- Grants and loans to national governments and government agencies to support infrastructure investment.
- Financing measures to catalyze business investment directly through concessional financing or risk mitigation instruments, such as sovereign/political risk insurance, partial credit guarantees and local-currency-denominated loans.
- Support for innovation, through grants and investment in projects or models with high demonstration effect.
- Technical assistance and capacity development to regulators and key government agencies.
- Support for policy development and implementation, as well as restructuring and reform, which can help to improve the enabling environment for business.
- Buying down the cost of technologies, through capital grants or targeted subsidies such as output- or performance-based aid (wherein subsidies are provided upon verification of certain performance targets).

Development finance institutions can also play an important role in increasing access to finance along the energy access value chain, for example by extending lines of credit to the local banking sector to support energy-related enterprises or loans for consumers to purchase energy products or appliances.

Customer contributions

Poor consumers are willing to pay for reliable energy services⁴² and often pay more than more affluent consumers because they face a lack of affordable alternatives. This willingness to pay can represent an important mechanism for covering the costs of expanding energy access. The AGECC report estimates that 55% to 70% of capital costs of providing universal access to energy could be recovered through end-user tariffs on consumers at all income levels⁴³. Well-designed policies can encourage customer contributions by developing markets (e.g. public awareness of the benefits of clean cook stoves), addressing market failures, and through the implementation of smart tariff policies that generate revenue but still ensure affordable access. In terms of business investment these measures can both improve returns and reduce risks associated with customer payments.

Climate finance

There are a range of opportunities to link climate change finance and access to energy, where energy services are provided through low-carbon technologies or improved energy efficiency. As a more sophisticated understanding emerges of the links between energy access and climate change mitigation/adaptation, the potential breadth of financing linkages is expanding. Climate finance flows can help mobilize additional funding resources, improve the risk-return profile and financial attractiveness of investments, and reduce costs to consumers (e.g. subsidizing the cost of low-emission cook stoves). However the international community should avoid making progress on energy access too contingent on global climate agreements, as the current impasse in climate negotiations may delay the urgent investments required in expanding access to energy.

The Clean Development Mechanism (CDM) has demonstrated how to achieve climate mitigation objectives while expanding access to clean, reliable and affordable energy (see Table 3).

However, obtaining finance under the CDM can be problematic due to high transaction costs and approval delays. Furthermore, experience with the CDM has shown that the expected carbon revenue normally provides up to 20% of the total project cost, while the remaining 80% needs to be raised from other traditional sources of finance⁴⁴. This means that while carbon finance can enhance the overall commercial attractiveness, these investments are still subject to the general challenges of mobilizing finance.

Project	Description	Beneficiaries	Expected CO ₂ savings ⁴⁵ (tonnes CO ₂ equivalent/year)
Bagepalli CDM Bio-gas Project (CDM 121)	The project involves the construction of approximately 5,500 two-cubic-meter capacity biogas digesters. The digesters, which utilize animal dung, produce methane gas from the anaerobic breakdown of organic waste. The resulting methane is used as a cooking fuel in biogas stoves built in the dwellings.	30,000 people	19,553
Visakhapatnam OSRAM CFL Project (CDM 1754)	The project involves the distribution of approximately 700,000 long-life compact fluorescent lamps (CFL) to households in the district of Visakhapatnam, Andhra Pradesh, India.	670,000 households	27,427
e7 Bhutan Micro Hydro Power Project (CDM 64)	The e7 Bhutan Micro Hydro Power Project supplies electricity to the village of Chendebji, previously without reliable electricity, from a dedicated 70 kW run-of-river micro hydro turbine on the edge of the village.	50 households, 5 municipal buildings (including a dispensary)	524
Chevron Darajat III Geothermal Power Project (CDM 673)	The Darajat III is a 110+ MW facility on the island of Java Indonesia which generates electricity for the national grid from geothermal energy.	Power generated equivalent to 825,000 households	700,000 (approximate.)
Nigeria Kwale Okpai power station (CDM 553)	In 2005, Eni built a 480 MW combined cycle power plant in Kwale Okpai (Nigeria). The plant uses the associated gas from production activities, which would otherwise be flared. The plant supplies electricity to Power Holding Company of Nigeria, which distributes it to the end users.	96,000 families use the electricity produced at Okpai	1,500,000 (under review)

Climate Investment Funds

The Scaling-Up Renewable Energy Program in Low-Income Countries (SREP), a component program of the Climate Investment Funds supported by the major development banks, is currently being established to support six pilot countries⁴⁶ in implementing renewable energy strategies by underwriting additional capital costs and risks associated with renewable energy investments and other instruments for reducing risk to investors. The SREP has a focus on using renewable energy to expand access to energy and is designed to encourage private sector investment.

Post-2012 finance mechanisms

The ongoing negotiation and development under the UNFCCC of the post-2012 climate financing architecture and the Green Climate Fund could create further opportunities and mechanisms to align climate change and energy access. One important question in the financing architecture concerns the potential modalities for aligning access to energy objectives with mitigation outcomes through the proposed Nationally Appropriate Mitigation Actions (NAMAs). The exact definition and structure of NAMAs is currently under negotiation. However, such an approach could potentially create major opportunities to align access to energy and

mitigation as has previously been done under the CDM, but with a much more strategic alignment with national energy planning and with lower transaction costs.

Another undefined area is how adaptation financing could support access to energy objectives. There could be strong alignment between the development and resilience objectives of adaptation finance and providing access to energy which helps reduce vulnerability to climate-related shocks and stresses.

Local banking sector

The lack of knowledge and capacity in the local banking system regarding financing energy projects can be a major impediment to investment, especially for local project developers. As noted above, development finance institutions can play an important role in building the capacity of local banks and extending credit for local lending for energy sector projects.

Microfinance

Microfinance can play a role in allowing poor households and small firms to cover connection charges or appliance costs that would normally be beyond their means. Examples of the

Environmental Resources Management (ERM)Low Carbon Enterprise Fund

ERM is a leading global provider of environmental, health & safety, risk and social consulting services with 3,500 consultants operating out of 145 offices in 40 countries worldwide. The Low Carbon Enterprise Fund (LCEF) is an initiative of the ERM Foundation which was set up to provide capacity development and investment support to low-carbon entrepreneurs in the developing world. The fund supports clean energy businesses, such as solar and biomass as these distributed small scale energy sources are important for catalyzing rural development as well as reducing carbon emissions and minimizing health risks from cooking smoke.

The LCEF provides seed capital at reasonable interest rates, free technical, management support, as well as the opportunity to network with other partners. The fund has a primary investment portfolio of 8 investments (total investment USD 1.2 million), with a wider group of 67 ventures across 27 countries having received management or technical assistance. The investment portfolio, which includes a producer of energy efficient stoves in India and a business providing solar-powered mobile charging in Burkina Faso, has created around 350 jobs and resulted in avoided emissions of

over 32,000 tonnes of CO₂.

The LCEF seeks to deliver results for non-traditional clients from the ERM's

core skills, markets and

values

Underlying commercial drivers of the program have included: building skills and capacity for future markets; addressing the need for ERM to make a demonstrable contribution to tackling climate change in the longer term; and piloting whether a more substantial exercise using money raised externally would be feasible based on the results of ventures supported through the Fund.

Case 18

Schneider Electric

Energy Access Fund

Schneider Electric has developed the BipBop program to bring safe, clean electricity to the people who need it most worldwide. With a strong willingness to involve local communities and local stakeholders in each country, the BipBop program addresses three key issues: the lack of appropriate and affordable products and appliances; the lack of financial resources available for innovative energy entrepreneurs; and the shortage of skills and expertise. The key elements of the BipBop program are: 'Business' – creation of an investment fund to support energy entrepreneurs for BoP markets; 'Innovation' – developing appropriate solutions to be a key supplier for BoP markets; and 'People' – training young people in electrical skills.

Under the business element, the Schneider Electric Energy Access Fund supports the development of entrepreneurial initiatives worldwide that will help the poorest obtain access to energy. Created with the backing of Crédit Coopératif and PhiTrust and with an initial capitalization of €3 million, the fund provides financing for projects that are designed to: help jobless individuals create businesses in electricity; promote the development of businesses that provide energy access in rural or urban areas; and support the deployment of innovative energy access solutions that use renewable energy. The fund has set the ambitious objective of supporting the electricity sector by the end of 2011.



use of microfinance are shown in the company case studies in this document. However, there are limitations to the use of microfinance, and it is generally more appropriate where the energy service being supplied supports the recipient to save money or generate additional income to pay off loans.

Social & impact investors

There are now a small but growing number of social and impact investors supporting ventures that expand access to energy for poor consumers. Such investors can play an important role in supporting new and smaller ventures to achieve commercial viability and to expand their businesses.

Company investment funds

Companies are also seeing the opportunity to increase their contribution to providing access to energy through their own innovative investment funds to support smaller enterprises. These funds can have additional benefits through building understanding of BoP markets and providing a platform for technology development. They also provide a conduit for highly-valuable management and technical assistance to support local enterprises. Leading examples include GDF SUEZ's Rassembleurs d'Energies program, Schneider Electric's BipBop program and ERM's Low Carbon Enterprise Fund (see Case Studies 17, 18 and 19).

Case 19

GDF SUEZ

Rassembleurs d'Energies program – Solidarity investment fund

The GDF SUEZ Group, the world's largest utility, is seeking to combat poverty and economic disparities with the launch of the 'GDF SUEZ-Rassembleurs d'Energies' program. This global program promotes access for the poorest populations to energy and essential services and supports the reduction of energy poverty. It provides socially responsible investment, donations, technical and managerial assistance, with the GDF SUEZ Group coordinating these various tools in support of social entrepreneurs and non-profit organizations.

The centerpiece of the GDF SUEZ Rassembleurs d'Energies program is the creation of an investment fund that will progressively increase to around €100 million in 2013, 10% of which will be immediately invested in social business energy access projects in the form of equity participation.

The GDF SUEZ Rassembleurs d'Energies program will make investments in the range of €250,000 to €1 million in projects such as the electrification of small villages and small-scale hydroelectric projects, with an emphasis on social entrepreneur involvement. Social and environmental impact is the most important selection criterion; however the selection process includes specific criteria regarding the profitability of the project in terms of the rate of the return of the investment and the returns to shareholders. The initial investment portfolio includes projects in India, Indonesia, South America and France.



Conclusions

Business supports the agreement of a goal for universal access to clean, reliable and affordable energy by 2030 and is keen to play an active role in the development of comprehensive global and national strategies to achieve this goal.

Maximizing the business contribution to universal energy access requires investments and ventures that are profitable and scalable. It needs business to deploy its core capabilities in developing innovative solutions and the support of governments and other stakeholders to provide enabling policy frameworks and financing. It also needs effective collaboration and partnerships.

The WBCSD and its member companies are keen to work with stakeholders to support effective action to deliver clean, reliable and affordable energy for all. The WBCSD Access to Energy Initiative will actively pursue this engagement through 2012 – the International Year of Sustainable Energy for All – and beyond.

Notes and references

- 1. International Energy Agency (IEA) (2010) Energy Poverty -How to make modern energy access universal. Special early except of the World Energy Outlook 2010 for the UN General Assembly on the Millennium Development Goals, OECD/IEA, Paris. The IEA estimates that to achieve the MDGs, an additional 395 million people need to be provided with electricity and additional 1 billion people provided with access to clean cooking facilities by 2015.
- IEA (2011) Energy for All –
 Financing access for the poor.
 Special early excerpt of the
 World Energy Outlook 2011.
 OECD/IEA, Paris.
- 3. The Secretary-General's
 Advisory Group on Energy
 and Climate Change
 (AGECC) (2010) Energy for a
 Sustainable Future. Report and
 Recommendations. 28 April
 2010, New York.
- 4. World Health Organization (WHO) (2011) Indoor air pollution and health. Fact sheet N°292, September 2011. [Online]. Available from: http://www.who.int/mediacentre/factsheets/fs292/en/
- 5. AGECC (2010) p.7.
- 6. IEA (2011).
- 7. IEA (2010).
- 8. AGECC (2010).
- See: http://www. sustainableenergyforall.org/.
- 10. AGECC (2010).
- 11. 'Base of the pyramid' (BoP) is a term used to describe the market for servicing the four billion consumers globally at the base of the income pyramid. It was originally coined by C K Prahalad.
- 12. Aron, J E, Kayser, O, Liautaud, L and Nowlan, A (2009)

 Access to Energy for the Base of the Pyramid. A joint project of Ashoka and Hystra with the support of GDF Suez, Schneider Electric and Total. [Online]. Available from: http://www.hystra.com/opensource/HYSTRA_Access_

- to%20_Energy.pdf.
- 13. IEA (2011).
- 14. The Global Sustainable Electricity Partnership & UN-Energy (2011) Strengthening Public-Private Partnerships to Accelerate Global Electricity Technology Deployment - Recommendations from the Global Sustainable Electricity Partnership Survey. Available from: http://www. globalelectricity.org/upload/ File/Summit%20Meeting/ NY%202011/e8-UN-Energy%20Report%20-%20 Strengthening%20PPP%20 Recommendations.pdf.
- 15. Adapted from Osterwalder et al. (2005) Clarifying Business Models: Origins, Present and Future of the Concept. Communications of the Association for Information Systems. Volume 16, 1-25.
- 16. Inclusive business models engage the poor on the demand side as clients and customers and on the supply side as employees, producers and business owners for mutual benefit. For further information see: World Business Council for Sustainable Development (WBCSD) (2005) 'Business for Development – Business Solutions in Support of the Millennium Development Goals'. WBCSD: Geneva; UNDP (2008) 'Creating Value for All: Strategies for Doing Business with the Poor'. UNDP, New York.
- 17. Aron et al. (2009).
- 18. Dalberg Global Development Advisors (Dalberg) (2010)

 Solar Lighting for the Base of the Pyramid Overview of an Emerging Market. Publication of the International Finance Corporation Lighting Africa Initiative.
- **19.** Enabling Access to Sustainable Energy (EASE) (2010) *Business Models for Energy Access.*
- 20. Gradl, C and Knobloch, C (2011) Energize the BoP! Energy Business Model Generator for Low-Income

- Markets A Practitioner's Guide. Endeva, Berlin.
- 21. Forthcoming.
- 22. WBCSD (2006) Access to electricity in developing countries. Issue Brief. [Online]. Available from: http://www.wbcsd.org/web/publications/IB%20Access.pdf.
- 23. Aron et al. (2009).
- 24. Aron et al. (2009).
- 25. IEA (2010).
- 26. AGECC (2010) pg.19.
- KPMG (2010) Financing low-carbon investment in developing countries. KPMG, London.
- 28. Deutsche Bank Group (2011) Get FiT Plus – De-Risking Clean Energy Business Models in a Developing Country Context. Available from: http://www. dbcca.com/dbcca/EN/
- 29. Adapted from Ward, M
 (2010) Engaging private sector
 capital at scale in financing
 low carbon infrastructure in
 developing countries. The
 report of the Private Sector
 Investment Project. Available
 from: http://www.gtriplec.
 co.nz/assets/Uploads/papers/
 psi_final_of_main_report_full_
 version_31_may.pdf.
- 30. Niez, A (2010). Comparative Study on Rural Electrification Policies in Emerging Economies: Key to Successful Policies. Information Paper, OECD/IEA, Paris.
- 31. Niez, A (2010).
- 32. The World Bank (2011) Investment Climate – Overview. [Online]. Available from: https://www. wbginvestmentclimate.org/ overview/index.cfm. The World Bank Doing Business Index provides a comparative measure of the investment climate in countries and includes the following parameters: starting a business, protecting investors, dealing with construction permits, employing workers, trading across borders, registering property, enforcing contracts, obtaining

- credit and closing a business.
- **33.** The Global Sustainable Electricity Partnership & UN-Energy (2011).
- 34. Independent Evaluation
 Group The World Bank
 (2008) The Welfare Impact
 of Rural Electrification: A
 Reassessment of the Costs
 and Benefits An IEG Impact
 Evaluation. The World Bank
 Group, Washington DC.
- 35. Niez (2010).
- 36. Niez (2010) pg. 100.
- 37. IEA (2011).
- 38. Bazilian, M et al. (2010)
 Understanding the Scale
 of Investment for Universal
 Energy Access. In Geopolitics
 of Energy, Special Issue Energy
 Poverty and Development,
 Volume 32, Issues 10 and 11.
- 39. IEA (2010).
- 40. AGECC (2010).
- 41. IEA (2011).
- 42. For example The Independent Evaluation Group The World Bank (2008) found poor peoples' willingness to pay generally exceeded the longrun marginal cost of supply.
- 43. AGECC (2010).
- 44. KPMG (2010).
- **45.** Expected Certified Emission Reductions (CERs) under the
- **46.** Ethiopia, Honduras, Kenya, Maldives, Mali, Nepal.

Co-Chairs

The Access to Energy Initiative is led by the following WBCSD member companies:

Robin Bidwell Group President ERM



Gérard Mestrallet Chairman and CEO GDF Suez



Jean-Pascal Tricoire
President and CEO
Schneider Electric



Core Group







































Acknowledgements

The Co-Chairs would like to thank the following people for their contributions to the Access to Energy Initiative and the preparation of this document: Françoise Guichard, Gilles Vermot-Desroches, Bernard Saincy, Marie Gérard, Malia Belkacem, Thomas André, Peter Rowley, Tom Ferguson, Ron Popper, Adrienne Williams, Anders Nordstrom, Dennis Welch, Paul Loeffelman, Helle Juhler-Verdoner, Sarah Eastabrook, Daniel Lieberman, Alan Pezeshki, Bente Pretlove, Nili Safavi, Lucia Bartocci, Sabina Ratti, Gloria Denti, Francesca Palmisani, Roberto Bossi, Bernhard Grünauer, Stefan Koch, Paula Restrepo Duque, Oscar Dario Gomez, Olga Velez Arango, Wendy Poulton, Mandy Rambharos, Nils Tcheyan, Ann Condon, Stefan Maard, Henk de Bruin, Robert Metzke, Harry Verhaar, Marie-Christine Johannes, Simon Bishop, Sören Buttkereit, Daniela Otten, Jochen Berner, Samuel Shiroff,

Dr. Peeush Kumar Bishnoi, Anne Bolle, Hege Marie Norheim, Per Arne Solend, Natacha Blisson, Ingunn Kroksnes, Erik Brandsma, Olivier Gilbert, Thomas Hascoet, Ad Dankers, Ana Muro, Virginia Vilarino and Sachin Joshi.

The Co-Chairs would also like to thank Dalberg Global Development Advisors for their initial input into the document as well as Shaanti Kapila (ADB) and Pepukaye Bardouille (IFC) for their very helpful comments on draft versions.

Finally, the Co-Chairs would like to thank Matthew Lynch, Marcel Engel and Filippo Veglio of the WBCSD Development Focus Area for managing the writing and publication of this document.

About the World Business Council for Sustainable Development (WBCSD)

The World Business Council for Sustainable Development is a CEO-led organization of forward-thinking companies that galvanizes the global business community to create a sustainable future for business, society and the environment. Together with its members, the Council applies its respected thought leadership and effective advocacy to generate constructive solutions and take shared action. Leveraging its strong relationships with stakeholders as the leading advocate for business, the Council helps drive debate and policy change in favor of sustainable development solutions.

The WBCSD provides a forum for its 200 member companies – who represent all business sectors, all continents and a combined revenue of more than \$7 trillion – to share best practices on sustainable development issues and to develop innovative tools that change the status quo. The Council also benefits from a network of 60 national and regional business councils and partner organizations, a majority of which are based in developing countries.

www.wbcsd.org

Disclaimer

This publication is released in the name of the WBCSD. Like other WBCSD publications, it is the result of a collaborative effort by members of the secretariat and senior executives from member companies. A wide range of members reviewed drafts, thereby ensuring that the document broadly represents the perspective of the WBCSD membership. It does not mean, however, that every member company agrees with every word.

Copyright © WBCSD, January 2012

Printer: Atar Roto Presse SA, Switzerland. Printed on paper containing 85.9% PEFC certified fiber and 3.2% FSC certified fiber. 100% chlorine free. ISO 14001 certified mill.

ISBN: 978-3-940388-84-1

Photo credits: Courtesy of member companies and Dominic Sansoni/The World Bank.

