

OPEN ACCESS  
ENERGY



Blueprint Excerpt  
Empower: People

MARCH 2017

Michael Brooks  
Nigel Moore

## Lead Authors

Michael Brooks, Nigel Moore

## Chapter Author (Energy access – the Canadian context)

Mariano Arriaga

## Researchers

Sivakumar Kuppuswamy, Scott Morton-Ninomiya, Isabelle Südmeyer

## Editors

Hayley Rutherford, Julie Wright

## OpenAccess Energy Summit

### Curator

Michael Brooks

### Facilitator

Dan Normandeau

### Strategic Advisor

Jatin Nathwani

### Lead Rapporteur

Nigel Moore

### Rapporteurs

Mariano Arriaga, Sivakumar Kuppuswamy, Scott Morton-Ninomiya

## Waterloo Global Science Initiative

*Founded in 2009, Waterloo Global Science Initiative (WGSI) is a non-profit partnership between Perimeter Institute for Theoretical Physics and the University of Waterloo. The mandate of WGSI is to promote dialogue around complex global issues to catalyze the long-range thinking necessary to advance ideas, opportunities and strategies through our Summit Series, Blueprints and Impact Activities.*



Waterloo Global Science Initiative

## Board

Dr. Feridun Hamdullahpur (Chair)

*President and Vice-Chancellor,  
University of Waterloo*

Dr. Neil Turok (Vice Chair)

*Director,  
Perimeter Institute for Theoretical Physics*

Dr. Arthur Carty (Secretary & Treasurer)

Dr. Tom Brzustowski

*Michael Duschenes  
Chief Operating Officer,  
Perimeter Institute for Theoretical Physics*

## Staff

Julie Wright

*General Manager*

Hayley Rutherford

*Content & Programming Manager*

Dana Bowman

*Operations Manager*

Jamie Cooper

Kate Pearce

*Operations Support*

## CC Creative Commons License

Attribution-NonCommercial 4.0 International  
(CC BY-NC 4.0)

*Licensees may copy, redistribute and make derivative works of this material in any medium or format for only non-commercial purposes and where the source, Waterloo Global Science Initiative, is attributed.*

Cover Photo Credits (clockwise from top):

*Julien Simery/UNESCO; CC 2.0 Flickr user*

*Helena Jacoba; UN Women/Gaganjit Singh;*

*Christopher Pollon; CC 2.0 Flickr user DIVatUSAID;*

*CC 2.0 Flickr user SteFou!*

## Design

Intent

*forgoodintent.com*

## 3. Empowered people

### Equip citizens to contribute to new energy access solutions

#### 3.1 Overview

The participation of a wide variety of talented people will be crucial to establishing global energy access. According to a report from the Miller Center for Social Entrepreneurship at Santa Clara University, between 7,000 and 20,000 new enterprises will be needed in order to eliminate global energy poverty with a market-driven approach.<sup>61</sup> These new enterprises will need to be staffed by thousands of employees, many of who have specialized training and experience. However, there is a major lack of human capital in the energy access sector because decentralized energy provision in the developing world is a relatively new concept. The need for specialized talent is most pronounced in the developing world contexts where these new enterprises must operate, adding another layer of difficulty to this capacity-building challenge.

One hidden consequence of the existing lack of knowledge is a lack of demand. End-users, politicians, civil servants and finance agencies lack knowledge about benefits, technology, market opportunities, business models, demand dynamics, and success stories. As a result, many energy access opportunities remain unexplored, and will continue to be until energy education initiatives of various kinds make the benefits and opportunities inherent in the new paradigm of universal energy access clearer to key participants, particularly the consumer.

Even with strong demand for modern energy access technologies in place, there is a significant need to train those who will be involved in their creation, diffusion and operation. The technical details of these energy systems and components, such as solar panels, wind turbines, batteries, and so on, are rarely taught in schools and colleges in the developing world. This makes it difficult to find people qualified to design, install, maintain, and repair the systems.

Another gap is in the equipping of energy entrepreneurs for success, something we consider important enough to give its own section (see page 32).

Finally, journalists and other media professionals can contribute with nuanced reporting on this dynamic global development sector, creating demand through storytelling. Although programs that educate individual communities about the benefits of energy access are useful, they are also labour-intensive. Getting information in local vernacular to the most energy deprived through local media like community radio is key, especially in countries which have widespread energy poverty in rural areas that are not reached by national media.

Each of these audiences require different sets of programs to drive capacity growth, which must be tailored to local needs and contexts in order to drive bottom-up interest and engagement.

#### 3.2 Six actions that will empower communities to access energy

##### 3.2.1 Establish demand-raising energy education initiatives

The development of new energy access projects depends upon demand. Energy-isolated communities may be unaware of the technologies available that match with their specific energy resources and community needs. By helping to provide this information, governments and other organizations can empower communities to instigate new projects and help ensure that they are sustainable over time. The work of TREC Education<sup>62</sup> and Lumos Energy<sup>63</sup> provide good Canadian examples of this strategy at work. Finding and supporting energy champions – individuals who have the skills and motivation to advance their community's energy agenda – is a powerful means to establishing a community's

61. Miller Center for Social Entrepreneurship. (2015). Universal energy access: An enterprise system approach. Santa Clara University. Retrieved from: <http://static1.squarespace.com/static/55036eefe4b0fe6c8e833e4a/t/560abee9e4b003cfd1815f5f/1443544809216/Universal+Energy+Access+-+Miller+Center+White+PaperJG.pdf>

62. TREC Education. (n.d). About. Retrieved from: <https://treceducation.ca/>

63. Lumos Clean Energy Advisors. (n.d.) About. Retrieved from: <http://indigenoucleanenergy.com/connect/about/>



voice. The model of the Young African Leaders Initiative provides a framework for helping individuals achieve skills that will help their communities.<sup>64</sup>

NGOs can also work to educate government officials, provide advice on policy and planning processes, and work with private enterprises to develop market intelligence and ensure that solutions are responsive to end-user needs. A further role for NGOs is to assist journalists and media outlets in covering energy access stories by providing support in the form of case studies, fact sheets and even financial assistance. Discourse Media, provides an example through its Power Struggle platform which – partially funded by WGSII – provides in-depth coverage of the universal human dimensions of energy poverty across the globe, from Zimbabwe to Kiribati to Transylvania.<sup>65</sup>

Finally, it should be noted that private marketing firms have been particularly effective contributors to previous consumer awareness campaigns, and a combination of public sector, private sector, and NGO-led initiatives that support sector growth through a full ecosystem approach will be the most effective way to create sustainable demand and supply.

Pioneered by Lighting Global, the World Bank's platform for supporting growth of the off-grid solar market, comprehensive consumer awareness and social marketing campaigns have emerged as highly successful market building initiatives for the energy access sector in Africa and Asia. By employing a holistic approach that both creates demand and helps distributors to meet it, Lighting Global and others have helped to fill the marketing and awareness gaps that small enterprises aren't able to address on their own.

*Find out more in our Solution Spotlight – Growing bottom of the pyramid demand with Lighting Global (page 56).*

### 3.2.2 Establish a diverse skills training portfolio

Energy access companies, and social enterprises more generally, often struggle to find the right talent. Energy access requires well-trained, skilled, motivated human resources to develop and implement energy service delivery in the most difficult markets and environments on the planet. Most countries that lack energy access also lack programs to create such a workforce. Leaders in this space include India's National Skills Development Corporation, which uses public-private and public-public partnerships to set up schemes that offer financial incentives for completing skills training. In order to avoid conflicts of interest, the rewards themselves are wholly funded by India's Ministry of Finance, and the assessment and training bodies are separate.<sup>66</sup> Though there will be no universal strategy that can be applied to all geographic contexts, but there is clearly scope for many kinds of partnership in such initiatives.

At the college level, standardized and certified training programs for technical, business and design competencies related to energy access are essential. These should be established and organized by national funding agencies and aim to offer a systematic and consistent training independent of specific company interests and components. It is equally important that manufacturers, installers and distributors of energy access hardware are consulted and included in program development. It would also be useful to establish a short course that familiarizes banking professionals with issues relating to renewable energy project finance, such as how to analyze projects that have no existing balance sheets or assets.

It is also worth pointing out that employment matchmaking sites such as the Alliance for Rural Electrification's Off-Grid Job Platform demonstrate a route to ensuring suitably qualified individuals find appropriate positions.<sup>67</sup> A post-graduate program that places bright young people inside energy access companies (ideally on a rotation basis so as to give a broad look at the industry) can also open up new

64. Young African Leaders Initiative. (n.d.). About YALI. Retrieved from: <https://yali.state.gov/yali-africa/>

65. Discourse Media. (n.d.) About Power Struggle. Retrieved from: <http://discoursemedia.org/power-struggle>

66. National Skill Development Corporation. (n.d.). Organization profile. Retrieved from: <http://www.nsdcindia.org/organisation-profile>

67. Alliance for Rural Electrification. (n.d.). Off-grid job platform. Retrieved from: <http://ruralelec.org/job-platform>



thinking and opportunities, especially when used to empower members of energy-isolated communities, whose lived experience can be a powerful catalyst for innovation.

Technical training can also be successfully integrated into broader technology transfer and diffusion programs. The SOLTRAIN project, for example, has not only developed 187 solar thermal demonstration projects across Southern Africa, but helped to develop a workforce of over 2,000 trained individuals through over 80 training courses and 25 stakeholder workshops. By undertaking a capacity-building approach, SOLTRAIN is working towards a sustainable, long-term diffusion of this underutilized technology.

*Find out more in our Solution Spotlight – Improving resilience with SOLTRAIN (page 57).*

### 3.2.3 Focus on empowering women

Women have a vital role to play in energy access. Gender equality can be significantly enhanced by access to electrical appliances that reduce the time needed to perform the household tasks such as water and fuel collection. Throughout the developing world, women currently spend three to five times as long as men on domestic chores including cooking

which exposes them to high levels of indoor pollution.<sup>68</sup> The time and energy saved by energy access and improved health outcomes will benefit them greatly, and can be channeled into education and economic initiatives, making women a powerful social and economic force and significant contributors to development. Like the ENERGIA, the International Network on Gender and Sustainable Energy,<sup>69</sup> and other organizations, we believe meeting SDG 7 will help to accelerate the completion of SDG 5's goal of establishing gender equality.

The need for such gender-focused efforts cannot be overstated. Studies have demonstrated that women face significant barriers in the quest for energy access. Female entrepreneurs, for example, encounter longer grid connection delays than their male counterparts, and are more often victims of extortion, in the form of demands for bribes to receive a connection.<sup>70</sup>

The electrification of rural communities in South Africa<sup>71</sup> and Guatemala<sup>72</sup> both produced a nine percentage point increase in female employment with no comparable increase in male employment. This increase in productive employment can be traced back to the increased efficiency in domestic chores, which frees up significant amounts of time. This has significant repercussions. According to World Bank figures, economic empowerment of women results in wide societal benefits. In Brazil, putting income in a mother's hands increases a child's survival chances by around 20 percent. In Kenya, the child will be about 17 percent taller because women tend to

68. OECD. (2014). Balancing paid work, unpaid work and leisure. Retrieved from: <http://www.oecd.org/gender/data/balancingpaidworkunpaidworkandleisure.htm>

69. OECD. (2014). Balancing paid work, unpaid work and leisure. Retrieved from: <http://www.oecd.org/gender/data/balancingpaidworkunpaidworkandleisure.htm/access/>

70. Alstone, P., Niethammer, C., Mendonca, B. & Eftimie, A. (2011). Expanding women's role in Africa's modern off-grid lighting market. Lighting Africa. Retrieved from: [http://www.esmap.org/sites/esmap.org/files/gender\\_lighting\\_highres\\_LOW%20RES.pdf](http://www.esmap.org/sites/esmap.org/files/gender_lighting_highres_LOW%20RES.pdf)

71. Dinkelman, T. (2007). The effects of rural electrification on employment: New evidence from South Africa. Princeton University. Retrieved from: [https://www.princeton.edu/rpds/papers/dinkelman\\_electricity\\_0810.pdf](https://www.princeton.edu/rpds/papers/dinkelman_electricity_0810.pdf)

72. Grogan, L. & Sadanand, A. (2009). Electrification and the household. Retrieved from: <http://microdata.worldbank.org/index.php/citations/2036>

73. wPOWER. (2014) wPower Hub Report 2013-2014. University of Nairobi, Kenya. Retrieved from: <http://wpower.uonbi.ac.ke/wpower-hub-releases-the-201314-annual-report/>



Photo credit: Julien Simery/UNESCO

invest more in health and nutrition. Empowering women economically raises agricultural productivity by around a fifth in sub-Saharan Africa. It also benefits communities and local economies. Female entrepreneurs have been shown to be twice as capable and successful as men.<sup>73</sup> They are also more socially connected, meaning that their success stories are more widely known and thus more influential in driving further interest and innovation.

Access to energy also has indirect benefits for women. Community street lighting reduces the incidence of violent attacks on women. Being able to watch television increases women's awareness of health, education, equality, and domestic violence issues. An Asian Development Bank study in Bhutan noted that less time spent on domestic chores also gave women the opportunity to attend village meetings and voice their concerns.<sup>74</sup>

As well as supporting energy access projects, governments can support gender equality efforts by creating enabling conditions to ease the flow of finance to women. A lack of legal and regulatory tools supports that address the needs of women, as well as cultural practices that, for example, limit property ownership stand in the way of women being able to access the financial tools they need to succeed.<sup>75</sup> According to the AfDB, only 16 to 20 percent of women in sub-Saharan Africa are able to access long-term financing from formal financial institutions. The median capital available to male entrepreneurs is more than twice that of women. In Kenya, women own 48 percent of small businesses, but access only

seven percent of the available credit. In response they have established a plan to create a US\$3 billion Affirmative Finance Action for Women in Africa fund to help end this disparity.<sup>76</sup>

#### 3.2.4 Establish networks that empower remote and Indigenous communities

With capacity-building initiatives like those highlighted above put in place, it is inevitable that networks of interested and mutually supporting parties will emerge. These networks, which will be of particular importance to those in Indigenous and remote communities, will become the load-bearing structure for the work of establishing energy access. It is vital that governments and NGOs act to foster and support networking efforts, so that small-scale efforts become scalable, solutions and resources are shared, and the emerging energy entrepreneurs become a powerful force in the market.

Australia's Centre for Appropriate Technology<sup>77</sup> and Canada's emerging Indigenous Clean Energy Network<sup>63</sup> are examples or organizations already working specifically to connect Indigenous communities engaged in energy project. We recommend they, and other networks for remote communities like the Arctic Energy Alliance<sup>78</sup> and the Renewable Energy Alaska Project,<sup>79</sup> continue to look for ways to link with others and establish larger knowledge sharing networks.

For a more in-depth look, see Energy access – the Canadian context on page 36.

74. Asian Development Bank. (2010). Asian Development Bank's assistance for rural electrification in Bhutan: Does electrification improve the quality of rural life? Retrieved from: <https://www.oecd.org/countries/bhutan/46757667.pdf>

75. Jideonwo, J. (2016). Getting women off the financial sidelines: Initiatives for gender equality in Africa. African Development Bank Group. Retrieved from: <https://www.afdb.org/en/blogs/investing-in-gender-equality-for-africa%E2%80%99s-transformation/post/getting-women-off-financial-sidelines-initiatives-for-gender-equality-in-africa-15546/>

76. AfDB. (2016). Is it what they need? Experts debate AfDB's new affirmative finance action for women in Africa. Retrieved from: <http://www.afdb.org/en/news-and-events/article/is-it-what-they-need-experts-debate-afdb-s-new-affirmative-finance-action-for-women-in-africa-15748/>

77. Centre for Appropriate Technology. (n.d.). Our Story. <http://www.cat.org.au/who-we-are/>

78. Arctic Energy Alliance. (n.d.). About us. Retrieved from: <http://aea.nt.ca/about-us>

79. Renewable Energy Alaska Project. (n.d.). About Renewable Energy Alaska Project. Retrieved from: <http://alaskarenewableenergy.org/index.php/about-reap/>

#### 3.2.5 Share experiences and resources across development sectors

There are several opportunities for governments to avoid re-inventing the wheel by integrating resources and expertise for energy access with other areas such as healthcare, education, sanitation, and agriculture.

For healthcare professionals, the return on investment in energy access will be significant. Many healthcare issues cannot be adequately resolved without the communities in question establishing reliable access to electricity. From refrigerators that keep vaccines from spoiling, to properly-lit operating theatres, to clinics that can safely operate during the hours of darkness, energy is vital to effective healthcare. Beyond the hospital, domestic refrigeration facilities reduce the occurrence of food poisoning, electrically-operated water-pumping and sanitation stations help prevent outbreaks of dysentery, cholera and other water-borne diseases and modern, reliable electrically-powered agricultural processing equipment reduces the incidence of workplace accident and injury. All these measures reduce the burden on healthcare services.

Healthcare professionals have significant experience that will benefit energy access programs. Even basic healthcare innovations often have to be 'sold' to communities through health education programs. Similar education initiatives are necessary for energy access programs. Health education professionals who have worked in the same communities will already have a good sense of what matters to them, and how new opportunities are best presented. To ignore this wealth of expertise is to waste a valuable resource.

Education, too, is widely seen as a pillar of economic and social development, and the providers generally have extremely high standing within their communities. As such they are valuable allies in establishing positive attitudes towards energy access projects. They also understand the way people within a local community think, and what is valued. That means they will be useful consultants when developing strategies for establishing and maintaining energy services in a particular community.

As with healthcare, education services stand to benefit enormously from energy access. The presence of electric lighting makes after-dark teaching and learning possible, radically extending the school day. Internet access, which relies on electricity access, facilitates learning from and communication with the wider world. The need to train local operators, technicians and service personnel for energy infrastructures means that establishing energy access also opens up new opportunities for course and curriculum development, potentially augmenting an educational institution's income.

Collaboration between energy access and agriculture programs would also be mutually beneficial. Agricultural activities that seek to add value to the supply chain of agricultural produce tend to require electricity for processing. A generic example is the freezing of produce to enable overseas shipping to larger, more lucrative markets. A specific example is the work of Promethean Power Systems, which provides thermal battery chillers that allow cows' milk to find a market beyond the immediate locality of rural dairy farmers in communities where access to electricity is intermittent.<sup>80</sup> Developing this technology, which is slightly more expensive than running a diesel generator to power a conventional refrigerator, involved liaising with both farmers and those who might be willing to lease access to electricity supplies serving infrastructure such as mobile phone masts.

Many farming-focused development projects have put considerable effort and resources into communicating the benefits of their innovations to end-users. This experience is a resource that those seeking to establish energy access projects would do well to tap.

NGOs and academic institutions should also be encouraged to partner with those who have on-the-ground experience. In particular, designers of technological solutions need to work closely with, and in proximity to, end-user communities in order to ensure the real-world value of their products is optimized. Design-to-value is an under-exploited paradigm that can be applied to development technology.<sup>81</sup> Research should be embedded within end-user communities – who are ultimately the experts in value assessment – and employ the principles of iterative design in order to ensure products are fit for purpose.

80. Promethean Power Systems. (n.d.) About us. Retrieved from: <http://cooelectrica.com/about-us/>

81. Fritzen, S., Nick, H. & Wullenweber. (2013). Capturing the full potential of design to value. McKinsey. Retrieved from: <http://www.mckinsey.com/industries/consumer-packaged-goods/our-insights/capturing-the-full-potential-of-design-to-value>

Small energy access companies often lack the funds necessary to pay salaries that can attract strong foreign talent. On top of this, it is often difficult to convince those in the developed world to commit to moving to a developing country.

### 3.2.6 Establish incentives for premium workers

For understandable reasons, the best young graduates in the developing world are often attracted to high paying jobs in finance or the development sector. It can be extremely difficult to attract local talent to work at a start-up which is inherently less stable than a larger, more established business. What's more, many talented mid-level managers leave the country for what they perceive as better opportunities.

This barrier is not just about home-grown talent, however. Small energy access companies often lack the funds necessary to pay salaries that can attract strong foreign talent. On top of this, it is often difficult to convince those in the developed world to commit to moving to a developing country.

Several strategies could be used to draw highly skilled workers into the energy access sector. One is to establish a pool of funds that could subsidize salaries of highly qualified repatriates who have moved abroad but want to come back, but are discouraged from doing so by higher salary expectations. Some universities already operate such a system, though not for energy access purposes. Convincing people to repatriate for longer periods is particularly difficult, and might benefit from an NGO or government-led recruiting platform that vets candidates and connects only the best current or recently-graduated students with energy access jobs would be immensely valuable. This could be paired with a funding pool that would act as a merit-based scholarship for candidates, funding a stipend to incentivize more talented people to work in this field. It is worth noting that a climate of increasing investment in a field – green technology, for example – encourages skilled workers to take note of the enhanced job prospects and move into that area, often without specific lures.<sup>82</sup>

Taking the idea further, universities or other organizations in the developed world could sponsor scholarships that enable high achieving college students from low energy access countries to study abroad for graduate school for one or two years – ideally, with a commitment to return and work in their home country for a specified minimum period. These students could be paired with peer mentors in their program or in the field. Precedents for this, the MasterCard Scholars Program,<sup>83</sup> the Carnegie-Mellon Innovators Forward Fellowship Fund,<sup>84</sup> and the SMART Africa Scholarships Fund,<sup>85</sup> are already in operation. Although this scheme does not specify the area of study, it will be critical for a similar energy access program to specify the areas of study particular to energy, such as public policy, electrical engineering or entrepreneurship. Such a program could stipulate that students return to their home countries after their studies. It could also partner with ministries of energy and rural electrification authorities to create positions for graduates of the program. This would create a capacity-building engine that recruits, develops and retains top talent where it is needed most in the energy access sector.

Such a program could imply graduate exchange programs between universities, offering experience and knowledge gained in countries that have already implemented off grid systems successfully. It could also lead to more effective knowledge transfer between academic and practitioner institutions in the developed and developing world.

82. OECD. (2011). Towards green growth. Retrieved from: <http://www.oecd.org/env/towards-green-growth-9789264111318-en.htm>

83. MasterCard Foundation. (n.d.). The MasterCard Foundation scholars program. Retrieved from: <http://www.mastercardfdn.org/the-mastercard-foundation-scholars-program/>

84. Carnegie Mellon University. (2014). Carnegie Mellon University launches fund to accelerate engineering education in Africa. Retrieved from: <https://www.cmu.edu/rwanda/news/2014-12-04-cmu-launches-fund.html>

85. Smart Africa. (n.d.). Smart Africa scholarship fund. Retrieved from: <https://smartafrica.org/?Smart-Africa-Scholarship-Fund>