

A Road Map for Energy Access and Development: Lessons learned in Chile for Developing Countries

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ABSTRACT

Today's world dependence on energy, particularly on fossil fuels, is an issue that for many countries imply complex issues regarding energy security locally and globally. As we see that today still there are countries where a sizeable amount of their population does not have access to any form of energy. How we provide energy access and develop the energy matrix is not neutral regarding the countries energy costs and their energy security.

Since the second half of the 19th century we have witnessed a growing use of fossil fuels, first coal, then oil and now natural gas. Most of the increase in energy consumption took place in countries that made the journey to become industrialized countries, particularly the Organization for Economic Cooperation and Development (OECD) countries. By the end of the 20th century, OECD countries accounted for 55% of world energy consumption, with only 19% of the world population, and a 60% of world Gross Domestic Product (GDP) (PPP). Today, the world population has reach over 7.4 billion people and our modern economy is every day more addicted to energy. The International Energy Agency (IEA) forecasts that energy consumption in the world will grow close to 40% by 2030 and non-OECD countries will grow close to 60%. It is interesting to mention that the energy consumption in non-OECD countries has grown over 65% since 2000. In this regard, the effect of population growth over the economy of countries has had its impact. The average energy consumption per capita in countries outside the OECD is ¼ of the level of the member countries of the OECD. If non-OECD countries increased to 1/2 of the OECD scale, global energy consumption will increase more than 50%. This will have a dramatic impact over the world economy showing new challenges as are Green House Gases (GHG)

emissions, global warming, environmental impacts, migration, etc. To attract the capital to finance the needed investments, countries need to build a proper and attractive business environment.

If we consider energy access as more than a first supply to a household involving also consumption of a specified minimum level of electricity, the amount varies based on whether the household is in a rural or an urban area. Despite the values, the higher consumption assumed in urban areas reflects specific urban consumption patterns. Both are calculated based on an assumption of five people per household. In rural areas, this level of consumption could, for example, provide for the use of a floor fan, a mobile telephone and two compact fluorescent light bulbs for about five hours per day. In urban areas, consumption might also include an efficient refrigerator, a second mobile telephone per household and another appliance, such as a small television or a computer.

Modern energy services are crucial to human well-being and to the economic development of a country, for the provision of clean water, sanitation and healthcare and for the provision of reliable and efficient lighting, heating, cooking, mechanical power, transport and telecommunications services as well. It is an alarming fact that today *nearly 1.3 billion people are without access to electricity and that 2.7 billion people rely on the traditional use of biomass for cooking*, which in addition causes harmful indoor air pollution.

Energy access is a key factor for social and economic development; a private sector enabler, with a non-subsidiary government. This entails areas such as social mobility, health, food preservation, education, safety and security, integration through communications, entertainment, extension of working and study hours, a window to the world, productive activities, and savings among many others.

By the end of the last decade, the importance of energy access is recognized as crucial to human development - on a personal, national and global scale. In 2011, the United Nations (UN) Secretary-General Ban Ki-moon shared his vision for making sustainable energy for all a reality by 2030, and launched SE4ALL initiative. This initiative has three primary goals by 2030: achieving universal energy access, doubling the annual rate of energy efficiency, and doubling the share of renewables in the global energy mix. Per the former UN Secretary, *"Universal energy access is a key priority on the global development agenda. It is a foundation for all the*

Millennium Development Goals", which lead to consider energy access within the sustainable development goals approved in 2016.

As we develop a Road Map for energy access and development, we must underscore that the Chilean Experience in Energy Access has been mostly driven by a privatized energy sector. Historically, before the 1980s the main objective of the Chilean law was to provide energy access to the main human settlements, and to interconnect the different regions of the country taking advantage of the hydro resources that existed. Since the 1980's decade, the Chilean electric sector is privatized and split into Generation, Transmission and Distribution. At that time the first systematic public policy efforts to improve energy access in the rural areas took place. An investment program (with IADB funds) helped, since 1986, finance rural electrification projects using social evaluation techniques for private projects. This opened the opportunity to subsidize investment by private companies.

In this context, private investments were encouraged and laws were put in place aiming to provide reimbursable financial contributions. Later, in 1994 and 2008, rural and social energizing programs, as are the Rural Electrification (PER) and the Rural and Social Energizing (PERYS) Programs were put in place. While PER was designed to promote rural electrification through profitable private investment, PERYS was designed to reduce the gap in education in rural areas, and to provide electrified health centers. In addition, they implemented small scale projects to improve energy access, through technology transfer and technical education. In 2010, the newly created Ministry of Energy, incorporated an Access and Energy Equity Division. Its objective was, and still is, to create the necessary conditions that will allow people of the country equal access to energy through the coordination, development and implementation of programs, projects, policy and technical advice provision. Other divisions, centers and agencies were created to complement on the equal energy access opportunity. Today the percent of houses with electricity in the rural areas is above 98%.

Chile is a very mountainous country with very different climates, and therefore not all the projects, technologies, and initiatives will apply to every region. Consequently, the programs needed to be geographically adapted. It is necessary to mention that no technology, or specific solution, can be chosen as the one that will help to address most of the issues of energy access at hand.

In this work, we expand on the mentioned programs, and extend on how to build additional value regarding the role of the private sector in the development and operation of the power grid, the expansion of the network to rural areas, and the development of stand-alone of mini and micro grids, developed and operated by the private sector. We provide a Road Map model that collects the Chilean experience. Some very interesting results are shown. The importance of such models are discussed in the frame of a favorable business environment that meet the needs of the poorest. Their impact on public finances and government budget, and on the maintenance and operation of systems are shown.

Using our Road Map, we examine the opportunities and possibilities for other country, as Africa. We performed an international comparative analysis showing the potential advantages of the private sector over state systems. Very interesting results are obtained, and the effect on the GDP is discussed. The Road Map is "technology neutral" meaning that no "preconceived" ideas in favor of one or another technology for either Energy Access and Energy Efficiency are forced. Many are the problems to analyzed and tackled, with their corresponding challenges. They include: regulatory framework for the operation of small isolated systems, permanence of subsidies, other potential energy needs, the need for a minimum standard for power supply, the role of multilateral agencies, attracting investment and new business environment, the rule of law, regulatory regime, private property, the economic and technical aspects associated to potential projects. The results are promising.

In addition, some key challenges for energy access for all are discussed: On-grid off-grid, Energy subsidies for se4all, institutions matter, history and the new Energy Ministry of Chile. Planning, technical assistance, execution and control, community's participation, institutional capacity, and the policies in place. We include the strategies, programs to follow and the needed investments in small projects as well as the impact in isolated areas, education and training, and the provision information access.

Finally, we discuss how the energy pillars established as policy, the infrastructure, the roadmaps to follow, certifications, training, the healthy economy, among many other issues, are a winning formula to push and propel a country towards development. The pillars behind our approach are of pro-business and technology neutral, in a private sector context. We do not take sides neither towards some technology nor we adopt any marked position towards carbon dioxide issues.

We believe that the Chilean experience, with a leading private sector anchor, has a tremendous amount of value as it shows, as one of its main results, that having energy access as one of its fundamental pillars. This has proven to be a fundamental component of the needed fuel to propel the country towards development.