The Smart grid: adopting new concepts for infrastructure to power Africa's emerging industrial revolution

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ABSTRACT
African economies are emerging among some of the world's best performers and set on course for imminent industrial revolution. This will however require more secure and affordable electricity supplies among other infrastructure. The centrally controlled power utility model as conceived by Nicola Tesla in the1880's has served the world well for just over a century and a quarter and been pivotal in the evolution of currently developed economies. But with emerging 21st century demands such as efficiency, environmental sustainability and consumer choice the model is reaching its limitations. Towering power lines traversing the countryside have traditionally presented imagery of development and advancement but are very capital intensive and incur massive power losses. A whole range of ecological and biodiversity issues along the routes of large power lines are also well documented. Solutions for development in the developing world need not follow the same path as the developed world. Instead, relevant technical solutions for advanced applications in the developed world can be used to leapfrog intermediate technologies and applied directly, with benefit to the developing countries. New trends are emerging both in energy supply economics and power management technologies. The most popular theme is the Smart Grid. The vision is comprised of three key elements namely, consumer empowerment, grid integrated distributed renewable resources and intelligent network logistics. The use of distributed resources particularly aims to reduce the need to invest in transmission infrastructure by positioning power generation closer to the load centers. In this paper the authors show through a case study of Tete province (Mozambique) that rather than taking generators to the load, new industrial centers should instead be built close to energy resources. Savings from the deferred transmission infrastructure could instead be used to construct manufacturing industry. Africa is particularly advantaged because unlike the developed world it does not have old infrastructure backlog. This presents a golden opportunity to plan using modern scientific concepts.

Keywords: Smart grid; renewable energy; distributed generation; power grid planning; infrastructure