FROM DARKNESS TO LIGHT: THE FIVE 'Ds'CAN LEAD THE WAY

Green energy and digitization of services today provide a great opportunity for inclusive growth – going beyond mere electrification. The five Ds of power management can help achieve this.

Technology makes the world a smaller, better place. Much of our 21st century sophistications are attributable to advances in technology. But even today, people across vast swathes of the planet seem to be living in the dark ages. Almost 1.3 billion people do not have access to electricity. If the statistic is staggering, the solutions beg a leap of faith and technology – energy from the sun for one hour suffices to meet the world's requirements for an entire year. However, less than five percent of the world's energy requirements are powered by renewable sources. The issue at stake is not mere electrification, but a mission for inclusive growth.

The demand for power is growing exponentially. Limited access to power inhibits development. Elsewhere, an increase in population, economic, and industrial growth, along with a rise in per capita energy consumption due to lifestyle changes, are intensifying the load on the power infrastructure. The concerted effort of industries such as automobile to reduce the carbon footprint by replacing fossil fuels with

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electricity is further driving the demand for power.

Policymakers need to ensure equitable distribution of energy supply, decouple carbon emissions from economic growth, rationalize domestic consumption as well as industrial demand, and foster sustainability of power companies. It can be achieved by focusing on the five Ds (democratization, decarbonization, deregulation, decentralization, and digitization).

Democratization

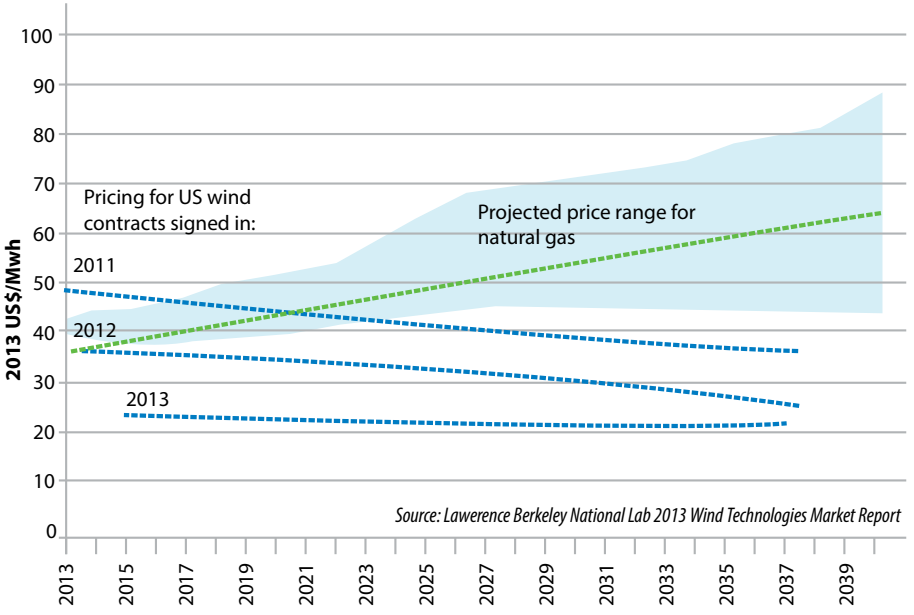
Democratization of energy supply facilitates access to power as well as flexibility to choose the source of power. Sustainable energy boosts economic growth and creates employment in emerging economies. In places with 24x7 power supply, the approach of consumers to renewable energy has changed dramatically over the years. In the formative stages when the price of 'green' power was high, providers offered incentives to consumers to boost demand. But today, consumers in the US, Australia, and Europe are prepared to pay a higher tariff per kilowatt-hour for power from wind turbines and solar farms.

Small-scale or distributed generation is an efficient mechanism to democratize supply across markets. Initially, the cost-effectiveness, flexibility, and scalability of renewable energy were a cause of concern. However, utility-scale wind and solar power projects are now viable due to the sharp decline in the price of solar panels and wind turbines. Additionally, rapid innovation in battery technology to drive consumer level and small-scale storage will further revolutionize this field.

Deutsche Bank expects solar energy to reach grid parity in 80 percent of the global market by 2018. The cost of wind energy is predicted to be below natural-gas-based power in the future (Figure 1). Grid parity with conventional energy sources empowers environment-conscious consumers to reduce their carbon footprint without paying a premium for `green' power.

Wind energy's cost

Recent wind energy prices are **competitive** with expected future cost of burning fuel in **natural gas** plants.



With no fuel cost and zero emissions, wind power provides **clean energy** with long-term, **stable pricing** and serves as a **financial hedge** against fossil fuel price volatility and potential future carbon pricing or regulations.

Figure 1: Cost of wind energy

Decarbonization

Coal-based power plants produce only about 40% of the total energy, but are responsible for more than 65% of carbon emissions. Some power plants have replaced coal with fossil fuel alternatives driven by technological advances in extraction that ensure an abundant supply of oil and gas. Natural gas is a much 'cleaner' source than coal, when methane leakage is circumvented. However, environmentalists warn that the rate of decarbonization needs to be accelerated to achieve the greenhouse gas (GHG) emissions target set by the US and Europe at 80% by 2050.

Further, distributed generation provides affordable and reliable energy, while mitigating carbon emissions and spurring economic growth. Bloomberg New Energy Finance expects global investment in solar installations to increase from the current 2% to 35% by 2040. Countries with rich oil and gas reserves, including Saudi Arabia and the United Arab Emirates, have undertaken programs to improve energy efficiency and reduce GHG emissions significantly.

Along with all this, the power infrastructure needs to be revamped. A majority of the existing power installations will continue to be operational in 2050 while being less productive. Public-private partnerships (PPPs) can better mobilize funds required to transition to a decarbonized energy system. The entrepreneurial skills, project costs, and financial as well as technical risks of large-scale energy projects are best managed by the PPP model.

Deregulation

The energy industry does not provide a level playing field yet. Conventional energy is subsidized in many markets and consumer segments. A conducive policy framework is a prerequisite for clean energy. Government energy policies should foster innovation as well as investment in utility-scale technologies to phase out carbon-intensive production facilities. The potential of solar, offshore and onshore wind, biofuels, marine, and geothermal energy can be realized only with institutional finance as well as regulatory support.

The collapse of two leading solar panel companies – Mark Group and Climate Energy – following a series of subsidy rollbacks in the UK, suggests that the energy sector needs all-around support to realize the 'green energy' vision. Political consensus on reducing GHG emissions to mitigate climate change augurs well for the renewable energy sector. At the United Nations Climate Change Conference in Paris, in December 2015, government and business leaders made a commitment to accelerate energy transformation. Initiatives of the 'Lima-Paris Action Agenda – Focus on Energy' conference will boost energy access and help achieve sustainable development goals by providing a productive and transparent working environment for companies.

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Simultaneously, initiatives such as the US Clean Power Plan and 'Reforming the Energy Vision' (REV) in New York State address regulatory obstacles and market uncertainties. However, high-level strategies are not sufficient. Global standards to measure and verify real-time energy savings need to be developed. Incentives to encourage replacement of power-guzzling home appliances and industrial equipment with more efficient products are required. Significantly, holistic programs are required to modernize legacy power infrastructures.

Decentralization

The industry has achieved Zero Distance with convergence of the points of generation and consumption. Investment in 'clean' energy sources is growing exponentially (Figure 2). Microgrids and onsite power systems allow enterprises, commercial establishments, and

residential consumers to become self-reliant. More importantly, it reduces overheads and even empowers consumers to sell excess power to the electric grid.

However, the ability to store energy holds the key to decentralization of electric power. Excess energy generated, whether from rooftop solar panels in a home or a wind farm, requires large-scale energy storage systems. At the 2015 Climate Change Conference in Paris, several governments promised to increase research funding for clean energy. Business leaders including Bill Gates and Elon Musk, and agencies such as Advanced Research Projects Agency-Energy (ARPA-E) are building grid-scale batteries that will also reduce the cost of energy storage.

In May 2015, Tesla's wall-mounted Powerwall batteries to store energy from solar panels at home were reported to be sold out within 10 days. The company plans to launch a more efficient version of the battery by August 2016. In a recent announcement, they clearly articulated their focus on the 7 kWh battery which is designed to integrate with solar panels.

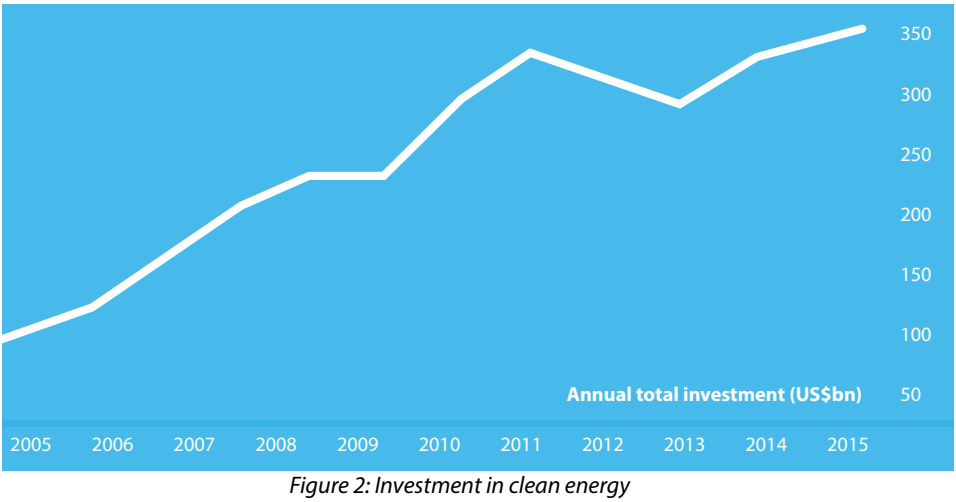

Figure 2: Investment in clean energy

Source: Bloomberg New Energy Finance

Digitization

A 10% reduction in power consumption will reduce carbon emissions by 18% and a 20% reduction in consumption will reduce 48% emissions by 2050, according to Bain & Company. A technological ecosystem can help companies and cities identify energy solutions and ensure the success of energy efficiency initiatives. Further, digital tools and collaboration between stakeholders can drive research and development in achieving an optimal energy mix.

The Internet of Things (IoT) simplifies demand management by integrating diverse points of power consumption. Real-time data from heating, ventilation, and air conditioning (HVAC) systems, industrial equipment, and gadgets help optimize power consumption. For instance, EnerNOC's energy intelligence software helps control electricity consumption in buildings, plants, and production lines. Analytical solutions predict consumption and combine it with weather data to capitalize on renewable sources. Energy management products empower customers to minimize demand and make informed decisions to reduce electricity bills.

Although smart meters and IoT enhance the distribution infrastructure, they increase the risk of data breaches and service blackouts. Security incidents cost the power and utilities industry US$1.2 million in 2014, according to 'The global state of information security survey 2015' by PwC. Advanced security solutions identify vulnerabilities and protect applications, databases, and the network from physical and cyber attacks.

The utility industry needs to be more responsive to the acute energy deficit as well as the preference of the millennial generation for greener energy. The sustainability of utility enterprises will be determined by how smartly they harness, store, and distribute energy.

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Ashiss heads Utilities for the Americas at Infosys. Ashiss's areas of interest include application of business intelligence and analytics for process agility and customer loyalty, solutions for grid transformation, and the evolving workforce. He is a keen observer of technology trends and how they impact the energy ecosystem.

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