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India's fortnightly focus on electronics design

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Green Power: In harmony with our home

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Our world today lives and thrives on the use of oil. The United States alone consumes oil worth nearly Rs.5,062 crore (\$1 billion) a day. Our economies are focused on accelerated growth, consumerism and industrialisation causing extensive irreparable damage to the earth.

The scientific community has been discussing global warming and its ill effects for the longest time. For many years it seemed like a constant drone of the bees that the common man could not care about. The reason was that the man on the street did not

understand the ramifications of his actions towards the earth and he thought that there was really nothing he could do as an individual to conserve the environment. So, is this the end? Will we survive the end we have created for ourselves? The answer should be "yes."



Rahman: Will we survive the end we have created for ourselves?

A lot of countries are already looking at creating sustainable economies that conserve the planet. This can be done by utilising natural resources like water, wind and solar energy in our day-to-day applications thereby reducing our dependence on conventional sources, like fossil fuel, and ultimately eliminating the harmful effect of greenhouse gases.

Renewable energy includes resources that restore themselves over short periods of time and do not diminish. Such include the sun, wind, moving water, organic plant and waste material (biomass), and the earth's heat (geothermal).

Severe shortage of power is one of the greatest obstacles to India's development. Over 40 per cent of the country's people, most living in the rural areas, do not have access to electricity and one-third of

Indian businesses cite expensive and unreliable power as one of their main business constraints.

India today is focusing on renewable resources that are expected to play a key role in accelerating development and sustainable growth in the country. Among the renewables, power generation from wind has emerged as one of the most successful programmes in India and has started making meaningful contributions to the overall power requirements of some Indian states. The total installed capacity of wind power is over 9,000MW, making India the fourth largest wind power generator after Germany, United States and Spain.

With 15 manufacturing companies, India now has a good local production base for wind turbines.

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Tool-box simplifies life cycle assessment

By Flora Vadas and
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Designers create, environmentalists scrutinise. Although much progress has taken place towards re-cycling, not only materials, but also knowledge from envi-

ronmental experts to designers, eco-design is still a concept in the making.

When developing an eco-design product, the designer should consider the environmental impacts throughout the product's life cycle, i.e. its manufacture, transport, use and End of Life (EoL). Studies that provide such data are called life cycle assessment (LCA), and have grown into a field of their own with specific expertise. Thus, there is a well-defined need to integrate LCA knowledge with product design. As the Eco-Design of the Energy Using Products (EuP) directive (2005/32/EC) puts

it, "considering at the design stage a product's environmental impact throughout its whole life cycle has a high potential to facilitate environmental improvement in a cost-effective way".

In this article, a tool-box that was developed as part of a project for the European Copper Institute will be presented. The tool-box enables designers to gain easy access to expertise in the field of LCA. The tool-box is, in fact, a model complex with an easy-to-use interface that calculates environmental profiles of products. To assess options, changes

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The capital cost of wind power projects is about Rs.6.5 crore per MW on turnkey basis and the Indian government has introduced a package of incentives, which includes tax concessions such as 100 per cent accelerated depreciation, tax holidays for power generation projects, soft loans, customs and excise duty reliefs, and liberalised foreign investment procedures.

Cheapest renewable

Hydropower is another renewable, economical, non-polluting and environmentally benign source of energy. Hydropower stations have the inherent ability for instantaneous starting, stopping, load variations, and help in improving the reliability of power systems. At the end of 2008, India's installed hydroelectric capacity was over 36,000MW or about 25 per cent of the total generation capacity. The government has set the target for India's optimum power system mix at 40 per cent from hydropower and 60 per cent from other sources.

While hydropower plants have large up-front capital costs, they also have a long and productive life, which significantly helps reduce costs over time. For instance, the Bhakra Nangal plant, now more than 40 years old, has operating costs of only Rs.0.10 (\$0.002) per unit. Hydropower plants are thus generally cheaper in the long run than natural gas-based plants, which are constantly

at risk from fuel price increases in the global market.

While India plans to develop mainly run-of-the-river projects, multipurpose hydropower plants with water storage facilities can help manage critical water resources by controlling floods and serving as sources of irrigation and much-needed drinking water. The environmental and social impacts of hydropower are significant and need to be addressed.

Supporting solar

Another renewable energy resource that India has in abundance is solar power. It converts the sun's energy into a pollution-free source of heat and electricity. Solar power has spread from homes and rural India into businesses, industry and power plants. Solar energy can also be tapped for many of the modern conveniences of life, from highway signs to automated teller machines. To tap this infinite energy source, and transform as well as transmit it to each household, the Indian government is promoting the use of solar energy.

Due to its geophysical location, India receives solar energy equivalent to nearly 5,000 trillion kWh/year, which is far more than its current energy consumption. But India produces a negligible amount of solar energy—a mere 0.2 per cent compared to other energy sources. Power generation from solar thermal energy is still in experimental stages in India. Up until recently, India's energy

base was focused on conventional energy. However, the country has now attained seventh place worldwide in solar photovoltaic (PV) cell production and ninth place in solar thermal systems.

The Ministry of New and Renewable Energy has initiated schemes to accelerate utilisation and exploitation of the solar energy. A number of incentives like subsidies, soft loans, 80 per cent accelerated depreciation, concessions on import duty towards raw materials and certain products, and excise duty exemption on certain devices/systems are being provided for the production and use of solar energy systems.

Thirty two grid interactive solar PV power plants have been installed with financial assistance from the central government. These plants, with an aggregate capacity of 2.1MW, are estimated to generate about 2.52 million kWhr/year.


In 1995, four lakh square metres of solar collectors were installed in the country for thermal applications such as water heating, drying and cooking. For rural electrification as well as employment/income generation, about 16,530 solar photovoltaic lighting systems were installed during 2004-05. Over 1.5 lakh square metres of collector area has been installed in the country for solar water heating in domestic, industrial and commercial sectors, making the cumulative installed collector area over 10 lakh square metres.

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The Integrated Rural Energy Programme had by early 2006 used renewable energy to served 300 districts and 2,200 villages. More than 250 villages in seven states were electrified under the programme during 2005, with additional projects under implementation in over 800 villages and 700 hamlets in 13 states and federal territories. Rural applications of solar PV had by then increased to 3.4 lakh home lighting systems, 5.4 lakh solar lanterns, and six lakh solar cookers.

Solar challenge

Several barriers remain despite high market penetration rates:

- High investment costs
- Land use concerns
- Inadequate policy and economic incentives

A robust national policy for India, comprising tax incentives, subsidies, price reductions, public education campaigns, user training, carbon credits and a higher penetration of renewable energy sources could play a major role in reducing fossil fuel use.

The continued use of conventional power resources will cause, even catapult, global warming. The answer to our unending list of needs is to use the abundant supply of alternative clean energy. As members of the human race, we need to be conscious of our dependence on fossil fuel and adopt newer green ways of living to build a safe, progressive and secure future for the coming generations. ■

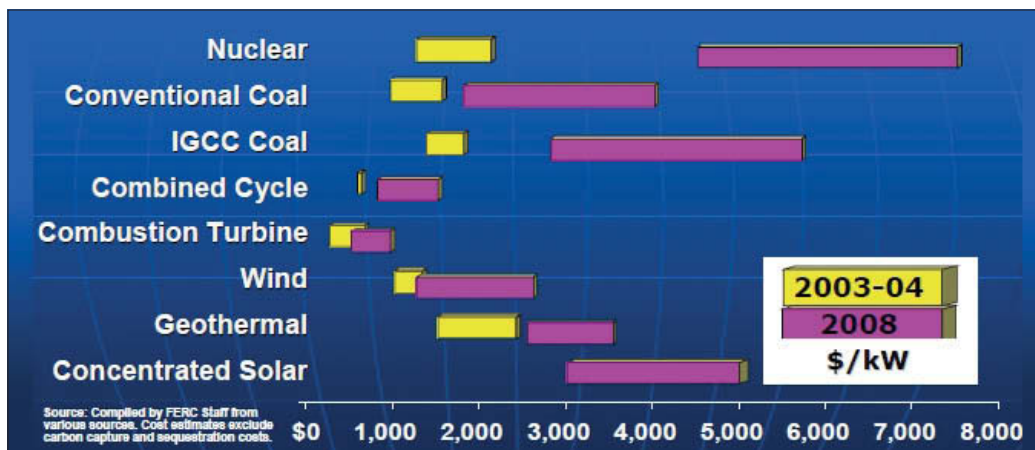


Figure: Increasing costs in electricity markets. Source: [U.S.] Federal Energy Regulatory Commission.