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RESEARCH ARTICLE

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## Enhancing energy efficiency techniques and strategies

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**Abstract:** Renewable energy and energy efficiency play a vital role in making our food, water and energy systems more sustainable, as well as reducing the strain between the three. Renewable energy and energy efficiency are essential for managing water resources and food production in a more socially and environmentally-responsible way. Consumers are playing an important role by increasingly exercising more involvement in energy decisions as illustrated by the growing number of distributed renewable generation systems and energy efficiency improvements at homes and businesses.

**Keywords:** energy efficiency improvements, cleanest and most economical energy resources, technological breakthroughs, energy efficiency projects

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**1 Introduction:** Energy efficiency means doing more with less - so we maintain or exceed performance while saving both energy and money. Energy efficiency can help meet the country's growing demand for energy just as well as oil, gas, coal or uranium can. It is the fastest, cleanest and most economical energy resource we have. The wide range of technological opportunities include lighting, building design and performance, vehicle miles per gallon, and industrial processes. In terms of energy policy, efficiency is often referred to as the low-hanging fruit.

Experts predict a 5 to 15 percent reduction in electricity demand by 2020 through energy efficiency. Coupled with demand response to manage electricity use, an additional reduction of 7.5 to 15 percent in peak demand could be achieved. With endless possibilities for projects, the future of energy efficiency looks promising. Technological breakthroughs have increased efficiency and performance for everything from household items to industrial processes. Increasing energy costs have increased demand for energy efficient products. Often the energy efficiency improvements have been coupled with water efficiency improvements, as demonstrated in high efficiency clothes washers. Improvements in LED lighting have greatly increased the use, aesthetics and application of that technology. Overall, expect more applications of energy efficiency as program, policy and technological barriers are broken down.

**2. Vast Potential of Energy Efficiency Market:** The overall size of energy efficiency market is estimated to be Rs. 74,000 crores. Till now, only 5% of this market has been tapped through Energy Service Companies (ESCOs) mode mainly in the areas of lighting and some industrial applications and the large-scale implementation of energy efficiency is constrained by a number of important regulatory, institutional and financing barriers. The concept of performance contracting implemented by Energy Service Companies (ESCOs) is being increasingly considered as a mechanism to overcome some of the barriers hindering and discouraging the large-scale implementation of energy efficiency projects. However, despite the fact that the potential for application of performance contracting in both the public and private sectors in developing nations is enormous, the growth of the ESCO industry has been particularly slow in the country. In order to develop a viable ESCO industry, Ministry of Power has set

up Energy Efficiency Services Limited (EESL), a Joint Venture of NTPC Limited, PFC, REC and POWERGRID to facilitate implementation of energy efficiency projects. EESL will work as ESCO, as Consultancy Organization for CDM, Energy Efficiency, etc.; as a Resource Centre for capacity building of SDAs, Utilities, financial institutions, etc. EESL will also lead the market-related actions of the NMEEE.

**3. Strategies for Maximizing Energy Efficiencies and Reducing Energy Costs:** Achieving world-class energy performance requires companies to gain a granular visibility of where one can save and closely monitor the impact of energy efficiency initiatives being implemented. This enables to maximize the investments made in energy efficiency and security through an integrated approach across the energy management lifecycle, including diagnostics, metering and monitoring, energy efficiency implementation, tracking reporting and verification.

- **Energy Audits:** Conduct detailed energy audits of facilities to identify energy efficiency initiatives and support in the development of business cases.
- **Energy Management Assessments:** Perform detailed assessment of metering and monitoring infrastructure and recommend an approach for integrated energy management platform for facilities, data centers and manufacturing plants.
- **Integrated Energy Management Platform:** Design and deploy an integrated energy management platform that covers all type of facilities and energy sources across the enterprise operations.
- **Green Data Center Audits and Power Usage Effectiveness (PUE) Management:** Get support in four different ways:
  - Supply-side energy management to identify an optimal energy mix of conventional, captive and renewable energy sources
  - Power usage effectiveness and data-center cooling through real-time power dashboards and thermal heat-load models
  - Analytics-led IT infrastructure transformation, to mitigate inefficiencies in basic IT operations and network systems and servers
  - Energy efficient building infrastructure management, including lighting, cooling, heating, “green” building and procurement strategy
- **Renewable and Low-Co<sub>2</sub> Energy Sourcing:** Support organizations to arrive at an optimal energy mix, considering the relevant policies and technology maturity of alternative energy resources

#### **4. Improving the Wind Energy’s Competitive Edge:**

Wind energy, one of the cleanest sources of power, is sharpening its competitive edge; producers are becoming steadily adept at harnessing the world’s wind resources and getting the energy to consumers. With this combination of intensifying competitiveness and light-weight climate impacts, wind power is already making a powerful strategic contribution to efforts to conquer one of the world’s most pressing challenges: the creation of a secure, affordable and sustainable energy mix. Wind energy is the lowest carbon emitter along its lifecycle; it has the shortest energy payback time; and it is one of the most cost-effective ways of introducing renewable energy into the grid. By 2030, wind power’s share of global electricity demand could reach 20%, with annual installations nearly matching the total global capacity registered at the end of 2010. The expected growth of large offshore wind installations is becoming a key driver; another is the repowering of old wind farms with larger, more efficient turbines. As technology and sector competence gather strength and push down costs, and as the appetite for non-fossil energy picks up, the industry can be expected to continue its forward-march.

#### **5. Accelerating Materials Development for a Clean Energy Future:**

Affordable, reliable, high performance materials are key enablers for countless transformational technology advancements, including clean-energy applications. However, many materials discoveries

made in the laboratory today never reach widespread market deployment, or spend too long in costly development cycles—it often takes 15-20 years for advanced materials to make it from lab to market. As a result, the development timeframe for advanced materials isn't keeping pace with national goals to combat climate change and build a clean-energy economy. Manufacturing better materials for clean energy products has the potential to revolutionize whole industries, but only a small fraction of the materials investigated in the laboratory currently make it to widespread market deployment.

**6. Conclusions:** Transitioning to a 21<sup>st</sup> Century supply chain model, on the basis of closed-loop systems, multilateral connectivity and information sharing, will help equip businesses meet changing customer demands and achieve high-growth performance in a carbon- and resource-constrained competitive landscape. With endless possibilities for projects, the future of energy efficiency looks promising. Technological breakthroughs have increased efficiency and performance for everything from household items to industrial processes. Increasing energy costs have increased demand for energy efficient products. Often the energy efficiency improvements have been coupled with water efficiency improvements, as demonstrated in high efficiency clothes washers. Improvements in LED lighting have greatly increased the use, aesthetics and application of that technology. Overall, expect more applications of energy efficiency as program, policy and technological barriers are broken down.

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