

The role of renewable energy in transforming India's manufacturing sector

Despite progress, deeper integration into energy-intensive industries is needed to maximise renewable resources and ensure sustainability.

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To drive any nation towards a sustainable and growing future, using renewable energy (RE) is inevitable in the manufacturing sector. India, which has abundant renewable energy (solar, wind, hydro), is at a pivotal moment in its journey toward a sustainable future, with renewable energy (RE) set to play a critical role in transforming its manufacturing sector. Leveraging these resources in manufacturing can enhance India's capabilities, reduce carbon emissions, and position India among the global leaders in sustainable industrial practices.



Current Energy Landscape in India's Manufacturing Sector

India's manufacturing sector is currently energy-intensive and heavily reliant on fossil fuels, which account for over 70 per cent of the energy mix. The country's dependency on imported fossil fuels, particularly oil (around 85 per cent of which is imported), poses a significant challenge to energy security. By increasing the use of domestic renewable energy, India can not only reduce its reliance on imports but also shield itself from the volatility of global fossil fuel markets. This shift would provide greater financial stability and make long-term planning more feasible for industries.

At present, India has an installed renewable energy capacity of over 200 GW, with solar energy contributing 44 per cent of this total. The government has set ambitious targets to increase this capacity to 450 GW by 2030 (MNRE) and to achieve 500 GW of non-fossil fuel-based energy by the same year, as announced at the COP26 summit. This growth in renewable energy is expected to lower energy costs, enhance energy efficiency, and decrease reliance on unpredictable fossil fuel markets.

Government Initiatives and Policies

To support this transition, the Government of India (GoI) has launched several initiatives and policies. Programmes like the Production Linked Incentive (PLI), 'Make in India', and 'Atmanirbhar Bharat' are designed to attract investment in renewable energy. Additionally, policies such as the Renewable Purchase Obligation (RPO) and incentives under the National Solar Mission encourage industries to adopt renewable energy sources.

These initiatives are crucial for integrating renewable energy into industrial policies and reshaping manufacturing processes, much like what has been achieved in Germany and China. However, more stringent measures are needed to fully integrate RE into India's manufacturing sector, particularly in energy-intensive industries.

Challenges in Energy-Intensive Industries

Several industries in India, such as iron and steel, cement, aluminium, chemicals and petrochemicals, textiles, paper and pulp, and glass, are particularly energy-intensive. Together, these industries account for a significant portion of the country's total energy consumption. For example, the iron and steel sector alone consumes 24 per cent of the total industrial energy, with steel production processes like smelting and rolling demanding substantial amounts of coal and electricity. Similarly, the cement industry, which is the second-largest energy consumer at 7 per cent, relies heavily on coal for clinker production.

These sectors also contribute significantly to carbon emissions. The cement industry, for instance, accounts for more than 8 per cent of global emissions. By integrating renewable energy, these industries can substantially reduce their carbon footprints, comply with stricter environmental regulations, avoid penalties, and enhance their reputation as sustainable businesses.

Opportunities for Renewable Energy Integration

Despite renewable energy accounting for 26 per cent of India's total installed capacity, its penetration in heavy industry remains limited due to a continued dependency on coal and natural gas for high-intensity processes. However, countries like Norway and Denmark have shown that industrial decarbonisation is achievable with the extensive use of wind and hydropower in manufacturing sectors.

Overall, India has made significant strides in expanding its renewable energy capacity. The various initiatives by GoI are steps in the right direction. These policies and initiatives have attracted approximately **\$125 billion** in investments in the RE sector from 2014 to 2023. This significant inflow of investment indicates the country's strong policy support, favourable market conditions, and mounting commitment to expanding its RE capacity.

However, more focused efforts are needed to integrate renewable energy into industrial processes, particularly in sectors like steel, cement, and chemicals. Achieving this will ensure a sustainable and resilient manufacturing industry, positioning India as a global leader in renewable energy and sustainable industrial practices. By continuing to invest in and prioritise renewable energy, India can transform its manufacturing sector and drive forward a sustainable future.