Annexure to the Directors' Report

Particulars pursuant to the Companies (Disclosure of Particulars in the Report of Board of Directors) Rules, 1988:

A. Conservation of Energy

Tata Motors has always been conscious of the need for conservation of energy and has been sensitive in making progress towards this end. Energy conservation measures have been implemented at all the plants and offices of the Company and special efforts are made to undertake specific energy conservation projects like:

- Installation of Variable Frequency Drives for motors of Blower & Pump, ranging 22 KW-160KW, as a flow control strategy for energy conservation.
- Conversion of electrical heating into gas heating system of washing machines.
- Installation of CFL and LED bus bar indicators. Use of 24Wx4 T5 lamps for street lights, electronic ballasts, LED street lights, 160W LED High bay lights at Dharwad Plant.
- Installation of Light pipes & Transparent Polycarbonate sheets, Solar water system for canteen, and 25KWp Solar Power plant at Company's Lucknow plant.
- Initiative towards use of "ON-Site" Green Power (Wind-Solar Hybrid System) for Company's Dharwad Plant.
- Installation of Waste heat recovery system on ED oven and for furnace flue gas to heat water used in the process.
- Modification in PLC logic for automatic switching off ASU.
- Optimization of AC plant operations. Installation of active grill for data center AC system.
- Installation of Energy Efficient Motors (Eff-1), Wind Ventilators and Super magnetic dust separator.
- Downsizing of motors, trimming of impeller of oversized water recirculation pump, etc.

These changes have resulted in energy saving of 2.3 crore units of electricity, 285KL of LDO, 10KL of HSD, and 173MT of Propane. The whole effort resulted in cost savings for the Company of around ₹14.92 crores and annual CO_2 reduction of 20,456 tCO_2.

Tata Motors and Japan-based New Energy and Industrial Technology Development Organization (NEDO) successfully converted two 2.5MW diesel electric power generators sets into dual-fuel generators, using natural gas as the main fuel and diesel as the pilot fuel. This effort resulted into cost saving for the Company of about ₹0.82 crore and annual CO_2 reduction of 1,600 tCO_2.

The Company's Endeavour for tapping wind energy has also made significant contributions.

- Energy is being generated from existing captive wind power. Further initiatives have been taken up to make Pimpri Plant "carbon neutral" by meeting the entire power requirement by purchase of wind power from Third Party through open access. To maximize the use of wind power from Third Party through open access, a Power Purchase Agreement (PPA) has been signed for an additional ₹6.95 crores. Presently, commercial vehicle plant at Pune has become 'Carbon Neutral' by annual utilization of Green Power of ₹13.37 crore units. Wind power units (equivalent CO_2 Reduction of 1,23,363 tCO_2) have resulted in savings in electricity charges of TML Pune plant of ₹28.76 crores.
- United Nations Framework Convention for Climate Change (UNFCCC) issued 25,297 CERs on December 12, 2011, for the wind power generation period FY 2009-10.

- Initiatives towards Carbon Neutral Manufacturing Plant have been implemented at Dharwad Plant and Tata Marcopolo Dharwad, which use Green Power (Wind Power). A PPA was signed with a wind power supplier which will allow CO_2 reduction of 15,000 tCO_2 per annum, resulting in energy cost savings of ₹0.66 crore.

Awards / Recognitions received during the year:

- Tata Motors has been awarded the "Certificate for Significant Achievement" of CII-ITC Sustainability Awards 2011, for demonstrating excellent performance in the area of sustainable development, in the largebusiness organizations category (turnover > ₹500 crores).

- The Company's Lucknow Plant bagged the 2nd Prize and commercial vehicle plant, Pune was awarded the Certificate of Merit in the National Energy Conservation Award 2011, in Automobile Manufacturing category by Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India.

B. Technology Absorption

Tata Motors has continued its endeavor to adopt technologies for its product range to meet the requirements of a globally competitive market. All Company products and engines are compliant with the prevalent regulatory norms. The Company has also undertaken programs for development of vehicles which run on alternate fuels such as LPG, CNG, bio-diesel, electric traction and hydrogen.

During the year, the Company filed 110 Patent Applications and 102 Design applications. In respect of applications filed in earlier years, 17 Patents were granted and 12 Designs were registered.

To reinforce the need of technology upgradation, the Company invested in variety of testing facilities and equipment such as -

- Urea Supply and Measurement system, alongwith Ammonia Analyzer for M&HCV Engines having Selective Catalytic Reduction technology for emission after treatment.
- Introduction of specialized oil conditioning system for engine friction mapping and analysis, to help improve fuel efficiency and CO_2 reduction.
- In-house development of shock tube and Split-Hopkinson pressure bar set up, for material characterization for blast testing application.
- Off road and gradient test tracks at Company's Jamshedpur plant.
- Acoustic Camera for Noise Source identification.
- Real time In-cabin multi-point air flow measurement.
- Door closure characteristics evaluation device.
- Inductively Coupled Plasma (I.C.P.) Spectrometer for Oil and Lubricants testing.

Major technology absorption projects undertaken during the last year include:

Technology For	Status
Development of Infotainment system	Development in Progress
Digital verification platform using Hardware-in-the-Loop system for various Electrical and Electronics Systems (such as Body Control Module, Instrument Cluster, HVAC System)	Implemented
Brushless DC Motor for Engine Cooling Module	Development in progress
Development of Low Carbon Vehicle Technology Program	Development in Progress
Development of Electric Traction Motor technology	Development in Progress
Hydrogen recirculation blower system on Fuel cell-Battery-Hybrid Bus(4x2) family	Development in progress
Battery Management System on Bus and Car Hybrids	Development in progress

Major Technology imports include:

Technology for	Year of Import	Status
Development of Fuel Cell Bus	2011-12	Development in Progress
Hot spot prediction of vehicle noise by Acoustic Camera *PU-Camera for near-field measurement of engine *Beam-forming for Pass-By-Noise measurements	2011-12	Commissioned and initiated use for cars
SONAR - bench-marking database for Engine-noise measurement	2011-12	In-use for engine-noise analysis
Gas Injection technology for LCV, MCV & HCV engines	2009-10	Under Development
Engine Management for Series Hybrid Technology for Buses	2009-10	Under Development
Design and Development of Infinitely variable transmission based on full toriodal traction-Drive variators for various vehicle platforms.	2007-08	Under Development
Design and Development of Electric Hatchback vehicle - Indica Vista EV	2008-09	Implemented
Stop - Start feature for various vehicle Platforms	2009-10	Under Implementation

During the year the Company spent ₹1,549 crores on Research and Development activities including expenditure on capital assets purchased for Research and Development which was 2.9% of the net turnover.

C. Foreign Exchange Earnings and Outgoing

(₹ in crores)

Earning in foreign currency	3,677
Expenditure in foreign currency (including dividend remittance)	3,709