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TOWARDS CARBON NEUTRALITY IN TATA COMMUNICATIONS (A NEW PARADIGM IN INDUSTRY'S CONTRIBUTION TO MINIMIZING ITS CARBON FOOTPRINT)

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ABSTRACT

In today's scenario of threatening climate change, Industry has responsibility of being carbon-neutral. The paper proposes introspective methods that would result in the reduction of carbon emissions caused by Tata Communications Ltd. (TCL) in Maharashtra Region. The Tata Group, with operations in more than 100 countries across six continents, can create an example by attempting to make one of TCL's Regions carbon-neutral. Scope of carbon emission caused by the industry was figured out according to the *"GHG protocol Corporate Standard"* of the World Business Council on Sustainable-Development. It came to light that the major 'Carbon Foot Print' was indirect due to electric power usage in the company and direct from the usage of fuel for power backup. In TATA Communications 90% of the Carbon Emission is due the usage of power. Therefore efficient power consumption and sourcing power from carbon-free mainsprings of energy were found crucial.

All aspects of Energy efficiency in Data Centers to reduce electricity consumption, offsetting it with non-conventional green power like solar, wind and hydro to the extent possible, replacing High Speed diesel by Bio-diesel in the back-up power system, offsetting carbon by replacing conventional vehicles by battery powered vehicles chargeable from solar panels,

Tele-presence Services to optimize Business Travel and sinking carbon through afforestation of the Campus have all been considered.

At Tata Communications, the target of achieving carbon neutrality seems possible if most of their input power can be tied up with (carbon free) Hydro. "Tata Hydro" has an installed hydro capacity of 576 MW in Maharashtra itself. While the other measures dealt with in this paper may make contribution towards Carbon Neutrality in their own magnitude, the objective could be fully achieved by dedicating majority of 24 MW now, progressing to 48 MW of "Tata Hydro" to Tata Communications in Maharashtra by 2020.

KEYWORDS: Carbon Neutral, Carbon Emissions, GHG, and Energy Efficiency.

INTRODUCTION

Any Industry going Carbon Neutral implies that it offsets carbon as much as it produces through its operations directly or indirectly. "For every car produced which would run on petrol, your company should produce another car which would run on ethanol (bio-fuel)" said Dr. A.P.J. Abdul Kalam while visiting a Car manufacturing company abroad. That signifies the concept of a carbon neutral industry in broad terms.

CARBON EMISSION IN INDUSTRY

Any industry is responsible for carbon emission directly or indirectly. Its scope can be categorized by "*GHG protocol Corporate Standard*" developed by World Resources Institute (WRI) and World Business Council on Sustainable Development (WBCSD) as under:

Scope-1: Direct Carbon Emissions

Direct carbon emissions occur from sources that are owned or controlled by the company, for example, emissions from combustion in owned or controlled boilers, furnaces, diesel generators, vehicles, etc.; emissions from chemical production in owned or controlled process equipment.

Scope-2: Electricity Indirect Carbon Emissions

Carbon emissions from the generation of purchased electricity consumed by a company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organizational boundary of the company. Scope 2 emissions physically occur at the facility where electricity is generated.

Scope-3: Other Indirect Carbon Emissions

Carbon emissions as a consequence of the activities of the company, but occurring from sources not owned or controlled by the company. Some examples of scope 3 activities are extraction and production of purchased materials; transportation and use of products and services.

SITUATION ANALYSIS AND SETTING AGENDA

CARBON FOOT PRINT (CFP) OF TATA COMMUNICATIONS

Scope-1: Fuel (Diesel) used in backup power

Scope-2: Electric power usage

[In TATA Communications- Maharashtra, approximately 90% of the Carbon Emission is due to the power (electricity purchased and used) and Fuel used in back-up power mentioned in Scope-1.]

Scope-3: Following activities generating carbon indirectly:

Waste generated, Business Travel and Employees commuting.

AGENDA OF TATA COMMUNICATIONS TOWARDS CARBON NEUTRALITY

Scope-1: Back-up Fuel "High Speed Diesel (HSD)" to be replaced by "Bio-Diesel"

Scope-2:

Carbon reduction through:

- Energy efficiency {Efficient usage of power in data centers}
- Innovative techniques to restrict carbon emission
- Geothermal Pumping for Cooling (saving electric power)
- Solar LED standalone street lighting system

  Carbon off-set by sourcing Carbon-Free Green Power:
- Solar
- Wind
- Regular & Seasonal Hydro

  Scope-3:
- Treating Waste generated
- Tele-presence Services to reduce "Business Travel"

- Replacing conventional vehicles by 'Solar charged battery operated vehicles' in the Campus to reduce carbon footprint of "Employees commuting"

- Afforestation to nullify remains of the above three indirect sources of carbon emission (under Scope-3)

- Promoting Environmental Consciousness

STRATEGIES AND IMPACTS

Scope-1 Strategies & Impacts

Back-up Fuel "High Speed Diesel (HSD)" to be replaced by "Bio-Diesel"

Back-up power is needed for interruption free continuity of operations. Electronic communication cannot be risked to be interrupted for some default of electric supply. Even a fluctuation of 1 sec can cause the loss for the company and their Service Level Agreements (SLAs) could be at stake. In the past it has happened at few locations like Prabhadevi and Pune that there was pre-informed power cut from substation for few minutes for maintenance purpose. In order to cope up with such situations, back-up diesel generation units have been installed.

Replacement of High Speed Diesel (HSD) used in power backup generating units by BIO-DIESEL could be very effective in reducing emissions by 90%. In FY 2013-14, HSD used was 910917.779 litres for back-up power and maintenance testing. Using CERC emission factor of 2.66 the usage of diesel was accountable for 910917.779 x 2.66 /1000 = 2423.04 tonnes of CO_2.

Usage of bio-diesel is a feasible option for reduction of carbon footprint. "My Eco Energy (MEE)", a UK based company is having a product 'INDIZEL' which could be used in Generation Units based in Maharashtra whose particulars are as follows.

Table-1: Generation units and Diesel storage capacity at various locations

Location	Storage Capacity (Litres)	Monthly Consumption (Litres)	No. of Units	Rating (KVA)	Make
Prabhadevi	50,000	10,000	3	2500	Sterling & Wilson
-do-	-	-	2	1250	Cummins
-do-	-	-	2	1500	-do-
BandraKurla	25,000	5,000	5	2500	Sterling & Wilson
Pune-Dighi	60,000	20,000	3	3000	Sterling Generators
-do-	-	-	2	1250	Cummins
Andheri	25,000	5,000	2	2000	Sterling & Wilson
-do-	-	-	1	1250	Cummins
-do-	-	-	1	1500	Cummins

Indizel^{TM} is seamlessly interchangeable with petroleum diesel. It has 90% reduced carbon emissions, better lubrication and increased productivity of electricity generators. Bio-diesel is the next best viable option to conventional fuel mediums that needs no change in infrastructure and no engine modifications, not even hampering the warranty of the equipment. INDIZEL (Bio-diesel) can be directly used as a replacement of HSD (High Speed Diesel).

Scope-2 Strategies & Impacts

Background

Electricity is consumed at following five different locations of TCL within Maharashtra:

a)   Bandra Kurla Complex, Mumbai

b)   Lokmanya Videsh Sanchar Bhawan, Prabhadevi, Mumbai

c)   Videsh Sanchar Bhawan, Fort, Mumbai

d)   Andheri, Mumbai

e)   Pune

At the end of FY 2014-15, the load at TCL Maharashtra was approximately 23.5 MW and the Company proposes to expand its business by the end of 2020, for which it has estimated a capacity addition at some of the sites in Maharashtra resulting in 48 MW of net total load in Maharashtra, as tabulated below.

Table-2: Present and forecasted loads at various centers in Maharashtra

Location	Present Load(2015) (MW)	Future Load(2020) (MW)
Bandra kurla Complex	10	13.0
Pune	5	25
LVSB Prabhadevi,Mumbai	4.50	6.0
VSB Fort,Mumbai	0.80	0.80
Andheri, Mumbai	3.20	3.20
Total	$23.5 \approx 24$	48

As per the CEA provided emission factor of 0.98 and accounting current load of 23.5 MW, TCL consumed 115404795 kWh of power from the Grid in FY 2014-15, causing emission of 115404795 x 0.98 = 113096699 Kg i.e. 113096.699 Tonnes of CO_2.

CARBON REDUCTION STRATEGIES

- **Energy efficiency {efficient usage of power in data centers}**

Benchmarking of Energy Efficiency of Data Centers is usually done by *Power Usage Effectiveness* (PUE) which is defined as the ratio of Total Facility Energy to Energy used in IT Equipment.

At present TCL compares with reputed companies in the world as follows:

Table-3: PUE in Different Reputed Companies

Company	PUE
GOOGLE	1.09
FACEBOOK	1.2
TCL	1.9

The above shows that there is a scope of improving energy efficiency at TCL. Their Facility load comprises:

1) IT Equipment Load→ 5%
2) Heating, Ventilating and Air Conditioning (HVAC) Load→ 70% (Includes both High Side Chillers and Low side Precision Air Handling Units (PAHU)
3) Lighting Load → 5%
4) Losses → 5% (Transformer, Cable etc.)
5) Uninterrupted Power Supply (UPS) and Power Distribution Unit (PDU)→ 15%

While energy efficiency can be looked at every component, one of the simplest ways to save energy in a data centre is to raise the temperature. It is a myth that data centres need to be kept absolutely chilly. According to most IT equipment manufacturers' specifications, data centre operators can safely raise their cold aisle to 80°F or higher. By doing so, we significantly reduce facility energy use. At present TCL Data Centres are operated at a temperature of 73.4 ^{0} F which is 6.6 ^{0} F chiller than what Google is operating at present.

The electricity that powers a data centre ultimately turns into heat. Most data centres use chillers or air conditioning units to cool down the equipment, requiring 30-70% overhead in energy usage. At Google data centres, they often use water as an energy-efficient way to cool instead. At TCL also we have Chiller and Crack units installed besides air conditioning, which help in cooling whereas at Google they are using natural water based cooling mechanism.

For using natural water based cooling, quality of water needs to be ensured and it may have a cost component associated with purifying it. A feasibility test on the availability of purified water has to be done, which if turns out to be positive for implementation, huge amount of electricity consumption can be reduced.

- **Innovative Techniques to restrict Carbon Emission**
- ➤ **Geothermal Pumping for Cooling (saving electric power)**

As stated above, around 70% of the total energy used in TCL Maharashtra is used in HVAC load, which basically includes Chillers and Cracks.

In order to drastically reduce the HVAC load of Chillers and Cracks or to eliminate them completely, geothermal pumping can be resorted to. Geothermal technology uses earth to dissipate heat as sink and uses reverse geothermal pumping for cooling purpose. It relies on the fact that the Earth (beneath the surface) remains at a relatively constant temperature throughout the year, very much like a cave. Heat pumps can be deployed using a vapour compression cycle to transport heat from IT Equipment to the earth which becomes a heat sink and in the process cooling the machines. Energy saved in Chillers and Cracks can be enormous contributing to carbon savings.

- ➤ **Solar LED standalone street lighting system**

Streetlights, which are being used at TCL Pune facility presently, are having the rating of 250 watts with at least 200 fixtures. Taking round-the-year operation @ 10 hrs. /day, energy implied would be *250 x 200 x 3650/1000 = 182500 kWh.* By installing standalone LED solar enabled street lighting system, around *182500 x 0.98* = 178850 Kg= 178.85 Tonnes of CO_2 can be offset annually.

CARBON OFF-SET STRATEGIES

Sourcing Carbon-free Green Power:

- ➤ **Solar**
- ➤ **Wind**
- ➤ **Regular & Seasonal Hydro**
- **Solar Power**

At TCL there is 3 MW of installed solar capacity in Pune which is supposed to provide about 12 % of power used in TCL, Maharashtra. Out of total energy of 129578438 kWh consumed

during 2014-15, 14173643 kWh (10.94%) of green power from solar was used in TCL. By adding some more capacity (going up to 5 MW), it is expected to supply about 20% of power from green sources in near future, saving to that extent the emission of CO_2.

- **Wind Power**

Out of the 5 office locations 4 are situated at the seashore where company is planning to install micro windmills for harnessing energy from wind source. They are looking at purchasing the turbines and installing them on the rooftops of the office locations. Power generated from these windmills can be used for general small lighting purpose. On an average these windmills cost Rs. 1-2 Lakh per turbine.

- **Regular & Seasonal Hydro**

At Tata Communications, a paradigm shift in carbon neutrality can be seen by tying up with (carbon free) Hydropower. While seriously attempting to tie up with "Tata Hydro" for entire power requirement, surplus hydro power in Maharashtra Grid during rainy season could be tied up at the first place.

Scope-3 Strategies & Impacts

Following activities were identified under Scope-3 on which the Company did not have much control. However, Company's limited intervention is possible.

- **Treating Waste Generated**

a) **Waste generated in operations**

In Tata Communications, the waste coming out of operations is primarily the waste from Diesel Generating sets during maintenance sent out to third party vendor for disposal. The data is maintained during refills and maintenance cycles for waste lubricating oil. During the FY 2014-15, only 29.62 metric tonnes of CO_2 was accounted towards this waste.

b) **Biodegradable Waste Generated in Campus**

Within the premises of Tata Communications, Pune the company has installed a waste handling unit, which essentially accepts biodegradable waste including kitchen wastes as input and processes it to provide output as manure, which is used for the plantation within the company. The process involved is termed as composting which is the natural biological breakdown of organic material. During the process of aerobic composting (in the presence of oxygen), microorganisms consume the organic matter and release heat and carbon dioxide

(CO_2). However, most of the carbon contained in the organic matter is retained in the compost and therefore not released into the atmosphere. This compost can be used as an inorganic fertilizer in plantations. The net GHG emission is reduced because the energy intensive fertilizer production and associated GHGs are reduced to that extent.

- **Tele-presence services to reduce Business Travel**

Tele-presence service can optimize travel. Tata's Tele-presence service encompasses both public room services and private tele-presence managed services. The tele-presence managed service includes pre-deployment support, network design, site surveys, resale, installation, configuration and support of Cisco Tele-presence equipment, centralized shared infrastructure such as Cisco unified communication manager (CUCM), Cisco Tele-presence manager (CTM), Cisco Tele-presence Multipoint Switch (CTMS). Scheduling servers are owned operated and managed by Tata network engineering and bandwidth. With tele-presence concierge enabling service monitoring, meeting management, help desk professionals can act as the service single-point of contact, for real-time trouble-shooting, reservation and directory operation.

Businesses aiming at reducing their travel costs and minimizing their carbon footprint want to consider adopting telepresence meeting options such as videoconferencing and unified communication tools. Frequent flyers contribute disproportionately to greenhouse gas emissions besides losing working time.

- **Replacing conventional vehicles by 'Solar charged battery operated vehicles' in the Campus to reduce carbon footprint of 'Employees Commuting'**

On an average around 750 vehicles are daily running within the campus for a distance of around 2 km each. So 1500 km of run of four wheelers at an average of 15 km/litre consumes 100 litres of fuel for commuting. TCL is planning to start battery operated vehicles within the premises and designing a master solar park at the main gate (proposed) which is at ideal location of sun face for solar power. Power generated from this park could be used to charge the batteries of a single vehicle.

Typically, the sitting capacity could be 25 to 30 people and total Run per day 80 to 100 KM. Product will be a close bus with good looks having to maintain global MNC decorum, charging from solar setup.

- **Afforestation to sink Carbon**

Remains of the three identified scope-3 activities can be addressed by creating some forest carbon sinks. By afforestation one can get carbon offset certificates (for quantitative authentication) from organizations like **Green Yatra** who advise specific plants after soil testing. On an average 6 trees are needed to sink 1 Tonne of CO_2 after 10 years. If we want to sink 1 tonne of CO_2 in 5 years, we will have to plant 12 trees. According to these statistics if we are planting 10,000 trees in 2015 in TCL's campus then 833 tonnes of CO_2 emission can be offset by 2020. The audited statistics would of course be dependent on survival and growth of planted saplings.

Plantation pattern has to be identified, which contributes to offset carbon emission and also adds to the aesthetics of the office premises as per choice of the employees. This approach will help in building green healthy environment around the work place. The office location of TCL Pune is spread over 1100 acres of land, so plantation on this land can be used to create carbon sinks.

As per the Government policy a Corporate has to invest 2% of its total annual Profit in CSR activity. Linking this expense with afforestation, plantation can be done in the premises with the help of any NGO and obtain offset certificates against the entire green plantation done.

- **Promoting Environmental Consciousness**

Promoting cycling within the Campus to '*burn calories not carbon*' will also help in involving each and every employee of TCL in generating awareness towards reducing carbon emission, Figure-1.

Figure-1: Display on a bus stop within the organizational Campus.

CONCLUDING REMARKS

All the above measures of carbon reduction and offsetting would show results in their own magnitude. Besides, it would generate tremendous awareness about carbon neutrality across the organization. Brand value of the Organization with pursuance of carbon neutrality as a corporate goal is going to increase in the emerging environment conscious scenario. For many firms, the allure of bolstering their corporate or product brand reputation is a key consideration in seeking to go carbon neutral. What is crucial is that the approach adopted by TCL is robust, transparent and based on available standards and protocols.

"Achieving Carbon Neutrality by 2020 in TATA Communications Ltd.-Maharashtra" has a great significance. But what is crucial is that it is not to be pursued as a stand-alone exercise, but as part of a broader sustainability strategy that encompasses the whole business.

At Tata Communications, the target of achieving carbon neutrality by 2020 seems possible if most of their input power can be tied up with (carbon free) conventional Hydro. The Group Company has an installed hydro capacity of 576 MW in Maharashtra itself. While the other measures dealt with in this report may make their own contribution towards Carbon Neutrality, the objective could be fully achieved by dedicating majority of 24 MW now progressing to 48 MW of "Tata Hydro" to Tata Communications in Maharashtra by 2020.

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