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Sub: **Comments on TRAI Consultation Paper No.3/2011 on Green Telecommunications**

Dear Sir,

With reference to TRAI's Consultation Paper 03/2011 on Green Telecommunications, kindly find herewith our comments on the issues raised in the consultation paper.

Thanking you,

Yours Sincerely,
For **Vihaan Networks Limited**

Sanjeev Kakkar
Chief Strategy Officer

Response to TRAI Consultation Paper No. 3/2011
On Green Telecommunications

3.1 How should the carbon footprint of Indian telecom industry be estimated?

The estimation for carbon footprint of Indian telecom industry depends upon various factors like consumption of power through grid, captive generators (diesel generators), the duration of grid supply availability and power required for core network elements.

The carbon footprint of Indian telecom industry may be estimated by measuring the power consumption and related emissions, caused by following:

a. Total grid power consumption for running BTS and Core Network sites, such as switches, data centers, site offices etc including air conditioning, lighting and for general maintenance.

b. The total amount of fuel consumed for running diesel generators, required for uninterrupted power back, for telecom towers, by getting the data from individual operators and infrastructure providers.

c. Power requirement and emissions associated with the manufacturing and deployment of network equipment.

d. Power consumption and emission by mobile handsets and other devices, when they are manufactured, distributed and used. Average power consumption and minutes of usage, per mobile handset, may be estimated to arrive at the total power consumption and related emissions by overall subscriber base.

e. The power consumption during the manufacturing process of towers, from extraction of raw materials to production and installation, including consumption of steel, welding, assembly and transportation may have to be considered.

The above information should be collected from all telecom operators, infrastructure providers, tower companies and manufacturers. This will provide near 100% data to estimate total carbon footprint of Indian telecom industry.

3.2 What is your estimate of the carbon foot print of the fixed, mobile and broadband networks?

It is estimated that the top 5 operators consume about 4000 MW of power every day. About 70-80 % of this power comes from the Grid and the balance is provided by the diesel generators used by these operators & tower companies.

As per Industry association reports about 2 billion liters of diesel is consumed for about 125,000 Towers – which means a CO2 emission of about more than 6 Million tons. From this industry figure TRAI can estimate the CO2 being emitted by these operators & tower companies.

3.3 In case of mobile what would be the individual footprints of the radio access network and the core network? How are these likely to change with 3G and 4G technologies?

The individual footprint of Radio Access Network and Core Network will depend upon the type of BTSs and core network elements, their capacity and power consumption requirements. It will also depend upon design and manufacturing technology and power efficiency of the deployed systems.

The maximum power is consumed by the Radio access network, which includes the Microwave & BTS. It is safe to assume that more than 90% power is consumed by the Radio Access part & just 10% is consumed by the Core network.

The individual carbon footprint in case of mobile Radio Access Network and Core Network are:

a. For Radio Access Network: Energy consumed by the network equipment like BTS, BSC and the infrastructure to maintain these elements. A macro BTS site in (2+2+2 config), with 20 W TRX output power typically consumes about 3.0 KW including Air-conditioners, Power plant, feeder loss etc.

b. For Core Network: Energy consumption associated with core network equipment / elements like MSC, Data Centers, VAS equipment, etc.

With the onset of 3G, there will be a huge transition from voice to data applications and increased NGN services. Using 3G technology, operators are likely to step up the peak data transfer offered to consumers, which will necessitate more cell sites for the 3G coverage. It is expected that this will increase the power requirement as against 2G systems. The situation may become worse in 3 to 4 years since the new technologies will be deployed in that period.

3.4 How should the carbon credit policy for Indian telecom sector be evolved? What should be the timeframe for implementing such a policy?

Further to the frame of the policy suggested, we are of the view that it should not be left totally on the market forces but Govt should ensure a timely implementation of adoption of greener telecom technologies by imposing strict instruments like pollution Tax on use of Diesel and additional surcharge on Grid power consumption.

This will encourage the usage of energy efficient telecom infrastructure deployable on conventional energy sources.

3.5 What should be the framework for the carbon credit policy?

Initial Benchmarking of power rating of all telecom products / nodes deployed in the networks should be defined on the urgent basis. With the advent of technology more power efficient network solutions will evolve with time, hence these rating should be made more stringent with passing of years.

3.6 What should be the metric to ensure success of the carbon credit policy in reducing the carbon footprint of the telecom industry?

Reduction in the collection of pollution Tax / surcharge on grid supply will be a good indicator to ensure the success of the policy.

3.7 What proportion of tower infrastructure is in rural areas? Please comment on the grid/electricity board power availability to these towers.

There are about 70% tower infrastructure in rural areas as per TRAI's consultation paper vide para 1.8. The grid supply in rural areas is very poor in terms of duration of availability. In many areas of some states like Bihar, east UP, Grid supply is not available and BTSs are powered by DG sets for 24hrs. Less than 40% power requirement is met by grid supply and rest by DG sets.

3.8 To what extent can active sharing reduce the carbon footprint and operational expenses?

It depends upon the type of sharing. At present only Tower, transmission and Power plant is being shared. About 20-25% power may be saved if active infrastructure (Sharing of BTS) is shared among operators. If frequency is also allowed to be shared, about 60-70 % power may be saved.

3.9 What proportion of non-grid power supply to towers in rural areas can be anticipated to be through renewable sources of energy in India in the next 5 years?

Presently there is insignificant number of towers running on solar or other alternate energy sources. Unless government takes a policy decision and provides incentives to the manufacturers as well as operators, it may not be even total to 1% of the BTSs running on alternate energy sources in next 5 years. At present, the operators and manufacturers are under no obligation to use energy efficient systems which run on alternate energy sources. This is mainly because there are no regulations and no incentives.

3.10 How much saving accrues per tower if supply is through a renewable source instead of diesel for towers that do not get grid power for 12 hours or more?

Based on the assumption as detailed in the consultation paper, one diesel generator consumes approx. 2 Ltrs of diesel per hour. Considering running generator for 12 hrs a

day, means 24 Litrs of diesel per day. As per the existing cost of diesel fuel (37.75 per litre), total expense per tower per day would be approx. Rs. 900/-. Therefore if renewable energy sources are considered, the minimum saving would be about. 900/- per day and accrued saving in a year can be estimated about Rs. 3,24,000 per year per tower (900 x 30 x 12). Apart from this, regular maintenance expenses can also be saved substantially.

Using renewable energy power means, saving of 8760 Ltrs of Diesel fuel per tower per year, which in other words, reduction of emission of 23652 Kgs of CO2 (as per TRAI paper 1 Kg Diesel = 2.7 Kgs CO2) from one tower.

3.11 How can migration to renewable sources be expedited?

Following action from Government would lead to expedite the migration to renewable sources :-

1 Quick benchmarking of stringent power consumption norms for various network nodes. This will set the reference for a time bound migration program with clearly defined milestones and targets to be announced by the government.
2 Firm implementation of Pollution Tax on usage of Diesel and additional surcharge on using excessive grid power.
3 It should be made mandatory to use only renewable energy in all rural sites.

It may be noted that with the implementation of mandatory usage of CNG for commercial vehicle in Delhi, has improved the quality of air in the city many folds.

3.12 If you are a service provider what steps has your company taken towards use of renewable sources of energy? Have the gains from this move been quantified?

Not applicable

3.13 What should be the metric for certifying a product green?

Following is suggested:

1 For rural areas, all the BTS which use renewable energy will be certified green.
2 All the BTS which use less than 600 watts of power for a three sector 666 BTS site should be certified Green.
3 All the Core equipment which uses less than 0.1 watt/ subscriber @ 25 milli erlang of installed capacity (including the AC & lighting)

3.14 Who should be the metric for certifying a network or service as green?

TEC/TERM cell may certify the network or service as green depending upon the energy efficiency.

3.15 As a manufacturer/service provider have you started producing/using energy efficient telecom equipment? How is energy efficiency achieved? Please explain.

VNL is Indian initiative started in 2004 focused on developing low power base stations running on non-conventional energy resources, specifically for rural & remote areas. We have designed & developed the GSM infrastructure solution, which runs entirely on solar power, not requiring grid supply or power backup using diesel gensets.

The power consumption of the system is less due to:

a. Highly power efficient BTS design.
b. No air-conditioning requirement for BSS (BSC & BTS), OSS and Transmission systems used for backhaul.
c. Integrated BTS with transmission backhaul system
d. Compact and pole / tower mounted

All the above has contributed towards better energy efficiency due to power efficient BSS design, reduction in losses in feeder, power plant, power requirement of air-conditioner and transmission system integration.

3.16 How does the cost of energy efficient and the normal equipment compare?

The **capex** of the **traditional system** is higher as it consumes higher energy:

a. Grid Power supply for powering the systems.
b. Cost of Diesel generators as a power back up Higher opex
c. Cost of air-conditioners
d. Cost of higher capacity batteries
e. Cost of high towers and RF cables
f. Cost of Space (lease / owned)

The **operating** cost of such **traditional systems** are much higher due to :

a. Cost of fuel for running diesel generators
b. Cost of energy consumption from the grid supplies
c. Cost of regular maintenance of the infrastructure

On the other hand, the overall cost of deployment and operation of alternate energy efficient cellular infrastructure solutions available in the Global market is much lower in terms of capex and opex due to the following:

a. This includes compact, pole/tower mountable outdoor BTSs, which are highly energy efficient and are operated solely on solar energy.
b. Integrated BTS with wireless transmission backhaul system
c. No expenditure towards obtaining grid supply.

d. Savings towards cost of diesel generators
e. Savings towards lesser space requirement
f. Savings towards cost of RF cables
g. Lower cost of batteries and power plant.
h. Initial capex required for solar panels.
i. Near zero operating cost, no cost of diesel.

3.17 What are the most promising renewable energy sources for powering telecom network in India? How can their production and use be encouraged?

Most parts of India receive sunlight for 70-80% of the year. Also India has a large coastal belt where Wind energy is available in abundance. Therefore solar & wind energy are the most promising renewable energy sources in India for power generation and can be used for telecom networks.

The areas where wind power is available for generation may not be suitable for tower installation. Therefore wind energy cannot be directly used for powering the BTS. However, the government should provide incentive to the operators to install wind mills to generate equivalent power which is required for their telecom installations especially in urban areas.

The government shall have to promote production of solar cells in huge quantities, so that the cost per cell is affordable. The country has a good manufacturing base for solar panels. However, the government should incentivize and encourage the development and manufacturing of raw materials such as silicon cells etc, to make it cheaper. This will encourage the operators to deploy solar panels at every installation.

The government should also incentivize the telecom operators who use energy efficient, low power equipments / systems which can be run on solar power or hybrid power plants with grid as a backup. Government may also considering making it mandatory specifically for the rural areas.

3.18 What is the potential of infrastructure sharing in reduction of energy consumption?

It depends upon the type of sharing. At present only Tower, Transmission and Power Plant is being shared. About 20-25% power may be saved if active infrastructure (BTS) is shared amongst operators. If frequency is also allowed to be shared, about 60-70% power may be saved.

3.19 What is the current procedure for storing, disposing and recycling telecom waste by the service providers and manufacturers?

No comments

3.20 How can waste management be made more green?

No comments

3.21 What steps can be taken by the service providers in planning green networks?

In our opinion, the operators should plan a network architecture in which systems operate either on solar energy or hybrid with grid power as back up.

In Rural & remote areas, the population clusters are scattered. Operators should plan judiciously for adequate capacity and coverage in rural areas. For example, thin radio coverage is needed in 75% of a village which constitutes farming (field) area. About 70% of the towers are installed in the rural and remote areas therefore the operators should plan a power efficient network for the deployment. Since the capacity requirement in rural areas is much less than the urban areas, small capacity and low power systems should be planned which operate on non-conventional energy sources, preferably solar power.

The operators should use energy efficient equipments which operate in non air-conditioned environment and should be compact to be installed on low height towers / poles. Power efficient low power BTSs operable on solar power are available in the market which can be easily installed on small height poles to extend the coverage with in the villages. Through long range wireless transmission backhaul solutions available remote villages locations can be connected to the central location to connect to the BSC/ core network of the existing networks.

For urban areas, the operators should install the equipment in the green buildings designed for such purposes to avoid use of air-conditioners. They should plan to power the equipments through hybrid power plants with solar power backed up by grid power supply. Only the outdoor coverage are to be provided by high capacity BTS installations as it is in practice now, but these must be energy efficient and must operate on non-conventional source of energy.

The indoor coverage requirements can be managed with the small capacity and highly energy efficient solutions within the buildings to save power and for better spectrum utilization as in practice now a days.

These steps will make entire Rural Telecom networks as 100 % Green and will provide a huge energy saving in Urban Telecom networks.

3.22 What standards do you propose to be followed in Indian telecom network for reducing the carbon footprint?

The government should make it mandatory for all the operators to use the systems as per the national standards, especially in respect of power consumption. At present, the

operators are free to procure / select equipment of their choice without caring for the power efficiency. The standardization body (TEC) should be mandated to develop standards for power efficient telecom systems which run on alternate energy sources.

3.23 Who should handle the testing and certification of green equipment and networks?

The Telecom Engineering Centre (TEC), which is technical body for government of India, should handle the testing and certification of the equipment and networks for such purposes.

3.24 How can manufacturers help in reducing GHG across the complete product life-cycle?

The manufacturers having large building infrastructure should install solar panels on their roofs for internal consumption to the extent possible. The building should be so designed that air-condition requirement is minimal. They should be mandated to plant trees in the surroundings to avoid heating of the roads and platforms within the premises. The industries can also process the gases including carbon dioxide generated during the manufacturing process to convert them into useful gases.

3.25 What should be the rating standards for measuring the energy efficiency in telecom sector?

Due to fast advancement in technologies it may not be feasible to standardize power consumption per carrier basis to compare the actual products to rating purposes. However, the standardization body may initially develop some standards with which the products in the market may be compared and may be rated in terms of percentage efficient with respect to these standards so created.

3.26 Please give suggestions on feasibility of having energy audit in the telecom sector on the lines of energy audit of buildings.

The operator should provide all the data about power consumption through the grid, through alternative energy source and through diesel generators is installed on a quarterly basis. Also, the operators should indicate the efforts made to utilize alternate energy sources in place of diesel generators.

Sample checks can be made by the TERM cell to verify their claim.

3.27 What should the monitoring mechanism for implementation of green telecom?

Operator should provide the power consumption per BTS / tower installation on a quarterly basis by self-certification.

3.28 Who should be the monitoring agency?

In our suggestion, TRAI should monitor the reports received from the operators / infrastructure providers while sample checks can be done by the TERM cell.

3.29 What type of reports can be mandated and what should be the frequency of such reports?

Each service provider should provide BTS wise power consumption in softcopies, including the type of BTSs, capacity of BTSs, etc. Such reports should be provided to TRAI on quarterly basis.

3.30 What financial and non-financial incentives can be useful in supporting the manufacturers and service providers in reducing the carbon footprint?

The telecom equipment manufacturers and service providers should be provided incentives in the form of:

a. Tax holidays
b. Free or subsidized tariff for use of grid power to the extent power generated by them through alternate energy sources.

The energy efficiency of equipment for the chosen radio technology should be given preference/incentives

MNRE's incentive scheme for solar based BTS sites is to be modified to include power efficiency of the total BTS site power requirement, not just the solar substitution of the diesel generators.

Incentives should be provided to replace existing energy in-efficient BTS powered by Diesel gen-sets in rural areas by the solar powered highly energy efficient BTS infrastructure.

3.31 What R&D efforts are currently underway for energy efficient and renewable energy telecom equipment?

Worldwide, there is awareness towards effects of carbon emissions and therefore lot of R&D efforts is being made to reduce power consumption by way of development of power efficient telecom systems, power management and network designs. ITU has also taken cognizance of the problem.

Major R&D efforts are focused on the energy efficient product line to meet the major objectives of future networks i.e.

1) Environmental Awareness

a) Energy Efficient
b) Viable with Alternate source of energy

2) Socioeconomic Awareness
   a) Low potential to pay in emerging markets
   b) Low cost, sustainable, easy to install & operate, new business models
   c) Low cost to entry as telecom player

New Cellular Network products choosing innovative deployment architecture which enables realization of high subscriber capacity without using high capacity product in a most efficient distributed manner as well as a innovative product architecture focusing on energy efficiency, compactness and the suitable outdoor packaging in order to operate in non Air-conditioning environment are being developed. Such products are already available in the market through indigenous development efforts of few Indian companies. Such Infrastructure solutions are highly power efficient and can be operated solely on the non conventional energy sources and best suited for rural deployment.

Also there are R&D efforts on development of new generation Distributed Antenna Systems (DAS) and in building solutions which are deployment alternates to the conventional network roll out and ensure significant energy saving of the overall energy consumption of the network deployment.

VNL is an Indian technology initiative focused on designing & developing energy efficient systems which can be operated solely through renewable energy sources.

1) VNL, at its inception in the year 2004-05, had evaluated the need and challenges of developing Green telecom equipment for providing indigenous option for establishing Green Cellular Telecom network in Rural India.

2) VNL has designed and developed indigenously, the3GPP compliant GSM Cellular network technology based infrastructure products that are extremely suitable for rural deployment. This GSM Cellular network infrastructure product includes the most energy efficient and compact GSM Base Station (BTS) operating on Solar power, most compact Base Station Controller (BSC) with GPRS and Mobile Switching Center (MSC), innovative Multi-Tier and Multi-hop wireless backhaul solution, Solar power based power system and its integrated Operation and Management Center (OMC) for the entire network.

By developing the complex telecom technology development competency in India, VNL has established leadership in the field of Green Telecom product development that can be further exploited to meet India specific needs.

3.32 How can domestic R&D and IPR generation be promoted?

As a special focus sector, special tax concessions and incentives should be provided to Indian companies who create IPR and develop telecom products. They should be given

an Income tax holiday for 10 years and for manufacturing in India, excise duties should be reimbursed to them.

It should be mandatory for Indian telecom service providers to use domestic products (Indigenous R&D and IPR generated) for a sizeable portion of their equipment requirements.

3.33 Would it be a good idea for TRAI to evolve a best practices document through a process of consultation with the stakeholders?

Yes, it is a good idea