"*Sanchar Kiran*"-An Initiative Towards use of Solar Energy for Rural Telephone Connectivity

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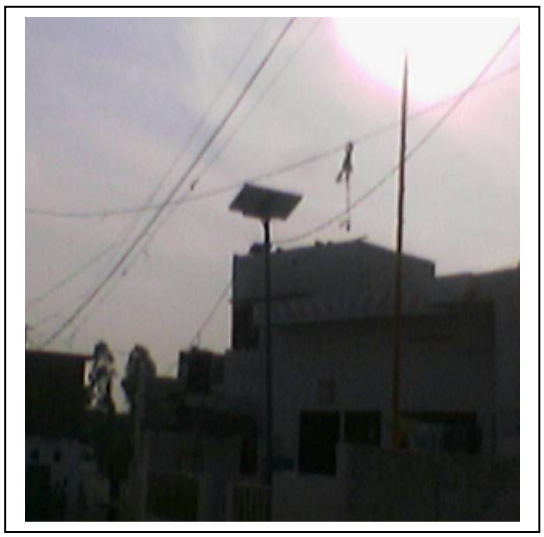
"Solar energy is the world's most plentiful energy resource, and the challenge has been tapping it cost-effectively and efficiently,"
- Janet Swain, World Watch



Subsidised Rural Telephony

India toady is a stark example of the digital divide. Even on October 2006, in spite of a vibrant and rapidly growing telecom sector, rural teledensity stood at a mere 2% compared with urban teledensity figures of 40%. To boost rural connectivity with its multifarious positive implications for rural development, the Government of India through the Department of Telecommunications (DOT) provides subsidy from a Universal Service Obligation (USO) Fund created on 1.4.02, to finance the spread of rural ICT. This includes public access telephones; individual rural household phones and recently proposals/projects are going on for financing mobile infrastructure and broadband facilities in rural areas. Based on a competitive bidding process agreements are entered into with public and private telecom companies to provide ICT facilities in rural areas. Under the Universal Service Obligation Agreement to provide rural household telephones in villages in selected net cost positive areas(Secondary Switching Areas(SSAs)) of Haryana State of India the incumbent telecom operator of India-BSNL as well as two major private telecom operators namely, Tata Teleservices Ltd (TTS) and Reliance Communications Ltd (RCL)are at present being given subsidy support for more than 100,000 Rural phones that they have installed between 1.4.02 and 31.3.05 and 1.4.05 and 31.3.07. These are mostly CDMA Fixed Wireless Terminals (FWTs) phones. The author who belongs to the Indian P&T Accounts and Finance Service was posted as Joint Controller Communication

Accounts and was charged with the responsibility of scrutinising the subsidy claims of telecom operators, monitoring and inspection of field implementation of USO Agreements and release of subsidy against qualifying, connections as per terms and conditions of USO agreements pertaining to Haryana Service Area.

Out of the total number of 415,043 rural connections provided by the incumbent (whether subsidized or installed in a period before the date from which subsidy regime is applicable) in rural Haryana. 76,833 are on CDMA technology (FWTs). The remaining are wire line. All the connections provided by private telecom operators under USO are CDMA FWT connections (around 80,000).There are a fair number of public access phones in rural Haryana both commercial and subsidized by USO; almost all these are CDMA FWTs. All future planning of rural phones by incumbent BSNL is centred on CDMA technology as a matter of conscious policy, whether in Haryana or elsewhere in India. The reason is that while it costs around Rs 25,000 on an average to provide a wire line rural phone, the cost of a CDMA connection is around Rs 5,000. Further given the dispersed nature of rural inhabitation, the cost of cable laying and maintenance is very high. Thus CDMA technology is of great significance in the context of rural connectivity. This analysis would be equally applicable to other states of India. CDMA FWT telephone sets generally have internal batteries with a back up, talk time of 2-3 hours at the most. Thus in the absence of electricity, once the internal battery runs out, these phones become non functional.

The Significance of CDMA Phones for Rural Telephony

Indian Code Division Multiplex Access (CDMA) operators have made the price of going mobile the cheapest in the world. Figures show that subscribers are lapping up these cheap phones. As on March 2007, CDMA subscribers crossed the 44.5 million mark, doubling last year's numbers. Analysts say with a tele-density of only 18 per cent and an under-served rural population, the rapid growth of cheaper CDMA connections in India is expected to fire the telecom market. "The aggressive pricing by a CDMA operator like Reliance," says Neha Gupta, senior research analyst, Gartner India, "is based on how efficiently it markets its tariff structure and bundles an affordable handset." Volume-based handset sourcing deals with Chinese equipment vendors, like Huawei, ZTE, TCL, helps the operator in further subsidising its subscriber acquisition cost further, she adds. Consider this. For Reliance Communications or Tata Teleservices, acquiring a CDMA subscriber has become almost Rs 1,000 to Rs 1,400 cheaper than a GSM operator, according to CDMA Development Group (CDG), an industry group that promotes CDMA technology. With CDMA operators like Reliance packaging their tariff structure at as low as Rs 777, the GSM counterparts have to lure subscribers with an entry tag of Rs 1,799 for the handset and another Rs 150 to Rs 200 for a GSM connection. "This price war is expected to ballyhoo rural and semi-urban mobile connectivity in India," says B V Raman, country head, CDG India.. Meanwhile, the government has extended its support to telecom companies who plan to introduce 'affordable' Rs 1,000 and low-priced CDMA handsets – a move that is expected to increase teledensity in rural areas. The target for CDMA base is 75 million subscribers by the end of fiscal 2007-08, according to the CDMA Development Group. With these moves, it appears very much in sight.

The Need for Alternative Energy Sources for Rural Telephony

Haryana has 6955 villages with a total rural population of 14.9 million as per 2001 census. This constitutes 71% of Haryana's population. Haryana has a continental climate with hot summers with the mercury rising above 45 degrees Centigrade and fairly cold winters. There are about 320 clear sunny days available in this State and the average solar insolation is 500-700 Joules per sq. meters. Haryana has primarily been an agrarian economy and, thus, most of the people are traditionally farmers. The total power installed capacity of the State is about 4033 MW out of which 20 MW is from Renewable Energy Sources.

Though as per official statistics 100% of its villages are electrified, the fact is that rural areas face prolonged power cuts and the average availability of power may be as low as a few hours a day. On an average, electricity is not available for 6-8 hours in the daytime and in most villages, in addition to this limited availability; electricity is available only on alternate days. Also due to the poor rural electricity infrastructure, power cuts extending over a few days are not at all unusual. This has the unfortunate implication of rendering rural CDMA connections non functional. The quality of rural connectivity is thus seriously negatively impacted.

Genesis of Project *Sanchar Kiran*

During the physical inspection of rural telecommunication facilities provided under USO agreements in Haryana, the author had observed that rural CDMA connections often remain non functional for prolonged periods due to the restricted and unreliable power supply in most rural areas, thereby adversely affecting the quality of rural connectivity. At present the telephones provided by BSNL (public sector incumbent) in the rural areas of Haryana are functioning on 220v commercial power supply with battery back-up (SMPS). The SMPS provides back-up power supply of a few hours. (2-5 hours depending on nature of usage). Given the erratic availability of power supply in the rural areas this back-up supply is insufficient and in most areas it runs out before commercial power is available to recharge it, rendering the telephone connection non functional. The same is the case with rural CDMA connections provided by private sector operators, TTS and RIL under USO. These rural connections are provided with CDMA instruments having an internal battery with about 3 hours of power backup.

The rural population have openly expressed their unhappiness with CDMA connections due to the fact that their functionality is dependent on the erratic AC power supply. This was observed by the author during inspections and is reportedly a predominant factor behind the mounting surrenders and dwindling waiting lists of the incumbent BSNL. (Who does not apparently have the flexibility to entice rural populace with measures such as three years incoming of free incoming calls as used by private operators to maintain subscriber base in spite of poor quality of rural service). However, it is also observed that at this stage the phone is still a novelty and a blessing for rural folk. Thus many of them are grateful for this subsidized facility even when it works only for a few hours a day. If our aim is to extend the benefits of tele-connectivity to rural India, this issue should nonetheless be tackled urgently by telecom operators and the government, lest rural telephony be reduced to the same status of flimsy existence as rural electricity! The problem of power is more serious when it comes to public access facilities such as VPTs. While some PCO/VPT/ franchisees have been able to afford inverters, others who

had been earlier been provided solar panels to run MARR VPT phones, have innovatively been using these panels to power the CDMA phones provided in replacement.

Measures Taken- Consultations with Renewable Energy Department. Discussions were held with private telecom operators and BSNL to find a solution to this problem so as to improve rural services under USO. During the course of discussions the idea of utilizing **solar chargers** specially designed for CDMA instruments at subscriber premises emerged as a good potential solution. We then took up the matter with the Haryana Government's Renewable Energy Department (HAREDA) under an effort which the author labeled as Project '**Sanchar Kiran.'** In May 2006 a proposal was sent by the author to HAREDA to customize solar battery charger developed/approved by HAREDA for use for charging battery back-ups of rural CDMA telephones being provided by various telecom operators in Haryana under USO. The understanding was that the solar battery charger so customized would be recommended to BSNL and private telecom operators for provision of the same with their rural phones. HAREDA was provided technical specifications, design and literature required for the purpose, keeping in mind the necessity to cater to the power requirement of various types of CDMA instruments being provided by different operators under USO agreements in Haryana.

Extremely Positive Test Results. The matter was pursued vigorously with HAREDA. As a result of the above efforts the solar battery cum charger packs for CDMA connections of BSNL and solar chargers for the two private telecom operators were customized by HAREDA. For BSNL CDMA Connections a prototype has been tested in the field by officials, nominated from for the purpose. Simultaneously, the prototypes developed specifically for TTS and RCL CDMA phones were handed over to these telecom operators for field testing and to explore the feasibility of providing the same with their rural CDMA connections. Field testing has shown extremely positive results. In fact as long as solar energy to power, it is available the charger cum battery set so developed have been found to be able to support the CDMA FWT entirely independent of AC power supply. This is important as it implies that with the help of these sets, CDMA connections can be provided even to un-electrified villages or rural households. The final configuration & specifications of the solar charger cum battery pack were formulated after incorporating results of field testing and the same were communicated to the manufacturer.. Subsequently a meeting was held with senior officers of BSNL Haryana. It was decided during the discussion to forward the proposal to TEC/BSNL QA for type approval. This type approval is mandatory before BSNL Haryana can introduce the solar power sets into its network even on an experimental order basis. The matter of expediting type approval and grant of pilot project status to BSNL for Haryana state is being pursued by the author with the Department of Telecom Head Quarters.

Solar Charger &
CDMA Handset

Subsidy Options It is felt that as BSNL Haryana has the largest rural presence and CDMA connections, once it is able to incorporate solar power sets with its subscriber FWT into its rural package, (even on a small experimental basis to begin with), the proven viability and resulting enhanced customer satisfaction with CDMA connections would incentivise private operators to follow suit. The deployment of solar chargers so developed in lieu of the normal battery back up for CDMA connections being provided by BSNL and other telecom operators would go a long way in improving the quality of rural telephone services. The provision of solar chargers in power starved rural areas would lead to greater utilization and therefore greater demand and revenue generation for rural CDMA connections. This would be to the definite advantage for the telecom operators. However it is appreciated that telecom operators would perhaps be more willing to incur additional cost of solar charger if the same is partly subsidized, at least in the initial stages. During discussions with HAREDA, the possibility of the cost of solar chargers being partly subsidized under the fiscal and financial incentives made available by Ministry of Non Conventional Energy Sources (MNES) and Indian Renewable Energy Development Agency (IREDA), as a pilot project to encourage and demonstrate use of renewable energy devices in rural areas, had also emerged. Accordingly the matter has been taken up with DOT HQ and the USOF Administration at New Delhi who have forwarded the proposal to MNES.

Needless to say, the dismal power situation and its adverse impact on rural connectivity would be equally or even more acute in other states of the country. For example, in Madhya Pradesh, power shortage as on February 2007 was reported to be 1,800 MW with load shedding in rural areas extending between 16-20 hours. Even the award winning and internationally acclaimed *Gyandoot* e-governance project is reported to have flopped in reality, partly due to this power situation. Thus the utilization of solar power/alternative energy is critical for rural ICT connectivity

Other Independent Initiatives

It is interesting to note that telecom operators, especially in the private sector have quickly gauged the need for alternative energy for powering telephony in electricity starved rural India, and have gone right ahead with innovative utilization of the same. Thus Hutch and Idea Cellular are increasing exploring use of solar energy and bio fuels for powering their rural mobile base stations (BTS). This phenomenon is already seen in the North and apparently in the remote North Eastern areas of India, BSNL too has recognized that solar power is the cheapest mechanism to power base stations. This is because non availability of electricity is serious constraint and the cost of carrying diesel in remote areas is huge. One such private solar BTS operated by Hutch in rural Haryana has been shown in the picture below. In this BTS solar power is used as a back up during daily electricity cuts. The security guard cum maintenance employee for this BTS, who is a local resident of the village, told the author that since solar powering was introduced for the BTS, it has become entirely independent of diesel which earlier had to be filled repeatedly every day to keep the generator going. The solar charged BTS thus requires relatively low maintenance. The initial investment of solar panel and batteries is relatively high as compared to a generator, but one should also think about the cost of diesel and maintenance cost of constantly refilling the generator to keep the BTS going, in comparison to a steady no fuss alternative source of energy such as solar power.

SOLAR PANEL OF ERSTWHILE MARR VPT BEING USED FOR NEW CDMA CONNECTION

SOLAR POWERED OUTDOOR BTS (MOBILE SERVICES EXCHANGE)

It is because of the high initial cost that the associations of cellular mobile and CDMA telecom operators (The COAI and AUSPI) have approached the DOT for subsidization of the use of non conventional energy sources in telephony. Given the power situation of rural India this is a reasonable demand. Recently Telecom Regulatory Authority of India has recommended that the USO Fund be used for subsidizing solar and non conventional energy usage in rural telephony and that DOT take up the issue of encouraging such projects in coordination with MNES.

The Multiple Benefits of Alternative Energy Usage-A Win, Win and Win Situation

The use alternative energy is almost compulsion in rural India, given the erratic existing power supply and difficulties in connecting large unconnected tracts in rural areas with the power grid. Given the cost of installing transmission lines in rural areas, use of bio-fuel /solar energy makes good sense. Amongst the alternative energy sources, solar energy in particular is expensive. However with improvements in technology, the cost of producing solar cells is reducing by 5% per annum. There is a real possibility of new technologies reducing the cost considerably. For example British Petroleum's Vivienna Cox in an interview with Economic Times recently stated that they are working on ways to modify the crystalline structure of the solar cells so that there is 7% more power generated by each cell.

Apart from the constantly reducing costs associated with solar and bio fuels, thanks to the Clean Development Mechanism (CDM) created under the Kyoto protocol, there is a lot of scope for developing countries like India with abundant sun/bio fuel resources to earn carbon credits from the West by trading Carbon Emission Reductions (CERs). Companies in the Western countries with emission caps imposed under Kyoto protocol can trade money for CERs with companies in countries like India with no emission caps. Gauging the tremendous potential of this activity, private sector banks are now eager to fund manufacturing initiatives in this direction. Solar Photo Voltaic Cell (SPV) manufacturing giants such as Signet, Moser Baer, Solar Semiconductors are entering the country to set up facilities. The estimated investment in this field in India in the near future is $5-$6 billion. These companies reckon that there is a huge demand for energy worldwide and SPVs offer a cheap and eco friendly way to achieve it. Also the cost of production of SPVs has fallen by over 50% in recent years making it an attractive option. Not surprisingly, in 2006 there has been a dramatic growth in SPV production in China. Last year, China surpassed the United States, which first developed modern solar cell technology at Bell Labs in New Jersey in the 1950s, to become the world's third largest producer of the cells, trailing only Germany and Japan. China's leading SPV manufacturer, Suntech Power, climbed from the world's eighth largest producer in 2005 to fourth in 2006, and SPVs have made the company's CEO one of his nation's wealthiest citizens. Experts believe that China, with its growing need for energy, large work force, and strong industrial base, could drive dramatic reductions in SPV prices in the next few years, helping to make solar competitive with conventional power even without subsidies. "To say that Chinese PV producers plan to expand production rapidly in the year ahead would be an understatement," says Travis Bradford, president of the Prometheus Institute. "They have raised billions from international IPOs to build capacity and increase scale with the goal of driving down costs. Four Chinese IPOs are expected to come to market this month alone." India's energy needs too are growing dramatically. Thus, the time is ripe for India to take full advance of technological progress and environmental issues and make power while the sun shines! When we think of providing power to millions of our countrymen who remain unconnected to electricity grid or deprived of steady electric supply, we should think of leapfrogging the traditional stepping stones of polluting fossil fuel and head straight for green energy energy. We are today the fifth largest emitter of carbondioxide in the world. Though our emission at 1.1 billion tones per year is less than a fourth of USA's; as a nation growing between 8-9% per annum we too need to do our bit to combat global warming. Solar energy is an obvious answer in hot sunny India. The Indian Government should make every possible effort to encourage its adoption by all sectors of the economy.

A SOLAR LIGHTING PROJECT

A solar photovoltaic (PV) pilot project in India has transformed the lives of approximately 100,000 people living in poverty-stricken rural regions by providing several hours of uninterrupted lighting every night. The goal of the $1.5 million project, led by the United Nations Environment Programme (UNEP), was to facilitate household financing for solar home systems. Its success has inspired satellite programs to improve energy access in Algeria, China, Egypt, Ghana, Indonesia, and Mexico. In the absence of alternative energy sources and plagued by the unreliability of local electricity grids, many rural regions in India have had to rely on polluting kerosene lamps and household stoves to meet lighting needs. According to UNEP, a single wick of kerosene can burn up to 80 liters of fuel, emitting more than 250 kilograms of carbon dioxide per year. In developing countries, the use of kerosene and other "dirty" fossil fuels for indoor lighting is responsible for 64 percent of deaths and 81 percent of lifelong disabilities from indoor pollution for children under the age of five. Approximately 45 percent of people in India are hooked up to a power grid and endure daily power failures. Those without grid access must often walk long distances to buy a few liters of expensive kerosene, which can be scarce because much of it is traded on the black market as an illegal way to dilute fuel and diesel. "Kerosene used by the poor for lighting is often unaffordable, unavailable, unsafe, and unhealthy, while the electricity power grid is unreliable," explained Timothy E. Wirth, president of the United Nations Foundation. Speaking about the new solar project, he noted that, "To provide even this little degree of electricity reliability and independence is to empower the poor in ways that can profoundly alter lives for the better."

The largest barrier to the switch to solar in developing countries has been the lack of financing for clean energy in poor communities. Often, the world's poorest people can afford only highly polluting options such as kerosene. With a program such as UNEP's Solar Home Systems project, communities have easier access to financing, with the opportunity to pay more money upfront to acquire better, cleaner technologies that can save money in the long-term while improving the quality of life. The UNEP project aims to make power affordable by encouraging local and national banks to finance small loans—usually $300 to $500—for a system that typically contains a roof-installed solar PV module, storage battery, charge controller, interior wiring, and switches and fixtures with the capacity to power two-to-four low-watt compact fluorescent lamps (CFLs) and a DC fan. Two of India's leading banks, Canara Bank and Syndicate Bank, were the project's original partners, jointly supplying low-interest loans that could be repaid over five years through their 2,000 rural branches. A vendor qualification process coordinated through the banks resulted in five solar vendors offering a variety of competitive products that were eligible for financing, offering customers flexibility in their choices.

Conclusion

Though there has been phenomenal progress in the telecom sector in India, rural connectivity still lags at 2% compared to overall teledensity of 18.7% and urban teledensity of 40%. As the government sets out to use USO funded agreements with telecom operators to bridge the digital divide, another infrastructural constraint by way of prolonged power shortages and erratic electricity supply in rural areas becomes a stumbling block to *effective* rural telecom connectivity. Given this backdrop, the author has made efforts to address the issue of providing sustained energy supply to power individual subscriber terminal equipment (CDMA phone sets) by way of development of customized solar charger battery sets. Telecom operators too are addressing the issue of erratic rural power supply at a macro level with their individual initiatives to use solar /bio fuel as energy sources for their mobile telephone exchanges or BTSs. They are pressing for subsidy to fund these initiatives and the government responding positively is seriously considering the modalities of providing the same. Technological developments in the field of SPVs are rapidly reducing the cost of this hitherto expensive energy source. As a green energy resource which our country abounds in, solar power represents a huge underutilized reserve of energy and potential wealth just waiting to be tapped.

Disclaimer

Views are entirely personal and in no way represent the Government's policy or view point on the matter.

About The Author

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