

Gwagwalada Community Telecentre Outfit

Gregory Onwodi, PhD and Moshood Akintayo

National Open University of Nigeria (NOUN)

ABSTRACT

*Owing to retrogressive state of cybercafe, this project, **Gwagwalada Community Telecentre Outfit (GCTO)** is well positioned to correct and promote improvement of standards and implementation of best practices by providing high speed Internet in a structured communication outfit for students of Open University of Nigeria (NOUN) and community people dwelling in Gwagwalada to meet the telecommunication needs of these August populace with triple-play services (Voice, Video and Data services). The implementation of this project was carried out using a dual-link to **NIGCOMSAT-1R** satellite with a view to deploying effective and modern ICT Centre at Gwagwalada, a satellite town in Abuja. The project began with NIGCOMSAT LTD installing Ku-band antenna and iDirect two-way IP router (X3 iDirect Evolution Modem) in the GCTO's Server Room. **GCTO Hotspot Wimax** architecture is designed to make possible a Metropolitan Area Network (MAN) that lets typical community users and vast majority of **National Open University (NOUN) students** ubiquitously subscribe to a well secured wireless network at Gwagwalada and environs and not necessarily visiting the centre to acquire access to the network. My aim is also to show how Nigerian Communication Satellite (1r) can be utilized by the National Open University students as well as some rural dwellers in Gwagwalada by supporting Gwagwalada Community Telecentre Outfit (GCTO). Integration of Solar Power System with this project has uninterrupted power supply possible for the Centre.*

BACKGROUND OF THE STUDY

This project has its origin from the core concept of Cybercafe in Nigeria that I briefly introduce here. Unfortunately, the Cybercafe had long lost its relevance due to unstructured communication outfit.

In the early, Cyber café has initially served as the fulcrum for many entrepreneurial ventures and we had witnessed the likes of NITEL and Post Offices play the mediator agencies between various communication parties in Nigeria.

Cybercafé is a general place where people have access to the Internet for a fee. It could have 10 to 100 computers for clients. In an ideal cybercafé, peripheral devices such as printers, scanners, routers among others are used (Ajewole, 2008). In cybercafés centre, computers are interconnected using a switch to internally link them to a router that connects the Internet. In that case, the router is a device that connects Internet Service Provider (ISP) equipment with the in-house server which then distributes the signal to both wired and wireless workstations. Router is the star of a network and the key to the success of the Internet. It routes packets across multiple networks and maintains a list of addresses which helps to link the other networks. Router is so intelligent that it works out the best route for itself to ease network communication. The scanner is used to scan pictures and other documents in case of need while the printer is used to make hardcopy of documents for the cybercafé users as desired.

In another dimension, Cybercafé could be described as a virtual market where all kinds of business transactions take place. Adomi et al. (2003) define cybercafés as places where entrepreneurs provide Internet public access services for a fee. It can also be described as places where people of diverse culture and characters meet and engage in Internet surfing and other form of electronic communication. In this era of cybercafés patronage, there was proliferation of cybercafés especially in developing countries because of the need to render services to Internet users. As it were, cybercafé played important role in accessing Information and Communication Technology (ICT) particularly in a region of low infrastructural development (Adomi et al., 2003; Mutula, 2003; Adomi, 2008).

At that time, Cybercafe became a soothing relief to Nigerians thus ending the needless delays associated with mail delivery, long queues at public phone booths, the epileptic telephone service which was as bad as electricity supply, and also becoming the fashionable alternative for communicating with friends and family.

Conversely, the cybercafe sector lacks scale and of course not socially conscious for today's standard of communication, almost a decade after their heyday, most cybercafés have either closed shops or converted to other business interests. (Adogbeji, 2015)

My visit to some cybercafe outlets in the satellite towns across the Federal Capital Territory (FCT), Abuja has revealed that there has been steady decline in the fortunes of this once vibrant sector of the economy. Owing to retrogressive state of cybercafe, this project, Community Telecentre Outfits are well positioned to correct and promote improvement of standards and implementation of

best practices by providing high speed Internet in a structured communication outfits across the rural or un-served areas in Nigeria to meet the telecommunication needs of Nigerians with triple-play services (Voice, Video and Data) using Gwagwalada, Abuja for deployment.

A Community Telecentre Outfit is a public place where people can access computers, the Internet and other technologies that help them gather information and communicate with others at the same time as they develop digital skills.

While each Community Telecentre Outfit is different, the common focus is on the use of technologies to support community and social development — reducing isolation, bridging the digital divide, promoting health issues, creating economic opportunities, reaching out to youths. Community Telecentre Outfit exists in almost every developed country on the planet, although they sometimes go by different names (e.g. village knowledge centres, infocentres, community technology centres, community multimedia centres or schoolbased telecentres).

Nigerian Communications Satellite (NigComSat-1R) as an ICT Solution provider in Africa led to the Initiation of this project. On the 19th of December, 2011, Nigerian Communications Satellite (NigComSat-1R) was successful launched into geostationary transfer orbit (GTO) atop a Long March 3B rocket. The 5000-kg telecommunications satellite, commissioned by Nigeria, is a replacement for Nigcomsat-1, which failed on orbit in 2008.

The rebirth of NigComSat-1R provides optimal and cost effective voice, data, video, Internet and e-services solutions with its 28 communication transponders, offering broadcasting services in C-band, Ku-band, Ka-band, and L-band with footprints in Western parts of Africa (massively in Nigeria), Central Africa, South Africa, parts of Asia, Europe and East Africa.

By this, Nigeria had stepped into the internet age. Yet, unknowingly today, about seven years after, the country is still struggling with the infrastructure of this technology or due to bad policies.

Thus, development of Community Telecentre Outfits using NigComSat-1R satellite will serve as one-stop assembly for easy access to e-services in un-served communities.

The outfits are fully equipped with desktop computers, furniture, ip-phones, solar power, and unlimited bandwidth via NigComSat-1r to provide access to ICT services and e-initiatives at semi-urban and rural un-served areas.

In developed countries, Community Tel-Centre Outfits forms an essential part of a growing

technological country and is the basis of an effective and efficient communication industry. Community Tel-Centre Outfit network is sometimes an arbitrary prospect for the different people, who make use of it.

Community Telecentre Outfit network seeks to determine the valuation of a job relative to other jobs within the organization. The Community Tel-Centre Outfit is secured and scalable. The importance of the security is to enhance proper management of users and avoid illegal and illicit user in the Community Tel-Centre Outfits network. Secured Community Tel-Centre Outfit networks are normally done in isolation; it requires a thorough specification of the range at which the network can cover, that is in terms of the bandwidth and the amount of packet data it can send along the network.

Secured Community Tel-Centre Outfits networks are primarily determined by the strength of devices around it, in terms of its transmitting rate and how it can conveniently communicate with other receiving connection. It is recognized that in practice, several factors used in determining the security of the network are:

1. The rate at which it can deny intruders access into the network.
2. The total amount of place it can cover at a time i.e. its hotspot zone.
3. The rate at which it communicates.

STATEMENT OF PROBLEM

There is need for Community Telecentre Outfit at Gwagwalada, Abuja.

The recent literature on Cybercafe has addressed various aspects of internet usage in the rural area but it has not effectively synthesized actual telecommunication experiences to identify the most appropriate design for integrating VOIP, Video and Data. Also sustainability is key of which the implementation of Solar System as an Integral part of Community Telecentre Outfit s stands to address.

REVIEW OF RELEVANT LITERATURE

2.6 SUSTAINABILITY OF TELECENTRES

The above literature leads to think about the sustainability of telecentres. Sustainability can be described as "the ability of a project or intervention to continue in existence after the implementing agency has departed" (Harris et al 2003). A key question that telecentre researchers are asking is the major issues that the stakeholders need to address to achieve sustainable telecentres in developing contexts. Some researchers argue that telecentres in

development contexts must continually evolve if they are to provide appropriate support for social and economic development and to meet the changing needs of citizens (Van Belle & Trusler 2005; Benjamin 2000; Gurstein 2003). In that sense, the sustainability of the telecentre is multi-dimensional. Indeed, it is not only about assuring financial sustainability, i.e. the capability of a telecentre of being financially self-standing (Hudson 1999), but also about social sustainability, i.e. the capacity of being coherent with the needs and characteristics of the local population in a given context.

Roman & Colle (2002) identified 10 themes for telecentre sustainability:

- The power of a national commitment by policy-makers who recognize the value of connecting the people of the country through the modern tools of the information society, and follow that commitment with funding and organizational support for multi-year programmes.
- The importance of partnerships in translating national policy into action through governmental and non-governmental bodies at the regional and local levels.
- The value of having local ‘champions’ (innovators) who can mobilize others (early adopters, opinion leaders) to accept the vision of an ICT telecentre programme.
- The significant value of community volunteers in operating telecentres.
- The advantages of clusters or networks of telecentres working together in a region to develop and share a variety of resources.
- The importance of raising awareness about information and ICTs as a valuable resource for individuals, families, organizations and communities.
- The role of research in creating a viable telecentre enterprise.
- Telecentres need long-term sustainability and business plans that fit the culture of the community.
- Focusing on information services rather than on computers and the internet alone to build a local institution more fully woven into the fabric of the community, with a larger base for generating income.
- Participation of the parties concerned. Simpson (2005) commented on the lack of success of the Australian government’s networking the nation fund which required rural and regional communities to identify their own ICT-related development needs, propose their own solutions and seek funding, and then manage these projects.

2.7 GWAGWALADA COMMUNITY TELECENTRE OUTFIT (GCTO)

Nigerian Communications Satellite’s mandate to be an ICT Solution provider in Africa led to the Initiation of the **Gwagwalada Community Telecentre Outfit (GCTO)** which is aimed at providing high speed Internet in a structured and wireless infrastructure across the Gwagwalada Local Government environs to meet the telecommunication needs of the people within Gwagwalada with triple-play services (Voice, Video and Data) using the Nigerian Communications Satellite (NIGCOMSAT-1R).

The GCTO is essentially a tele-centre set up for a specific local community within Gwagwalada area so that communal use can be made of the facilities available at affordable rate(s). In line with this, GCTO has developed a franchising scheme aimed at providing employment and generating income for unemployed graduates and improving the standards of ICT nationwide.

The Vision of the GCTO is to enhance information and communication infrastructures through provision of local access to information services in order to support and empower socio-economic development.

GCTO Franchise Justification

1. To upgrade Cyber cafe status in Nigeria with higher level of operational efficiency from indigenous scale.
2. To strengthen entrepreneurial capacity of Nigerians thus improving service quality, marketing and capital base.
3. To create additional jobs and increase income generation in the rural and urban areas.
4. To reduce rural-urban population drift and crime in general due to job creation and increase in income.
5. To provide business ownership opportunities through the GCTO franchise scheme. Human capital development, the GCTO’s as a business opportunity enables business men, women and Government to own a business of their own to generate profit without necessarily having the capital to start the business.
6. To facilitate e-Governance, e-learning, e-health and e-commerce. The GCTO will provide the opportunities and the benefits of these services to rural and un-served urban areas of the country.

Key Attractive Features:

1. Nigcomsat-1R is a national strategic ICT infrastructure with the far reaching capability of transforming Nigeria and Africa into an information society. GCTO will provide such facilities (phone, fax, internet, computers, photocopier, audio-visual equipment, etc.) for a wide range of community uses, including the improvement of governance and public services.
2. GCTO will support individuals by providing access to telephony, distance education, computer-training, village hall facilities, and local small enterprises by providing business information, office facilities, professional training, etc. In fact, some of the tele-centres themselves work as small enterprises.
3. GCTO will provide communities with access to data processing and telecommunication services as well as computer-assisted service suggesting the viability of providing a sustainable, cost-effective, shared community facility, capable of servicing most of the requirements of the local population.
4. GCTO will build connections and promote knowledge sharing between the government and community networks with its focus on community engagement strategies.
5. GCTO is promoting the use of green energy which is pollution-free and noiseless without impact on the environment.
6. GCTO bridges the technological gap between the urban and rural areas.

These features make the GCTO a distinct ICT medium and that aims at spreading knowledge and technological knowhow throughout Africa

Distribution Strategy

In the long run, a widespread strategy is the purpose for the CTO. Nigerian Government be advised to have a CTO in every local government of the Federation.

GCTO will have significant State Government Patronage

1. FCT Governments to be number ONE Customers
2. Links to Kuje Local Government site, companies and schools in the area
3. Reloadable GCTO internet cards for Government officials, and Students

4. GCTO to provide technological services (printing, stationary, and support services) for State conventions and Seminars
5. State Notary Services – stamps and signatures

A variety of printing Services:

6. Colour printing and binding Services
7. Personalized Products – Seasoned greeting cards, Custom Invitations, Photo Calendars, ID card and Business card services
8. Photo Printing Services

3.1 RESEARCH METHODOLOGY

3.1.0 Research Design and Sources of Data

The essence of this chapter is to assess GCTO infrastructures, technical solutions and network designs, different business models and to investigate the usage and impact of the connectivity on the users.

To develop **Gwagwalada Community Telecentre Outfit (GCTO)** and expand its burgeoning business and retain its standing as a leading Telecentre in the Gwagwalada and environs, **GCTO** sought out a partner that could provide a reliable internet solution. It selected NIGCOMSAT LTD, a communication satellite services provider with an outstanding performance record in broadband connectivity in Africa. For GCTO, NIGCOMSAT LTD developed a high-speed point-to-point bandwidth internet from NIGCOMSAT LTD's Teleport to GCTO Gwagwalada, Abuja using NIGCOMSAT-1R satellite.

This broadband link is based on its global VSAT service, which is built on the iDirect satellite communications platform.

The project began with NIGCOMSAT LTD installing Ku-band antenna and iDirect two-way IP router (X3 iDirect Evolution Modem) in the GCTO's Server Room.

iDirect satellite-based IP communications technology enables constant connectivity for voice, video and data applications in GCTO Tecentre. X3 iDirect Evolution satellite routers that are used in conjunction with iDirect hub services provide cost effective dedicated satellite internet services.

Satellite transmission has many advantages, it is especially attractive because its feature-set encompasses secure transmission, disaster restoral,

broadband capability and quick deployment for “on the move” and “fixed” applications. In fact, Mobile and Telecom operators use satellite based backhaul in mobile networks due to its cost effectiveness for sparsely populated areas, its bandwidth efficiency.

Below are the pictures that show on site installation of the outdoor VSAT.

3.1.1 GCTO WIMAX ARCHITECTURE

The **GCTO Wimax** architecture is design to make possible metropolitan area networking (MAN). The base station of Wimax capable to provide access to business and hundreds of homes.

WiMAX (Worldwide Interoperability for Microwave Access) is a wireless industry coalition dedicated to the advancement of IEEE 802.16 standards for broadband wireless access (BWA) networks.

WiMAX is an advanced technology solution based on an open standard, designed to meet the need for very high speed wide area internet access, & to do so in a low-cost, flexible way. It aims to provide business & consumer broadband service on the scale of the Metropolitan Area Network (MAN).

WiMAX is optimized for IP-based high speed wireless broadband which will provide for a better mobile wireless broadband internet experience.

With its large range & high transmission rate, WiMAX can serve as a backbone for 802.11 hotspots for connecting to the internet.

Mobile devices connected directly to WiMAX base stations without using 802.11 can achieve a range of 4 to 6 miles, because mobility makes links vulnerable.

WiMAX can be used in disaster recovery where the wired networks are broke down as a backup links for broken wired links. It can typically support data rates from 500 kbps to 2mbps. WiMAX also has clearly defined QoS classes for applications with different requirements such as VoIP, real-time video streaming, file transfer, & web traffic.

The WiMAX technology provides fast & cheap broadband access to markets that lack infrastructure (fiber optics or copper wire), such as rural areas & unwired area as shown below:

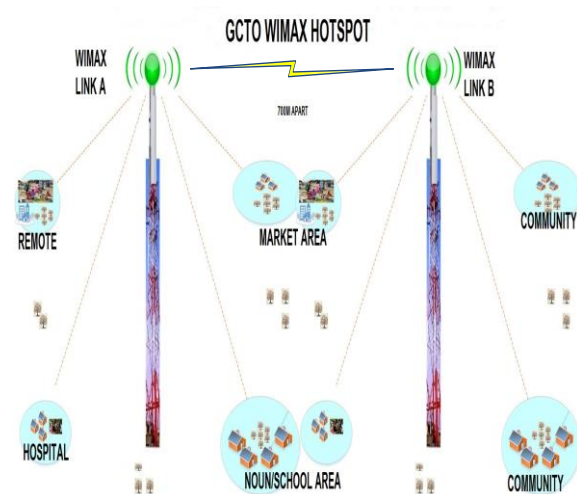


Fig 1 GCTO Wimax Hotspot

WiMAX is a family of technologies based on IEEE 802.16 standards. There are 2 main types of WiMAX : fixed WiMAX (IEEE 802.16d), & mobile WiMAX(IEEE 802.16e). Fixed WiMAX is a poin-to-multipoint technology.

Mobile WiMAX is a multipoint-to-multipoint technology, similar to that of a cellular infrastructure. It uses orthogonal frequency division multiple access(OFDMA) technology which has inherent advantages in latency, spectral efficiency, advanced antenna performance, & improved multipath performance in, an NLOS environment. Mobile WiMAX systems offer scalability in both network access technology & network architectures.

Both solutions are engineered to deliver ubiquitous high-throughput broadband wireless service at a low cost.

The WiMAX specification improves upon many of the limitations of the WiFi standard (802.11b) by providing increased bandwidth & stronger encryption.

3.2.1 GCTO LAN NETWORK INFRASTRUCTURES

GCTO networks connect the National Open University (NOUN), Gwagwalada Centre, the Local Government Council Gwagwalada, the University of Abuja, Mini-Campus down to the Gwagwalada Teaching Hospital. The primary focus of the network is to connect the local government authorities, some educational institutions, and health facilities and market women. The network hosts a website where its content management is done in Gwagwalada, a local e-mail server, telecommunication services via voice over IP, and a Hotspot wireless wifi across and between the connected centres.

The GCTO premises house a bookstore, a library, a number of computers with an Internet connection, and a wireless network for rent to visitors bringing their own devices. It runs various educational and networking forums and publishes a quarterly literary magazine.

Below is the network diagram that depicts the components of GCTO LAN deployment.

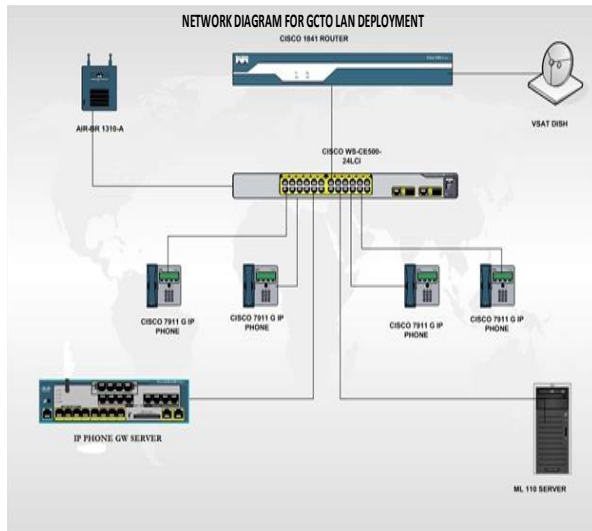


Fig 2 Network Design for GCTO

GCTO LAN network's driven vision is to authorise people by giving them access and to inspire them to use it for knowledge development and e-participation. People are coming to the Telecentre both for pleasure and work and people look at the Telecentre as a "community knowledge centre," recognising that "information is power." They promote lifelong learning and aspire to take the role of "intermediary," to proactively support their clients in debating, networking, and building up an active reading culture on the Internet.

Today, GCTO is utilizing Hotspot Server, Cisco Unified Communication and Cisco Aironet Omni Access Points to advance several strategic aspects of its integrated network. These services include Voice Over IP (VOIP) telephony from GCTO Centre to within and outside Nigeria via IP based phones, upgrading operations by running real-time business applications on Point of Sale (POS) and online marketing & banking, enabling remote access and support, e – education, social networking etc.

3.2.2 DUAL POWER SOLUTION

Electricity in developing countries is often ridiculous, unstable and erratic. According to the world Bank, a typical firm in Africa can expect

nine outages per month, each lasting an average of seven hours, causing losses of 7% in sales (World Bank 2013). By contrast, in OECD countries, a typical firm can expect less than one outage per month, lasting an average of three hours when one occurs. Reasons behind these electricity disgraces in African countries are corruptions, poor policies, inadequate regulations, lack of planning and institutional support, lack of financing for off-grid entrepreneurs, and affordability for poorer households.

In Nigeria it has been reasoned that lack of sufficient power generation capacity, poor transmission and distribution infrastructure, high costs of supply to remote areas, militant's attack, are also among the biggest hurdles for electricity setback.

Besides curtailing domestic business activities, the poor capacity of electricity in Nigeria deters foreign direct investment inflows into the country, as investors are typically weary of high electricity costs and shortages. Nigeria's total electricity mix is largely dominated by non-renewable energy despite a vast potential in renewable sources.

Nigeria's inability to achieve stable power supply over the last few decades is a stark pointer to the fact that its over-reliance on gas and to a lesser extent, hydroelectric power sources alone need to reviewed.

The unreliable state of public electricity supply at National Open University Gwagwalada where the GCTO sited has forced many large business ventures and prominent residents to acquire and depend largely on private electricity generating plants in order to remain in business and live comfortable life. This has greatly increased business running costs, the costs of production of goods and services and the consumers paying more to access basic goods and services. The poor residents and the small-scale businesses who can hardly afford own electricity supply are the most adversely affected. For this category of individuals and business operators, owning and maintaining private electricity generating plants coupled with the associated costs is a herculean task.

Solar Power Solutions integrated with Gwagwalada Community Telecentre Outfit (GCTO) infrastructures is constantly providing uninterrupted renewable energy for the telecentre.

Solar Power Solution has considerable potential in Nigeria and could bridge the major energy gaps in rural areas. The growing opportunities for renewable energy in Nigeria are becoming more evident as new grid technologies, like concentrated solar power, are emerging as in competitors with

conventional oil-based power generation of electricity for the project.

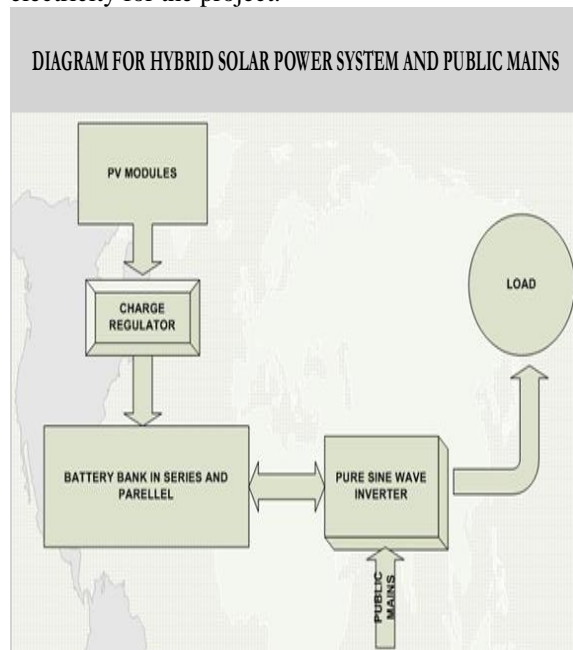


Fig 3 Hybrid Solar Power System and Public Mains

Solar panels are the major component of a solar power system. It converts light energy from the sun to direct current DC electric voltage. Solar panels are made up of arrays of photovoltaic cells (also called solar cells), connected in series and parallel to deliver rated voltage and power.

The photovoltaic cell is the basic component of a solar panel. PV cells are made from semiconductor materials, like silicon and doped with other elements, like Boron and phosphorus.

These elements create an N-type layer and a P-type layer on the cell. The junctions between the N-type layer and P-type layer contains an electric field, which stops electrons from moving across the junction, effectively creating an open circuit.

When a photovoltaic cell is exposed to sunlight, energy-carrying particles in light called photons continuously strike the p-n junction area of the cell and are absorbed.

Energy derived from these absorbed photons provides electrons on the cell with enough energy to overcome the potential barrier of the electric field in the p-n junction. This causes electrons to flow across the junction to power electrical appliances.

A solar panel consists of an array of solar cells, usually covered in glass. Solar panels provide power for charging your batteries and for powering your appliances.

Solar panels are expensive per watt (though they are getting cheaper) when compared to a petrol generator, but uses free energy from the sun. Solar panels can last for up to 30 years.

Solar electricity is a clean, reliable, and cost-effective energy source, powered from the sun. Solar Power System is a smart choice for all Telecentres especially for a strategic Community Telecentre Outfit like the **GCTO**.

The **GCTO** Solar Power design takes into consideration future expansion, duality of public power supply mains and Solar Energy and battery bank capability of more than 12 hours in the absence of both Sun's energy and public mains.

3.2.3 Advantages of Solar Power System for GCTO

- The Telecentre utilizing free energy from the Sun.
- The Telecentre enjoys zero emissions
- Solar Power System offer silent operations
- The Solar System reduces electricity bills
- The cost of running a solar power system is low
- Solar panels last for up to 30 years with minimal maintenance cost.

3.2.4 Disadvantages of a Solar Power System for GCTO

- Expensive: components cost a lot to acquire
- Require more space for battery bank & solar panel.

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