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REPORT ON ASSIGNMENT TO SUPPLY, DELIVER AND INSTALL SOLAR POWERED COMPUTERS IN 52 SELECTED SCHOOLS AROUND UGANDA

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Abbreviations and Acronyms

BOG	Board of Governors
UCC	Uganda Communications Commission
CLS	CLS Limited
CPU	Central Processing Unit
g	Grams
GB	Gigabytes
ICIP	Inveneo Certified ICT Partner
ICT	Information and Communication Technology
IT	Information Technology
Kg	Kilograms
Km	Kilometres
Lab	Laboratory
LAN	Local Area Network
LCD	Liquid Crystal Display
MB	Megabytes
mm	Millimetres
P. S.	Primary School
RCDF	Rural Communications Development Fund
S. S.	Secondary School
TFT	Thin Film Transistor

Acknowledgements

CLS would acknowledge the contribution of all that were involved in this project to supply, deliver and install solar powered computer labs in 52 (fifty-two) rural school around Uganda. Without their input, the challenges that are involved in such an operation would have been harder to surmount. Below are those, among many others, that CLS would like to acknowledge for their contributions to this project:

- The board of directors, management and staff of the UCC
- The board of trustees, director and staff of the RCDF of UCC
- Our suppliers and vendors including:
  - Inveneo Inc. of California USA
  - Asus Technologies of Taiwan
  - Ultra Tec Uganda Limited
  - JoeFreight Uganda Limited

- Our project management team including:
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- Also acknowledged are CLS staff, Richard Maganda, Rachael Mbabazi, Sanyu Mugerwa and Vincent Luli.

Contents

Summary

CLS signed a contract with UCC on August 30th 2009 to supply, deliver and install solar powered computers at fifty-two (52) selected rural schools around Uganda. The tables below show summaries of the scope and supplies involved in the assignment:

Milestone	Quantity
School computer labs fitted with solar power	52
School computer labs fully outfitted with solar powered computers	52

Equipment Installed	No. of Schools	Quantity per site	Total project quantities	Total Installed
Computers	52	10	520	520
Dedicated servers	52	1	52	52
Solar panels	52	8	416	416
Deep cycle batteries	52	3	156	156
Charge controllers	52	2	104	104
Network routers	52	1	52	52
Lights	52	4	208	208

1.0 Introduction

1.1 Background

On August 30th 2009, UCC reached an agreement with CLS Ltd. for the supply, delivery and installation of solar powered computers to 52 schools. This was after the former had accepted CLS's bid for the provision of supplies and services related to the assignment mentioned above.

1.1.1 About CLS Limited

CLS is the leading specialist in and supplier of low power computing in Uganda. Founded in 2005 as a computer and computer peripherals and accessories trading company, its leaders recognised that the biggest impediment to a wider dissemination of modern computers especially to underserved Ugandans around the country was lack of access to the national power grid as well as unreliable power supply for many of those that have access to it. It is primarily for these reasons that CLS sought accreditation with one of the world's leading developers and certifiers of low power computing solutions, Inveneo Inc, which is a non-profit IT enterprise based in the USA. CLS was appointed an ICIP for Uganda in 2007 after rigorous assessment and evaluation.

1.2 Objective of the Assignment

The overall objective of this assignment was to establish a functional computer laboratory with modern equipment in the fifty-two (52) selected schools. Due to limited electricity supply or lack of it in the locations, the computers were to be powered by an appropriate solar power system.

1.2.1 Specific objectives

- To supply computers and their accessories according to specifications indicated in the Contract Document
- To deliver computers and their accessories to selected schools listed in the Contract Document
- To install the computers and their accessories in the selected schools into a functional laboratory
- To supply, deliver and install appropriate solar power systems at the selected sites.

1.3 Scope of the Assignment

CLS was assigned to supply, deliver and install computers and their accessories in the selected schools in various districts around Uganda. Thereafter the laboratories would be operated and maintained by the schools. The installation involved setting up of a LAN.

1.3.1 Schools Benefiting from the Project

The assignment according to the Contract document and communications with UCC involved the following beneficiary schools:

No.	District	County	Name of School
1	Kaabong	Dodoth	Jubilee SS Karenga
2	Abim	Labwor	Morulem Girls SS
3	Amuru	Kilak	Keyo SS
4	Kitgum	Lamwo	Palabek SS
5	Pader	Agago	Patongo SS
6	Pader	Agago	Adilang SS
7	Lira	Moroto	Apala SS
8	Apac	Maruzi	Akokoro SS
9	Oyam	Oyam	Abudala Anyuru Mem. Sch.
10	Adjumani	East Moyo	Alere SS
11	Moyo	West Moyo	Moyo SS
12	Yumbe	Aringa	Kuru SS
13	Koboko	Koboko	Nyarilo SS
14	Maracha	Terego	Otumbari SS
15	Maracha	Maracha	Otravu SS
16	Arua	Vurra	Logiri Girls SS
17	Arua	Ayivu	Mvara SS
18	Nebbi	Padyere	Erussi SS
19	Kiboga	Kiboga West	St. Joseph's SS Vvumba
20	Hoima	Buhaguzi	Buhimba SS
21	Kibaale	Buyaga	Naigana SS
22	Kyenjojo	Mwenge	Katooke SS
23	Kyenjojo	Kyaka	Humura SS
24	Kamwenge	Kitagwenda	Kitagwenda HS
25	Bundibugyo	Bwamba	St. Mary's SS Simbya
26	Kasese	Bukonzo	Mutanywana SS
27	Rakai	Kooki	Katereero SS
28	Ibanda	Ibanda	Bigyera SS
29	Kiruhura	Nyabushozi	Kashongi SS
30	Isingiro	Bukanga	Ngarama SS
31	Isingiro	Isingiro	Isingiro SS

32	Ntungamo	Rushenyi	St. Paul's HS Rushooka
33	Rukungiri	Rujumbura	Kasheyi SS
34	Rukungiri	Rubabo	Kyamakanda SS
35	Kanungu	Kinkizi	Nyakinoni SS
36	Kisoro	Bufumbira	Kabindi SS
37	Mityana	Mityana	Sekanyonyi SS
38	Mityana	Mityana	Namutamba SS
39	Mubende	Kassanda	Kassanda SS
40	Luweero	Bamunanika	Luteete SS
41	Mayuge	Bunya	St. John Buwaaya SS
42	Namutumba	Busiki	Bugobi HS
43	Kamuli	Bugabula	St. Peters Namwendwa SS
44	Sironko	Bulambuli	Nabbongo SS
45	Kapchorwa	Kween	Chemanga Seed SS
46	Bukwo	Kongasis	St. Josephs Girls SS
47	Soroti	Kasilo	Kamod SS
48	Kaberamaido	Kaberamaido	Kaberamaido SS
49	Amuria	Kapelebyong	St. Francis Acumet
52	Katakwi	Katakwi	Katakwi TS
51	Moroto	Matheniko	Nadunget SS
52	Nakapiripirit	Pokot	Pokot SS

2.0 Composition of Supplies to Each Site's ICT Laboratory

The composition of the supplies and related services supplied by CLS to each site include the following:

Item no.	Brief Description of Supplies and Related Services	Quantity	Unit of Measure
1	Computing stations with one as a dedicated server	11	Unit
2	Solar power supply system sized to support the lab	1	Unit
3	Solar lighting devices	4	Unit
4	Networking accessories	Lot	Lot
5	Cost of transportation to site	Lot	Lot
6	Cost of installation and networking	Lot	Lot
7	Basic user training and instruction	Item	Item

2.1 Description of supplies involved in the assignment

2.1.1 Low Power Computers and Accessories

Compliance of specification offered
Computing stations offered: a) *Asus Eee Box B202 low power computing stations and Inveneo R4 Hub Servers*
Processor: ***Asus Eee Box B202*** *Intel Atom N270 1.6 Ghz* ***Inveneo Hub Server R4*** *1.6 GHz Intel Atom processor with a 533 MHz system bus*
Asus Eee Box – *RAM: 1 GB* ***Inveneo Hub Server R4 –*** *RAM: 2 GB*
Asus Eee Box – *Hard drive: 160 GB* ***Inveneo Hub Server R3 –*** *Hard drive: 160 GB x 2 in RAID 1 configuration*
Asus Eee Box Ports: • *USB: 2x front; 2x rear* • *Card reader* • *Gigabit LAN* • *Digital Video Interface* • *Wifi Antenna* • *Card reader* • *Headphone* • *Microphone* • *Sony/Phillips Digital Interface* ***Hub Server R3 Ports*** • *RS-232C serial port (DB-9)* • *6 USB 2.0 ports* • *1 parallel port* • *PS/2 keyboard port* • *PS/2 mouse port* • *VGA video output (DB-15)*
Asus Eee Box *USB optical mouse* ***Inveneo Hub Server R4*** *USB optical mouse*
Asus Eee Box *USB keyboard with Windows 104 keys* ***Inveneo Hub Server R4*** *USB keyboard with Windows 104 keys*
Asus Eee Box *In-built network interface card – wired network: Gigabit Ethernet LAN, twisted pair (RJ-45) ports ; wireless network: 802.11 b/g/n WLAN* ***Inveneo Hub Server*** *In-built network interface card – two 10/100 Base-T fast Ethernet, twisted pair (RJ-45) ports*

Asus Eee Box *Built with Azalia ALC888 Audio Chip* ***Inveneo Hub Server R4*** *Built with Realtek ALC662 audio codec (5.1 channel HD audio)*
Liquid Crystal Display Monitor • *Anti-glare* • *15.6-inch diagonal size* • *Maximum resolution: 1024(W)x214(H)*
Server – USB-powered 8X DVD/CD with DVD/CD labelling function
Pre-installed Microsoft Windows XP Service Pack 2
Asus Eee Box *Maximum power rating - 21 Watts setting with 15-inch LCD monitor* ***Inveneo Hub Server R4*** *Maximum power rating – 23 Watts setting with 15-inch LCD monitor*
Router offered: Linksys Model No. WRT54G all-in-one 10/100 switch. • *All-in-One internet-sharing router, 4-port switch with wireless access point*
The following accessories will be required for networking the laboratories • *CAT-5 network cabling* • *RJ-45 network connectors* • *Trunkings* • *Cable clips* • *Cable ties* • *Nails*
Parts warranty: 1 year
Labour warranty: 2 years

2.1.2 Solar power system, accessories and related services

8 (eight) solar panels of a minimum of 90 Watts each in capable of fully charging backup batteries in an average of 4 hours – models provided: SolarWorld Sunmodule SW 90 mono
3 (three) First Power 12-volt 200AH deep cycle solar batteries capable of storing up to fifteen hours of backup power when there is no/not enough sunlight to provide direct solar power.
2 (two) Steca Solarix 4024 *30-Amp charge controllers with LED backup state-of-charge indicator. Its function will basically be to prevent overcharging and over-drainage of the backup battery it will be connected to.*
4 (four) UltraLight *compact fluorescent lamps of 7-Watts to provide light equivalent to 40 Watts of incandescent lamps*

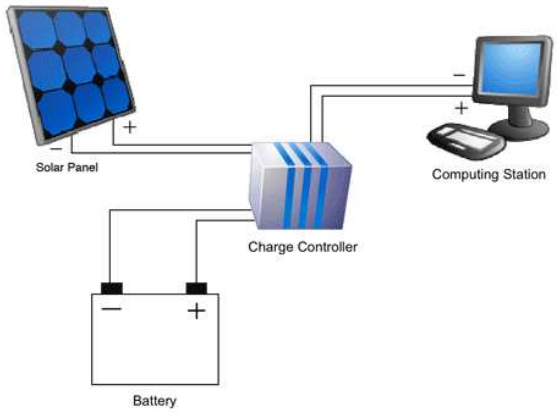
3.0 Description of the Installed Solar Powered ICT Lab

As indicated above, each installed ICT lab was installed with 10 Asus EEE Box B202 computing stations, one Inveneo R4 server, eight 90W solar panels, three 200Ah deep cycle batteries, two 30A charge controllers and four 7W DC lamps. The computers were linked to a wireless LAN through a router. All of the supplied components listed above are connected to the solar panels. The solar panels harvest the rays of sunlight and convert them into energy, which is stored in the batteries through cables connected

through the charge controllers. The role of the charge controllers is to regulate the power in the system by:

a) Disconnecting power from the solar panel to the batteries when they are fully charged
b) Cutting off power to the computing stations and server if the batteries are discharged excessively.

The diagram below shows the above description:



The installed solar power system is designed to require an average of five (5) hours of sunshine to fully charge ten (10) computing stations and a server. At full charge, the batteries can run the equipment mentioned for up to ten (10) hours. If they are run for less than ten hours, then less hours of sunshine for charging will be subsequently required. Assuming that they have five hours of sunshine charging them, each panel harvests through it up to 450 watts. The installed harvesting capacity is therefore 3,600 watts.

4.0 Implementation of the Assignment

On presentation of the bid security as was required, a letter of credit was opened in favour of CLS through Stanbic Bank Uganda on 28th September 2009. The LC was to facilitate the purchase and importation of supplies and services for the assignment. To act as their agents in this transaction, CLS appointed Barclays Bank Uganda.

4.1 Delivery and Installation

After a few delays caused mostly by failure to extend the letter of credit beyond CLS's vendors' bankers to their other suppliers, it was decided that the delivery and installation of supplies for this assignment be divided into the two major tasks involved. Instead of delivering and installing simultaneously the computers and solar power equipment and accessories, CLS separated the delivery and installation tasks. The installation works were also further divided into those for the solar power and computers, both of which were originally planned to be done simultaneously.

To-date, all schools selected to benefit from this assignment have had solar power installed at their campuses except four.

4.1.1 Installation Schedule

The table below shows the supply, delivery and installation schedule followed in this assignment:

em No.	School	District	County	Sub-county	Date of Installation	Comments
1.	Sekanyonyi Secondary School	Mityana	Mityana	Sekanyonyi	14th December 2009	Solar power, computers and four DC lights installed and in working order
2.	Namutamba Secondary School	Mityana	Mityana	Bulera	14th December 2009	Solar power, computers and four DC lights installed and in working order
3.	Kassanda Secondary School	Mubende	Kassanda	Kassanda	14th December 2009	Solar power, computers and four DC lights installed and in working order
4.	Akokoro Secondary School	Apac	Maruzi	Akokoro	15th December 2009	Solar power, computers and four DC lights installed and in working order
5.	Apala Secondary School	Lira	Moroto	Apala	16th December 2009	Solar power, computers and four DC lights installed and in working order
6.	Patongo Secondary School	Pader	Agago	Lokole	16th December 2009	Solar power, computers and four DC lights installed and in working order
7.	Adilang Secondary School	Pader	Agago	Adilang	16th December 2009	Solar power, computers and four DC lights installed and in working order
8.	Morulem Girls' Secondary School	Abim	Labwor	Morulem	17th December 2009	Solar power, computers and four DC lights installed and in working order
9.	Jubilee 200 Secondary School Karenga	Kaabong	Dodoth	Karenga	17th December 2009	Solar power, computers and four DC lights installed and in working order
10.	Palabek Secondary School	Kitgum	Lamwo	Palabek	18th December 2009	Solar power, computers and four DC lights installed and in working order
11.	Alere Secondary School	Adjumani	East Moyo	Adropi	18th December 2009	Solar power, computers and four DC lights installed and in working order
12.	Moyo Secondary School	Moyo	West Moyo	Moyo	18th December 2009	Solar power, computers and four DC lights installed and in working order
13.	Kuru Secondary School	Yumbe	Aringa	Kuru	18th December 2009	Solar power, computers and four DC lights installed and in working order
14.	Nyarilo Secondary School	Koboko	Koboko	Kobolo Town Council	19th December 2009	Solar power, computers and four DC lights installed and in working order
15.	Otumbari Secondary School	Nyadri (Maracha/Terego	Terego	Odupi	19th December 2009	Solar power, computers and four DC lights installed and in working order
16.	Otravu Secondary School	Nyadri	Maracha	Oluffe	19th December 2009	Solar power, computers and four DC lights installed and in working order
17.	Mvara Secondary School	Arua	Arua	Arua Hill	19th December 2009	Solar power, computers and four DC

			Municipality	Division		lights installed and in working order
18.	Logiri Girls Secondary School	Arua	Vurra	Vurra	20th December 2009	Solar power, computers and four DC lights installed and in working order
19.	Erussi Secondary School	Nebbi	Padyere	Erussi	20th December 2009	Solar power, computers and four DC lights installed and in working order
20.	Keyo Secondary School	Amuru	Kilak	Lamogi	21st December 2009	Solar power, computers and four DC lights installed and in working order
21.	St. John Buwaya Secondary School	Mayuge	Bunya	Buwaya	17th December 2009	Solar power, computers and four DC lights installed and in working order
22.	Bugobi High School	Namutumba	Busiki	Bulange	17th December 2009	Solar power, computers and four DC lights installed and in working order
23.	St. Joseph's Secondary School, Vvumba	Kiboga	Kiboga West	Mulagi	25th January 2010	Solar power, computers and four DC lights installed and in working order
24.	Buhimba Secondary School	Hoima	Buhaguzi	Buhimba	26th January 2010	Solar power, computers and four DC lights installed and in working order
25.	Naigana Secondary School	Kibaale	Buyaga	Kyanaisoke	26th January 2010	Solar power, computers and four DC lights installed and in working order
26.	Katooke Secondary School	Kyenjojo	Mwenge North	Katooke	26th January 2010	Solar power, computers and four DC lights installed and in working order
27.	Humura Secondary School	Kyenjojo	Kyaka	Kyegegwa	27th January 2010	Solar power, computers and four DC lights installed and in working order
28.	St. Mary's S. S. Simbya	Bundibugyo	Bwamba	Busaru	28th January 2010	Solar power, computers and four DC lights installed and in working order
29.	Mutanywana Secondary School	Kasese	Bulonzho	Kyarumba	29th January 2010	Solar power, computers and four DC lights installed and in working order
30.	St. Peter's Secondary School, Namwendwa	Kamuli	Bugabula South	Namwendwa	11th January 2010	Solar power, computers and four DC lights installed and in working order
31.	Nabbongo Secondary School	Sironko	Bulambuli	Muyembe	12th January 2010	Solar power, computers and four DC lights installed and in working order
32.	Chemanga Seed Secondary School	Kapchorwa	Kween	Benet	12th January 2010	Solar power, computers and four DC lights installed and in working order
33.	St. Joseph's Secondary School, Bukwo	Bukwo	Kongasis	Bukwo Town Council	13th January 2010	Solar power, computers and four DC lights installed and in working order
34.	Pokot Secondary School	Nakapiripirit	Pokot Upe	Amudat	13th January 2010	Solar power, computers and four DC lights installed and in working order
35.	Nadunget Secondary School	Moroto	Matheniko	Nadunget	14th January 2010	Solar power, computers and four DC lights installed and in working order
36.	Katakwi Technical School	Katakwi	Usuk	Katakwi	14th January 2010	Solar power, computers and four DC lights installed and in working order

37.	St. Francis Secondary School, Acumet	Amuria	Kapelebyong	Kapelebyong	14th January 2010	Solar power, computers and four DC lights installed and in working order
38.	Kaberamaido Secondary School	Kaberamaido	Kaberamaido	Kaberamaido	15th January 2010	Solar power, computers and four DC lights installed and in working order
39.	Abdallah Anyuru Memorial School	Oyam	Oyam North	Anyeke	16th January 2010	
40.	Kamod Secondary School	Soroti	Kasilo	Bugondo	4th February 2010	Solar power, computers and four DC lights installed and in working order
41.	Luteete Secondary School	Luweero	Bamunanika	Bamunanika		Solar power, computers and four DC lights installed and in working order
42.	Isingiro Secondary School	Isingiro	Isingiro	Kabingo	2nd March 2010	Solar power, computers and four DC lights installed and in working order
43.	Ngarama Secondary School	Isingiro	Bukanga	Ngarama	2nd March 2010	Solar power, computers and four DC lights installed and in working order
44.	St. Paul's High School, Rushooka	Ntungamo	Kashenyi	Kayonza	3th March 2010	Solar power, computers and four DC lights installed and in working order
45.	Kyamakanda Secondary School	Rukungiri	Rujumbura	Buyanja	3rd March 2010	Solar power, computers and four DC lights installed and in working order
46.	Kashenyi Secondary School	Rukungiri	Rubabo	Ruhinda	3rd March 2010	Solar power, computers and four DC lights installed and in working order
47.	Nyakinoni Secondary School	Kanungu	Kinkizi West	Nyamirama	4th March 2010	Solar power, computers and four DC lights installed and in working order
48.	Kabindi Secondary School	Kisoro	Muhabura	Nyarusiza	4th March 2010	Solar power, computers and four DC lights installed and in working order
49.	Bigyera Secondary School	Ibanda	Ibanda	Bishehe	5th March 2010	Solar power, computers and four DC lights installed and in working order
50.	Kitagwenda High School	Kamwenge	Kitagwenda	Kicece	5th March 2010	Solar power, computers and four DC lights installed and in working order
51.	Kashongi High School	Kiruhura	Nyabushozi	Kashongi	6th March 2010	Solar power, computers and four DC lights installed and in working order
52.	Katerero Secondary School	Rakai	Kooki	Byabakanda	6th March 2010	Solar power, computers and four DC lights installed and in working order

5.0 Challenges

As mentioned above, the assignment was initially delayed by the inability of the LC to be transferred beyond the manufacturer's bank in the US to their other vendors and suppliers. For instance, the monitors are supplied by sub-contractors in Taiwan. Transferring the LC to Taiwan from the US proved to be impossible. This snag was overcome through acquisition of funds from other sources by the contractor.

Another challenge was in the contacts given to UCC by the schools. In many instances, the contractor was not able to communicate with some schools prior to proceeding to their premises. It was then found that some these schools were not ready to receive the supplies when they were delivered.

Some schools did not have rooms ready for computer labs. Solar power equipment was therefore delivered to their premises and stored until they had sorted the designated computer labs out. The schools below were such schools

No.	School	District	County
1	Kamod S. S.	Soroti	Kasilo
2	Abdalla Anyuru S.S.	Oyam	Oyam
3	Humura S.S.	Kyenjojo	Kyaka
4	St. Mary's S.S Simbya	Bundibugyo	Bwamba

Kamod S. S., in particular, had its head teacher interdicted. This stalled progress in preparing the computer lab and having it ready in time for the contractor to carry out the assignment. The rest of the schools did not have adequately protected doors and windows to provide security for the computers once they were installed. Abdalla Anyuru S. S. also lacked a proper ceiling which exposed especially the solar panels mounted on the roof to having their lockable frames unscrewed from within the room.

Another challenge lay in giving basic user training and guidance. The school administrators, in most cases, did not easily comprehend the most basic principles of the installed supplies. This delayed the installation process more.

Infrastructure also posed a challenge. The beneficiary schools are mostly remote, rural and hard to reach. The roads to these sites are not in the most ideal conditions for the transportation of supplies as fragile as computers which were the subject of this assignment.

6.0 Conclusion

CLS recommends that, for avoidance of delays in future assignments, there needs to be a full consideration of all mechanisms involved in the issuance of LCs. There needs to be some more flexibility to allow for the LC to be transferrable beyond one overseas vendor.

Also the pre-project briefing of the stakeholders needs to compel the beneficiaries to make better preparations for the assignment. The stakeholders also need to be given basic minimum knowledge of the supplies they will be receiving to minimise delays. CLS

thank UCC for the confidence shown in awarding them this assignment and are confident that they have satisfied the terms of the contract mainly in terms of quality.