Report on Results of 2003 & 2004 Presentations of VRLA "Boosted" Batteries and Remote Battery Monitoring Respectively

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Robert Szasz, P.Eng. – MTS Allstream Corp

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Overview

The objective of this paper is to provide update on progress of previous years Infobatt presentations.

- VRLA “Boosted” Batteries results of 4th year in service
- Battery Remote Monitoring and Control – results of first year in service.

It is believed that this report of results from a major operator will be beneficial to the industry, vendors, consultants and 2005 Infobatt participants.

VRLA Booster Batteries

Summary of 2003 Presentation

- Old battery stock with (4) years shelf life was acquired during company merger and originally considered to be scrap.
- Batteries of 1997 vintage have been boosted through a combination of constant voltage and current charge/discharge (C&D) or constant voltage only charge/discharge (GNB)
- Batteries have been installed in 2001 and are in use at over 20 MTS Allstream sites.

Summary of 2003 Presentation (continued)

- Battery Stock Acquired

Battery Stock Acquired

Manufacturer	Model/ Type	Number of Strings
C&D Tech.	HD-300	20
C&D Tech.	HD-700	6
C&D Tech.	HD-1100	3
GNB Power.	90A-07	11

Over $340,000 in new equipment value

Summary of 2003 Presentation (continued)

- The batteries were regularly monitored to ensure they are serving sufficiently. At the time of 2003 presentation the batteries have been in service for app 24 months and were performing well.
- All batteries have performed well during Ontario blackout of August 14, 2003. None of these battery failed during the duration of the blackout.

Battery Installation Sites

Number of Strings	Location	Site Installation Date
2 x HD300	Alexandria	April/01
2 x HD300	Mirabell TC	June/01
2 x HD300	ST. Therese TC	June/01
2 x HD300	Pont Viau TC	June/01
2 x HD300	Cobourg TC	Aug/01
2 x HD300	Concord TC	Aug/01
2 x HD300	Joilette	Aug/01
2 x HD300	Jonquiere	Aug/01
2 x HD300	Coteau	Aug/01
1 x HD300	Welland	Sept-Oct 2001
1 x HD300	Woodstock	Sept-Oct 2001

Number of Strings	Location	Site Installation Date
2 x HD700	Tweed	April/01
2 x HD700	Tichborne	April/01
2 x HD700	Dorion	April/01

Number of Strings	Location	Site Installation Date
1 x HD1100	Wolfdale	May/01
1 x HD1100	Guelph	May/01
1 x HD1100	C&D	Undetermined

Number of Strings	Location	Site Installation Date
1 X 90A-07	438 U –Lab	May/01
3 X 90A-07	5160 Orbitor	June/01
1 X 90A-07	Metro Centre	July/01
1 X 90A-07	Mississauga Dixie/Eglinton	July/01
2 X 90A-07	Glencoe	July/01
2 X 90A-07	Gracie	July/01
1 X 90A-07	GNB Facilities	Undetermined

Results of 4th year in service (7-8th from manufacturing)

- The intent of this report is to :
- present results of 4th year in service of boosted batteries (7-8 years from year of Manufacture)
- compare with results of batteries which have been charged and/or installed within the 6 months period recommended by Manufacturer.
- Criteria for evaluation of the state of health of the batteries was the conductance measurements with Midtronics Celltron meters.

Results of 4th year in service (7-8th from manufacturing) cont..

- Overall results indicate that conductance was maintained within 80-100% at most of the sites.
- C&D visited (8) sites between April-June 2005 with following results :
- Battery re-hydration procedure has been applied at all sites –conductance readings after the procedure of adding water were 100-120%
- One cell each at (2) sites did not pass the pressure test performed before re-hydration-cells were replaced at later date.

Example of Boosted Batteries (1)

Allstream Alexandria fots Plant #1

JAR	R - Volts	Jar -- G	% Ref.
001	2.22	1668	92%
002	2.24	1427	79%
003	2.24	2010	111%
004	2.22	1456	80%
005	2.2	1569	87%
006	2.2	1439	79%
007	2.22	1595	88%
008	2.2	1923	106%
009	2.24	1512	84%
010	2 22	1856	103%
011	2.2	1574	87%
012	2.22	1501	83%
013	2.22	1308	72%
014	2.22	1850	102%
015	2.24	1938	110%
016	2.2	2017	112%
017	2.24	1640	91%
018	2.22	1501	83%
019	2.25	1379	76%
020	2.22	1880	104%
021	2.2	1875	104%
022	2.22	1516	84%
023	2.22	1943	107%
024	2.22	1478	82%

Reference Value Entered: 1800 Siemens (MHOS)
Liberty 2000MAX, type HD-300
Reference Temperature: 21 Degrees Celsius

String Average: 1662s
String % of Ref: 92%
Manufacture Date: 1997/04
Test performed BEFORE _ the procedure of adding H2O

Allstream Alexandria Fots Plant #1

JAR	R - Volts	Jar -- G	% Ref.
001	2.22	2045	113%
002	2.24	2063	114%
003	2.24	1993	110%
004	2.22	2112	117%
005	2.2	1956	108%
006	2.2	1943	107%
007	2.22	1992	110%
008	2.2	1862	103%
009	2.24	2110	111%
010	2 22	2120	117%
011	2.2	1793	99%
012	2.22	1962	109%
013	2.22	2063	114%
014	2.22	2052	114%
015	2.24	2144	119%
016	2.2	1945	108%
017	2.24	2160	120%
018	2.22	1838	102%
019	2.25	1936	107%
020	2.22	2100	116%
021	2.2	2169	120%
022	2.22	1930	107%
023	2.22	1960	93%
024	2.22	1949	108%

Reference Value Entered: 1800 Siemens (MHOS)
Liberty 2000MAX, type HD-300
Reference Temperature: 21 Degrees Celsius

String Average: 1992s
String % of Ref: 110%
Manufacture Date: 1997/04
Test performed AFTER _ the procedure of adding H2O

Example of Boosted Batteries (2)

Allstream Alexandria fots Plant #2

JAR	R - Volts	Jar -- G	% Ref.
001	2.24	1936	107%
002	2.2	1424	79%
003	2.25	2218	123%
004	2.22	2096	116%
005	2.22	1996	110%
006	2.2	1497	83%
007	2.22	2075	115%
008	2.24	1776	98%
009	2.25	2390	132%
010	2 20	1297	72%
011	2.2	1655	91%
012	2.25	2222	123%
013	2.22	2112	117%
014	2.2	1493	82%
015	2.2	2085	115%
016	2.2	1504	83%
017	2.24	1971	109%
018	2.17	1640	91%
019	2.22	1338	74%
020	2.25	2230	123%
021	2.24	1396	77%
022	2.22	2172	120%
023	2.22	1976	109%
024	2.22	1911	106%

Reference Value Entered: 1800 Siemens (MHOS)
Liberty 2000MAX, type HD-300
Reference Temperature: 21 Degrees Celsius

String Average: 1850s
String % of Ref: 102%
Manufacture Date: 1997/04
Test performed BEFORE _ the procedure of adding H2O

Cell # 18 fails presure test. No H20 added to this cell.

Allstream Alexandria Fots Plant #2

JAR	R - Volts	Jar -- G	% Ref.
001	2.24	1983	110%
002	2.2	2201	122%
003	2.25	2176	120%
004	2.22	2128	118%
005	2.22	2082	115%
006	2.2	2045	113%
007	2.22	2071	115%
008	2.24	2297	127%
009	2.25	2188	121%
010	2 20	2278	126%
011	2.2	2096	115%
012	2.25	2297	127%
013	2.22	2120	117%
014	2.2	2169	120%
015	2.2	2013	111%
016	2.2	1804	100%
017	2.24	1816	100%
018	2.17	1640	93%
019	2.22	2119	117%
020	2.25	2297	127%
021	2.24	2196	122%
022	2.22	2117	120%
023	2.22	1996	110%
024	2.22	1868	103%

Reference Value Entered: 1800 Siemens (MHOS)
Liberty 2000MAX, type HD-300
Reference Temperature: 21 Degrees Celsius

String Average: 2087s
String % of Ref: 115%
Manufacture Date: 1997/04
Test performed AFTER _ the procedure of adding H2O

Example of Same Vintage Batteries 1 (not boosted)

Allstream Smith Falls Plant #1

JAR	R - Volts	Jar -- G	% Ref.
001	2.22	1466	60%
002	2.22	1604	66%
003	2.22	1320	53%
004	2.22	1268	51%
005	2.24	1354	55%
006	2.24	1646	67%
007	2.22	1434	58%
008	2.22	1010	41%
009	2.22	1569	64%
010	2 22	1475	61%
011	2.22	1431	58%
012	2.24	996	40%
013	2.24	1158	47%
014	2.22	1400	57%
015	2.22	1541	63%
016	2.25	1622	66%
017	2.22	1282	52%
018	2.22	1583	65%
019	2.22	1302	53%
020	2.24	1407	57%
021	2.24	1311	53%
022	2.24	1367	55%
023	2.24	1675	69%
024	2.25	1509	62%

Reference Value Entered: 2500 Siemens (MHOS)
Liberty 2000MAX, type HD-500
Reference Temperature: 21 Degrees Celsius

String Average: 1405s
String % of Ref: 57%
Manufacture Date: 1998/04
Test performed BEFORE _ the procedure of adding H2O

Allstream Smith Falls Plant #1

JAR	R - Volts	Jar -- G	% Ref.
001	2.22	2949	121%
002	2.2	2952	122%
003	2.2	2876	119%
004	2.2	2740	112%
005	2.22	2478	102%
006	2.24	2813	115%
007	2.2	2892	119%
008	2.22	2779	114%
009	2.24	2879	119%
010	2 20	2957	112%
011	2.22	2690	110%
012	2.22	2635	108%
013	2.24	2691	110%
014	2.22	2816	115%
015	2.22	2922	120%
016	2.28	2974	122%
017	2.22	2722	111%
018	2.22	2982	123%
019	2.22	2857	117%
020	2.22	2774	113%
021	2.22	2767	113%
022	2.24	2936	121%
023	2.24	2944	121%
024	2.27	2949	121%

Reference Value Entered: 2500 Siemens (MHOS)
Liberty 2000MAX, type HD-500
Reference Temperature: 21 Degrees Celsius

String Average: 2832s
String % of Ref: 116%
Manufacture Date: 1998/04
Test performed AFTER _ the procedure of adding H2O

Example of Batteries (2)

Allstream Smith Falls Plant #2

JAR	R - Volts	Jar -- G	% Ref.
001	2.24	1729	69%
002	2.22	1757	70%
003	2.22	1725	69%
004	2.22	2020	81%
005	2.22	1911	76%
006	2.22	1610	64%
007	2.24	1431	57%
008	2.25	1873	75%
009	2.22	1894	76%
010	2 22	1614	65%
011	2.22	1730	69%
012	2.22	1906	76%
013	2.22	1858	74%
014	2.22	1545	62%
015	2.22	1846	74%
016	2.24	1858	74%
017	2.22	1985	79%
018	2.22	1725	69%
019	2.22	1665	67%
020	2.22	1864	75%
021	2.22	1750	70%
022	2.22	1478	59%
023	2.24	1894	76%
024	2.22	1528	61%

Reference Value Entered: 2500 Siemens (MHOS)
Liberty 2000MAX, type HD-500
Reference Temperature: 21 Degrees Celsius

String Average: 1758s
String % of Ref: 70%
Manufacture Date: 1998/04
Test performed BEFORE _ the procedure of adding H2O

Allstream Smith Falls Plant #2

JAR	R - Volts	Jar -- G	% Ref.
001	2.24	3051	122%
002	2.22	2892	116%
003	2.22	2966	119%
004	2.22	2959	118%
005	2.22	2944	118%
006	2.24	2952	118%
007	2.24	2678	107%
008	2.27	3038	122%
009	2.22	3013	121%
010	2 22	2944	118%
011	2.19	2974	119%
012	2.2	2697	108%
013	2.24	2774	111%
014	2.24	2929	117%
015	2.22	3091	124%
016	2.25	3101	124%
017	2.22	3093	124%
018	2.22	3028	121%
019	2.22	2936	117%
020	2.22	2927	117%
021	2.24	3013	121%
022	2.22	2959	118%
023	2.24	3150	126%
024	2.22	2829	113%

Reference Value Entered: 2500 Siemens (MHOS)
Liberty 2000MAX, type HD-500
Reference Temperature: 21 Degrees Celsius

String Average: 2956s
String % of Ref: 118%
Manufacture Date: 1998/04
Test performed AFTER _ the procedure of adding H2O

Smith Falls tower

Smith Falls Batteries

4th year results (cont)

- Boosted GNB batteries conductance readings continue to be over 80% with no re-hydration procedure
- Several GNB batteries strings of same vintage have been either re-hydrated or have been replaced.

Conclusions

- Fourth year results indicate that these batteries are performing as well or even better when compared with similar batteries in our network which have been charged and/or installed within recommended 6 months period.
- Present signs show batteries are serving well and are expected to be in service for at least another 2-3 years.

Remote Battery Monitoring
Summary of 2004 presentation

- MTS Allstream selected in 2004 a DC Power Plant with Remote Battery Monitoring capabilities
- The benefits of this system or similar can be summed up as follows:
- Routine remote battery monitoring and control reduces the frequency of man-hour routines in the field and will all but eliminate system outages caused by failed batteries
- Programmable alarms for current,voltage, temperature and battery capacity provides back-up for existing alarm system
- Historical data logs are valuable tool in the investigation of system outages and product performance.

Summary of 2004 Presentation (cont)

- The increased visibility to the battery plant can allow for more effective deployment of mobile generators in the event of large-scale power outages and thus enhance the survivability of the network. Mobile generators can be dispatched to locations based on network priorities and the remaining battery reserve based on real time data.

  The system capabilities and actual man-hour results for the sites implemented will be reviewed after one year to confirm the savings and benefits prior to any further rollouts.

Summary of 2004 Presentation (cont)

Network **connectivity**

The following are Allstream key requirements :

- TCP/IP Ethernet connection between the remote DC power plants and host computers (Dial-up connectivity not accepted due to security concerns - allowed for the trial on the first two sites only)
- SNMP capabilities at a later phase of the project once significant number of sites will be added

Project Challenges

- Installation of these systems required establishment of new Network OSS infrastructure connectivity system
- The least cost of such systems is an added cost of approximately 60% of the costs of selected DC power plants

Network Connectivity (continued)

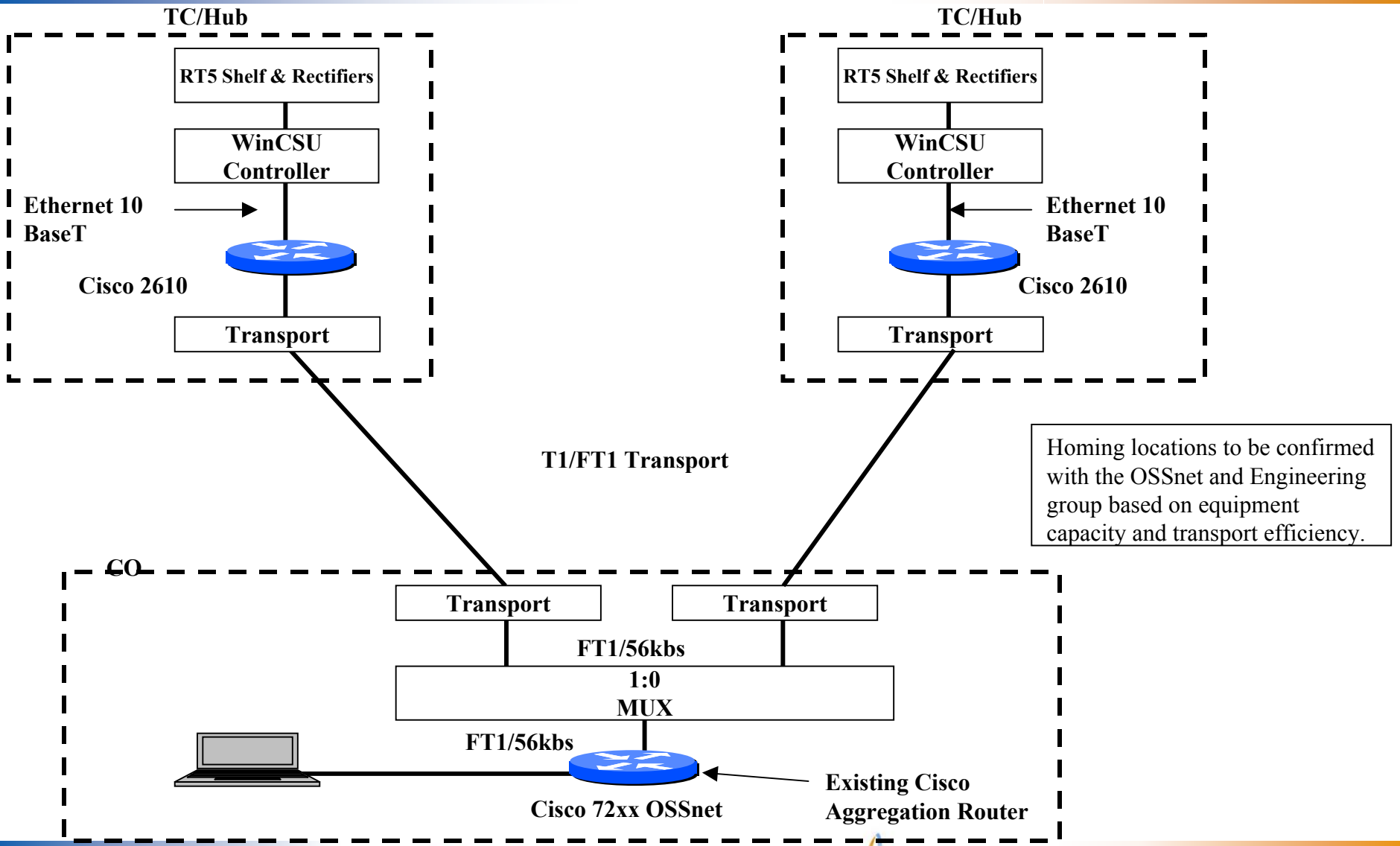
- There are a number of remote sites at which the connectivity costs are very high and therefore it renders impractical the use of remote capabilities.
- All sites have been equipped with RT5 rectifiers and MiniCSU controllers supplied by Spectral.
- Each site has been equipped with a Cisco 2610 router to allow remote connectivity to the MTS Allstream OSS network.

Network Connectivity (continued)

- The site routers connect via an Ethernet port to the telemetry MiniCSU rectifier controller. The site routers are connected via DS1/56kbs transport to appropriate homing locations in each region.
- The following is a typical connectivity diagram implemented for phase 2 of this evaluation.

Attachments

Typical Rectifier System Configuration



Phase 2-Field evaluation summary

- Phase 1 - started Q1 2003 -Vendor and technology selection complete with 12 -16 months field trial-satisfactory results obtained
- Phase 2- design and implementation of several systems for further evaluation completed Q1 2005
- **Project Implementation challenges**
- The challenges continued to be in respect to OSS LAN/Network connectivity , 7/24 monitoring capabilities and conductance measurements.
- **OSS LAN Issue** : Data Technology group do not recommend the rectifiers to be connected to the OSS net without a dedicated Authentication Server – Rectifiers are temporarily connected to the OSS net

Phase 2-Field evaluation summary

- Dedicated PC will be required until authentication server will be installed later this year.
- **Network connectivity challenges**:
- Remote communication has been established at (7) out of the (10) sites only.
- At the time of writing this paper Network Engineering is still investigating cost effective solutions to implement remote communication to the balance of (3) sites
- **Field Operation challenges :**
- Lack of manpower and commitment for 7/24 Remote Monitoring of the system renders the system less attractive

Phase 2-Field evaluation summary

- Field Operation personnel still have to travel to remote sites to perform quarterly conductance measurements as the selected system does not have such remote capabilities.