CEATI
Advanced Metering Infrastructure (AMI) and Time-of-Use (TOU)
May 11, 2006
By: Daniel Pouliot
dpouliot@ozzcpl.com
OZZ Corporation
Innovation and Leadership in Energy

- Ontario-based Canadian company delivering innovative technical solutions for the utility, energy and construction sectors.

- Products and services touching over two million customers.

- End to end fully managed technology and infrastructure implementation – Designed, Implemented, and Supported.

- Over 800 technical, service and field staff supported by expert practitioners with over 20 years helping customers better manage energy.
OZZ Corporation
The Leading Energy Technology and Infrastructure Services Company

- 2005 Revenues of $100 Million
- Measurement Canada Accredited Meter Facility
- Services more than 70,000 residential customers, and provides utility data management services for more than 1.5 million utility customer accounts
- Delivers demand management, web presentment and energy management services to more than 1000 commercial, industrial and institutional facilities
- 70,000 square foot facility including warehousing and operations
- Privately held with more than 150 private and institutional shareholders

Get your energy’s worth!
OZZ Corporation
Innovative, integrated energy technology solutions

OZZ Infrastructure Solutions
New Construction
Electrical Contracting
Communications cabling and systems
Electrical and Mechanical Service and Maintenance

OZZ Comfort Solutions
80,000+ hot water tank customers
10,000 in-suite HVAC systems
Service and Maintenance
24/7 Customer Care Call Centre

OZZ Energy Solutions
Smart Metering
Energy Management
Meter Data Management
Distributed Generation and Cogeneration
Asset Management

Get your energy’s worth!
Trilliant Networks

- Canadian high-tech design and development company with 20 years experience in utility AMR and Smart Metering solutions
- Extensive R&D in wireless two-way communication strategy for large, cost-effective and smart metering deployments
- Leader in standards development of meter reading devices and subsystems
OZZ Smart Metering Implementations

Milton Hydro

Power Stream

hydro one

toronto hydro corporation

Hydro Ottawa

Get your energy’s worth!
Milton Hydro Distribution Inc.

Communities served: Municipal boundaries of the Town of Milton

Characteristics of the Service Area:
- Workforce of more than 40 staff
- More than 550+ km of overhead primary feeders and 210+ km of underground distribution feeders
- More than 18,000 residential/business customers (with approximately 3,800 rural customers)
Time-of-Use (TOU)

- Ontario Energy Board-approved TOU rates
- Interval meters
- Began October 2005 to offer TOU rates to general service customers
May 01st – October 31st

Summer - Weekdays

Regulated Price Plan
Time-of-Use Prices
Off-Peak - 2.9 cents/kWh
Mid-Peak - 6.4 cents/kWh
On-Peak - 9.3 cents/kWh

A.M.

P.M.

Time-of-Use RPP
Periods of the Day
- Off-Peak
- Mid-Peak
- On-Peak

Get your energy’s worth!
Winter - Weekdays

Regulated Price Plan

Time-of-Use Prices
Off-Peak - 2.9 cents/kWh
Mid-Peak - 6.4 cents/kWh
On-Peak - 9.3 cents/kWh

November 1st April 30th

Time-of-Use RPP
Periods of the Day
- Off-Peak
- Mid-Peak
- On-Peak

Get your energy’s worth!
Weekends and Holidays

Regulated Price Plan
Time-of-Use Prices
Off-Peak - 2.9 cents/kWh
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Time-of-Use RPP
Periods of the Day
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Get your energy’s worth!
Milton AMI Technology Criteria

- Superior Enterprise-wide Solution
  - Advanced Meter at Every Socket
    - 2-way Communication
    - Interval Data and Dynamic Rate Ready
    - Real-time Reliability Data
    - Real-time Control
  - Meter-embedded and Mesh Network
  - Strategic Wide Area Networks
    - Broadband and Fiber
  - Standards Compliant
  - Remote Programmable
  - Enterprise Applications
## Open Standards – *End-to-End*

<table>
<thead>
<tr>
<th>Data Exchange</th>
<th>XML</th>
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<tbody>
<tr>
<td>Meter Communication</td>
<td>ANSI</td>
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<tr>
<td>Network Transport</td>
<td>Internet Protocols</td>
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<tr>
<td>Media</td>
<td>IEEE</td>
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Get your energy’s worth!
AMR today

- Local access
- Network (RF, Power line, Cable, phone, …)
- Acquisition system

Get your energy's worth!
ANSI C12 Protocol Suite

ANSI C12.23 Compliance Testing for Standard Protocols and Tables

ANSI C12.19 Utility Industry End Device Data Table

ANSI C12.18 Protocol Specification for ANSI Type 2 optical port

ANSI C12.21 Protocol Specification for telephone MODEM communication

ANSI C12.22 Protocol Specification for Interfacing to Data Communication Networks
## Standard Tables

<p>| | | | | | | | |</p>
<table>
<thead>
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<tr>
<td>Configuration</td>
<td>Measurement Source</td>
<td>Register</td>
<td>Display control</td>
<td>Security</td>
<td>Clock and Calendar</td>
<td>Profile</td>
<td>History and Event Logger</td>
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</tbody>
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<tr>
<td>User defined</td>
<td>Modem control</td>
<td>Extended Measurement Source</td>
<td>Load Control</td>
<td>Network Control</td>
<td>Network Relay</td>
<td>Extended User Defined</td>
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</tbody>
</table>
MESH: According to Wikipedia

Wireless mesh networking is implemented over a Wireless LAN. This type of infrastructure is decentralized, inexpensive and very reliable and resilient, as each node need only transmit as far as the next node. Nodes act as repeaters to transmit data from nearby nodes to peers that are too far away to reach, resulting in a network that can span large distances, especially over rough or difficult terrain. Mesh networks are also extremely reliable, as each node is connected to several other nodes. If one node drops out of the network, due to hardware failure or any other reason, its neighbors simply find another route. Extra capacity can be installed by simply adding more nodes. Mesh networks may involve either fixed or mobile devices.
Dynamic Rerouting & Re-association

Wireless Broadband
- Canopy
- WiMAX

Digital Cellular
- 1xRTT
- GPRS
- iDEN

Open RF Link

MeshGate™ Concentrator

MeshGate™
The MESH system is composed of a WAN (Wide Area Network) based on TCP-IP and LAN (Local Area Network) based on IEEE 802.15.4.
Definitions

End point (MESH Reader)
Node hosting an application such as a meter, thermostat, …

Repeater (MESH Repeater)
Node used strictly for network routing

Access point (MESH Gate)
Node attach to the LAN and the WAN and providing services such as:
- Concentrator
  Application used to gather metering information and events for an efficient retrieval form the back office.
MeshReader – Residential Electric

**Advanced Metering**
- Large interval memory
- Real-time clock
- ANSI meter data tables
- Wireless Hand-held support
- Interval meter data
- Diagnostics

**Options**
- Real-time outage
- High-output RF (1 watt)
- Service disconnect

Get your energy’s worth!
MeshGate – Features

- Concentrator
  - Up to 800 meters
  - Large memory
  - On-demand concentrator readings

- Physical Form Factors Supported
  - Metal or Plastic Enclosure
    - Mounts on pole, streetlight or building
  - Socket Adapter

- Options
  - Networks
  - High-output RF (1 watt)
Residential Wireless Mesh

Getting Signals From Hidden/Difficult Locations
Reporting Download Process

- **Identification**
- **Status**
- **Configuration**
- **Reading**
- **Profile**
- **Statistic**

**Last transferred**
- Report #24
- Report #25
- Report #26
- ...

**Report list**

**Concentrator**
- Report #24
- Report #57
- Report #58
- Report #25
- Report #26

1- Get List
2- Set pointer according to list
3- Download Reports

**Time**

**Creation of reports**

**Reports sent to Concentrator**

**Reports retrieved from the Back Office**

Get your energy’s worth!
Two-way Advantages

- The ability to communicate with the end-use device is fundamental
  - Re-configuration of the meter or any parameters without visiting the site
  - Execution of any system/device-level diagnostics
  - On-demand reads
  - Direct delivery of information regarding pricing to the customer
  - Direct communication of load limiting instructions
Deployment & Work Force Management
MeshTools – Work Force Management

- Integrated Multi-Net Window CE Handhelds
  - Multi-network always connected tool
    - Digital Cellular WAN
    - Mesh LAN
    - GPS

- AMI Installation and O&M Tool
  - On-going O&M tool for network and meter device troubleshooting
  - Server and network access to AMI data

- Meter Reading Tools
  - Batch or selective meter reading
Data Communications Management
Network Architecture

One-to-Many Server Networks
- Database Server
- Communications Servers
- Task Manager

Enterprise
- Any Enterprise IP Net
- VPN Carriers Services
- Internet
- OZZ Meter Vision OMV

WAN/MAN (Metro Area)
- 1xRTT, GPRS, iDEN
- WiMAX
- Ethernet
- Fiber
- Phone

LAN
- IEEE 802.15.4

One-to-Many IP-Networks
- Wireless Mobility (Digital Cellular)
- Fiber Ring
- BPL or Ethernet
- Wireless Broadband (WiMAX/WiFi)

Many-to-Many Peer-to-Peer Networks
- MeshGate™
- Access Points

Personal Area (ad hoc connections)
- Hand held or Smart Phone

Home Area (demand response)
- Smart Thermostat or In-home Display

Get your energy’s worth!
OZZ Global Data Centre

*Powered by IBM*

- Dual-Natural Gas Backup Generators
- Advanced UPS with over 50,000VA of battery backup
- Dedicated Fiber-Optic Data Feed
- Fully redundant HVAC by *Liebert*ility Network Infrastructure
- High-Availability Database Infrastructure
- 99.99% Uptime
- Servicing over 1 million utility customers per month
Meter Data Management
ASP-Driven Turn-key solution

- Meter Data Acquisition, Management and Repository
- Meter Data Validation (VEE)
- Meter Asset and work order management
- Driven by OZZ Meter Vision (OMV) Enterprise Software
- Remote Access
- Performance
  - Fast and Reliable
  - Low O & M
  - Scalable and Functional
  - Secure
- Multi-vendor, Multi-technology, Common View, Simple Integration

Get your energy’s worth!
OZZ Meter Vision (OMV)

*Meter Data Management Software – Eyes in the Field*

- Fully Customized to meet your Utility needs
- A friendly layer above any AMI system
- Innovative way of meter management
  - General meter information
  - New meter installation and exchange meter
  - Meter event logs
  - Meter behind schedule
  - Create service request
  - Service request history
- Validate meter data
  - Interval data and register read

Get your energy’s worth!
**OZZ Meter Vision**

*Meter Data Management Software*

- **Service Requests**
  - Meter Change-outs, New Installs, General Service

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**Meter Service Order Form**

- **Status:** Open
- **Date:** 12/15/2005
- **Initiated By:** Ron Brajovic
- **Priority:** Medium
- **Submit To:** Milton Hydro Metering Dept
- **Request Reason:** Visit Meter
- **Please email the following recipients:**
  - Dave Nini
  - Ron Brajovic
  - Yvonne Robinson

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*[Submit, Clear, Cancel]*

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Get your energy’s worth!
Related Benefits
Internet Presentment and Analysis
Related Benefits
Ongoing Up to Date Billing
OZZ Asset Management

- Asset operation, maintenance and repair
- System failure management and recovery
- System troubleshooting and emergency response
- Meter replacements
- Measurement Canada requirements
- Adherence to AMI data delivery specifications
- Trouble ticket management and field rectification

$ Cost per meter per month
Motivations for Outsourcing

- **Capital Resources**
  - Maximize investment dollars
  - Tight operating budgets

- **Limitations of Staff & Infrastructure**
  - Major cost elements – labor and benefits
  - IT system aging
  - Potential to improve service levels

- **Risk Management**
  - Pay for what you use
# Milton Hydro Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Open Mesh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hourly Intervals for &lt; 50kW customers</td>
<td>Yes</td>
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<tr>
<td>2-way Communications</td>
<td>Yes</td>
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<tr>
<td>Open Network Connections</td>
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<tr>
<td>802.15.4</td>
<td>Yes</td>
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<tr>
<td>ANSI – C12.19 (tables)</td>
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<tr>
<td>IEEE Internet Protocols</td>
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<tr>
<td>99.8% Interval data reliability</td>
<td>Yes</td>
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<tr>
<td>Remotely Programmable</td>
<td>Yes</td>
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</tbody>
</table>
Deployment and Installation
Bench-strength

- Largest provider of smart metering and load control outsourcing services in Ontario
- Over 800 field technicians including 150 licensed electricians
- CSA Trained and accredited single & poly-phase smart metering field personnel
- Established fleet of service vehicles

Get your energy’s worth!
Operations and Customer Support

- Meter data management and presentment
- State of the art data centre
- Equipment and systems servicing and maintenance
- 24 / 7 call centre with field dispatch services
- Workforce management and training
- Implementation logistics and warehousing

Get your energy’s worth!
In Summary

Full Service Capabilities
- LDC expertise to specific requirements
- Scalable for peak period requirements and emergencies
- Committed to continuous refreshment of infrastructure

Ideal AMI Business Partner
- Stable
- Local skilled union and non-union workforce
- Experienced and committed
- Financially strong