McMaster University Sustainable Developments in Communities Workshop

Nov 26, 2007

Smart Meter System Concept

REX 1-phase meters

LAN

A3 ALPHA Meter Collectors

Public Networks

WAN

MAS Comm Server(s)

2
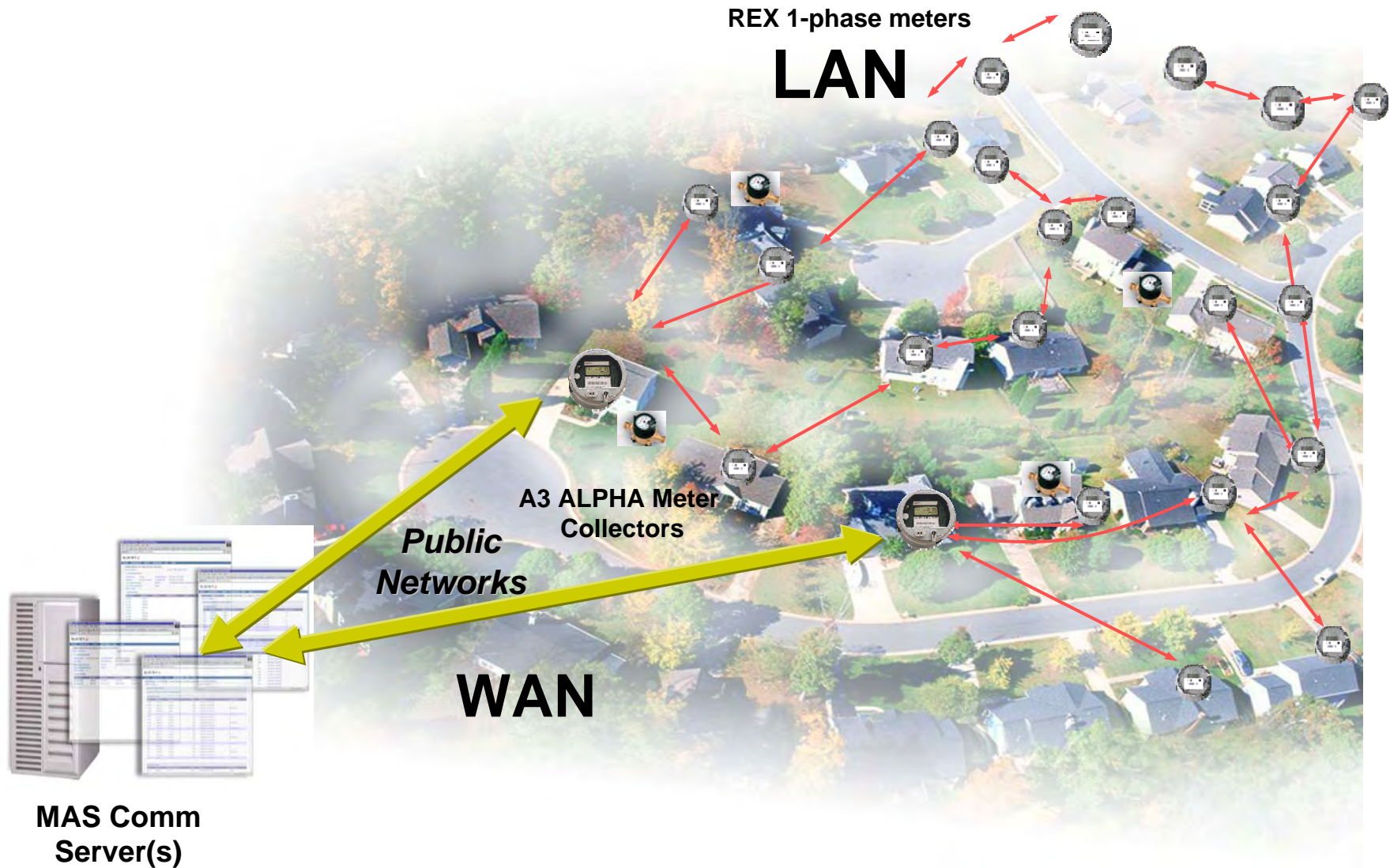
Demand Response – Leveraging your Smart Meter Investment

- A key goal of Smart Metering is to get consumers to reduce consumption especially during peak demand hours

- Demand Response products are tools that make it easier for Utilities and consumers to do this and to respond in a way that will provide the most benefit

- Real Time information is available at the Smart Meter

Demand Response - Getting into the Home

- Questions for Utilities or Service Providers
  - Do I want to get communication into the home through my Smart Meter System?
  - How much control do I want?
  - How much responsibility am I willing to take on?
  - Can I make money at it?
  - Do I need to make money at it?
  - Will it help demand or conservation?
  - Who pays and what will it cost?
  - What is the impact on my service model?
  - How do I know I my customer is doing what I expect (or what I am paying for)
   - What if they're not?
  - What about my regulator(s)???

Getting into the Home - Demand Response Products

- True Smart Meters have a lot of information at the home that can be leveraged – consumption, interval data, TOU rates, clock, etc.

- Smart Meters work in real time, but the systems don't.

  - There are delays in getting the meter data back to the Utility

- For true Smart Meters at the premise, the options for getting into the home through the meter are wireless or power line carrier

Getting into the Home - Demand Response Products

- Power Line carrier into the home

  - Requires a separate board/equipment in the meter

  - Provides robust communication link over the wires virtually anywhere a plug is.

  - Requires in home devices to be plugged in

  - Can introduce noise onto the home network

All current deployments in Ontario are wireless communication to the meter meaning an extra PLC board has to be added to the meter

PLC
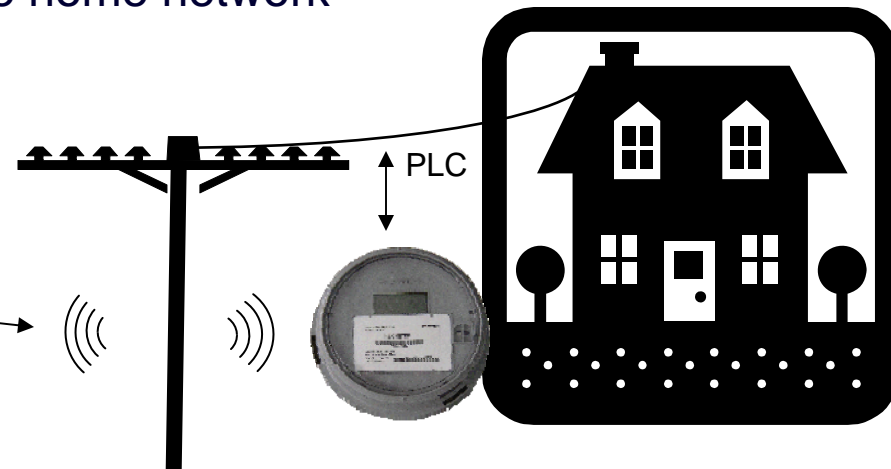
Getting into the Home - Demand Response Products

- Wireless Options
  - Two ways to do things –
  - **Option 1) Put a separate "into the home" radio in the meter**
    - Allows a wide variety of compatibility with various technologies
    - Requires installation in the meter – cost, space, sealing
    - Not all technologies are suitable or ideal
      - Wi-Fi – potential building penetration and security concerns
      - ZIgbee – not a full open standard, possible Wi-Fi interference, penetration
      - Needs to be +40C to -40C

Extra circuit board in the meter
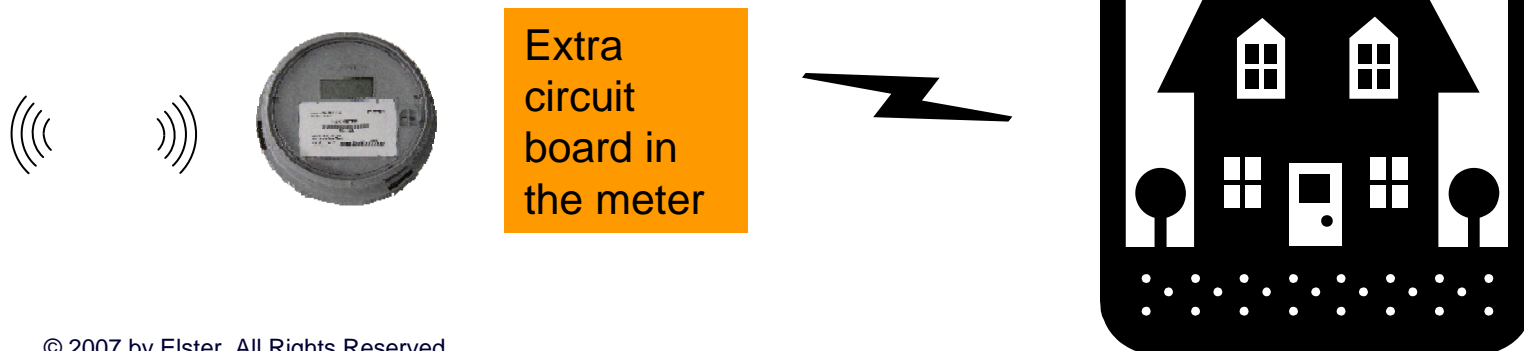
Getting into the Home - Demand Response Products

- **Option 2) Use the existing wireless Smart Meter network (LAN)**

    - Doesn't require any up front commitment or decision

    - Lowest cost option for the meter

    - Good building penetration

    - Requires network management considerations

Examples of in Home Demand Response Products with Smart Meters

The Ontario Smart Meter Program has driven four Canadian companies to develop demand response products that work with the EnergyAxis system

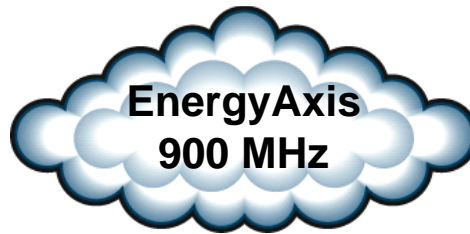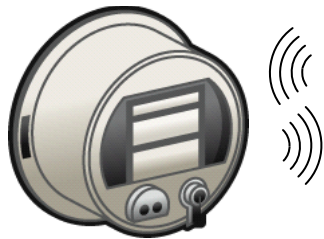- Additional Canadian and U.S. companies will be added in the future

4C Energy Solutions

- Small start-up company based in Vineland, Ontario
- Product is the "Electricity Meter Reader", an in-home device that displays energy consumption information
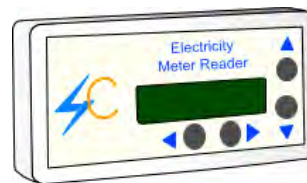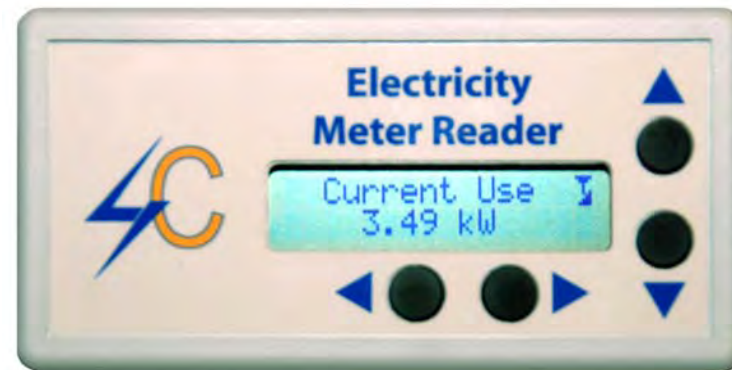
4C – How it Works

A3 ALPHA Collector

REX Meter

**EnergyAxis
900 MHz**

**2.4 GHz

ISM Band**
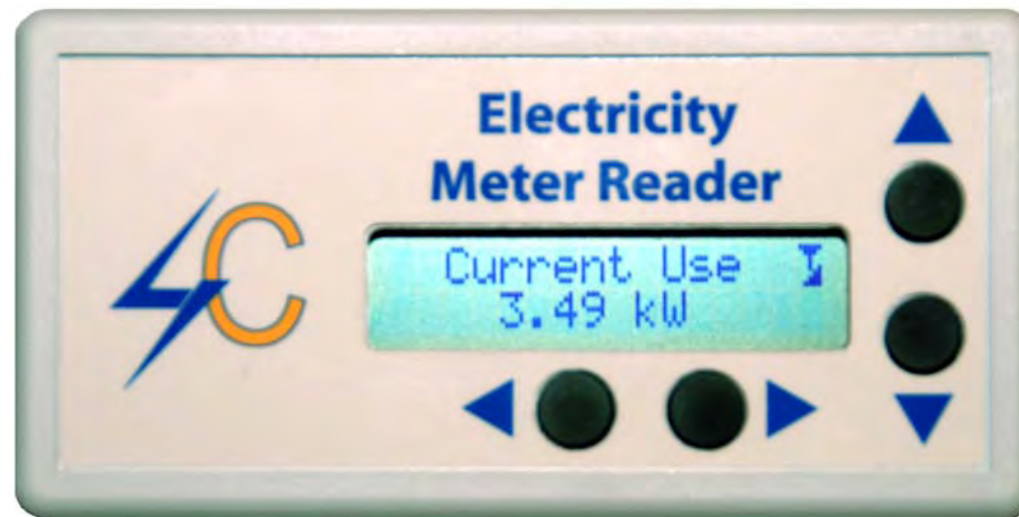
4C In-Home Display

4C – Features

- 2-line text display
- Runs on AC power or batteries
- Current use (instantaneous)
- Past hour
- Past 24 hours
- Peak use hour
- Peak cost hour
  - May not be the same as the peak use hour
- Watts and dollars or cents
- Date, time and current rate
- Uses low-power, 2.4GHz "Sigsbee-like" RF communication with the meter
- Requires an option board in the meter
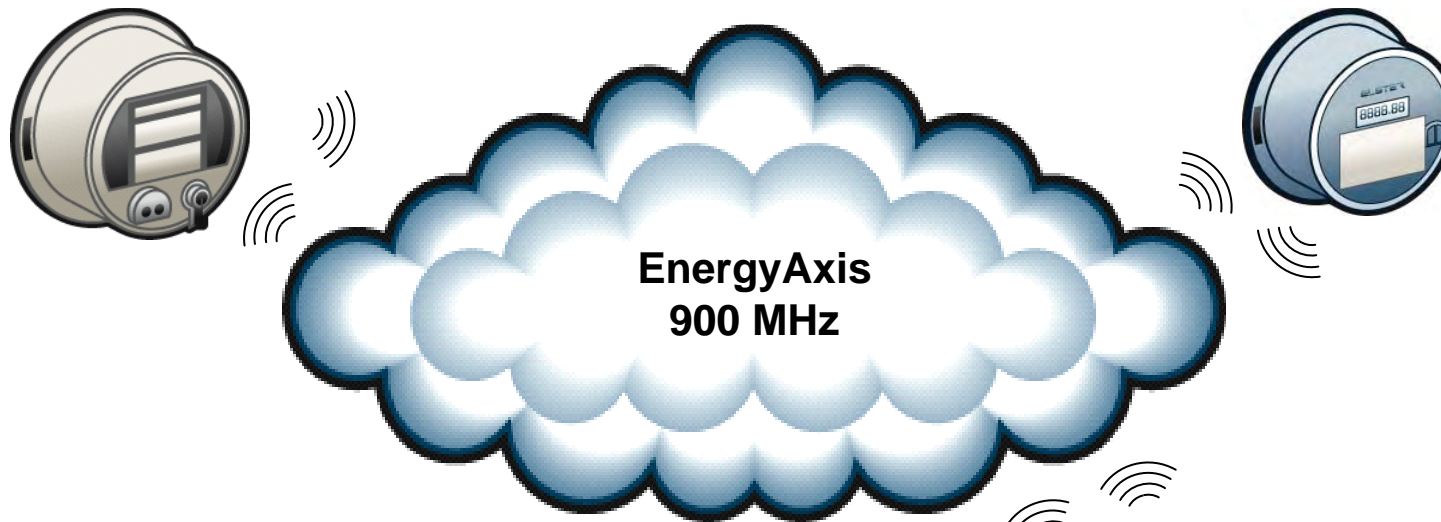- Measurement Canada approved

Aztech

- Company based in Kingston, Ontario
- Product is the "Energy Monitor" in-home display

Aztech – How it Works

A3 ALPHA Collector

REX Meter

**EnergyAxis
900 MHz**

Two–Way Communication
to the end point

In-Home Display

Aztech – Features

- Graphical display
- Runs off a rechargeable battery or AC
- Summation Screen displays accumulated kWh data from the meter
- Cost screen shows kWh and $ since last reset
- Instantaneous screen shows present rate of consumption
  - Light sweeps across at a speed proportional to the consumption rate
- Active tier
  - Different coloured lights for different rates
- Communicates on the EnergyAxis 900MHz LAN
  - No option board required in the meter
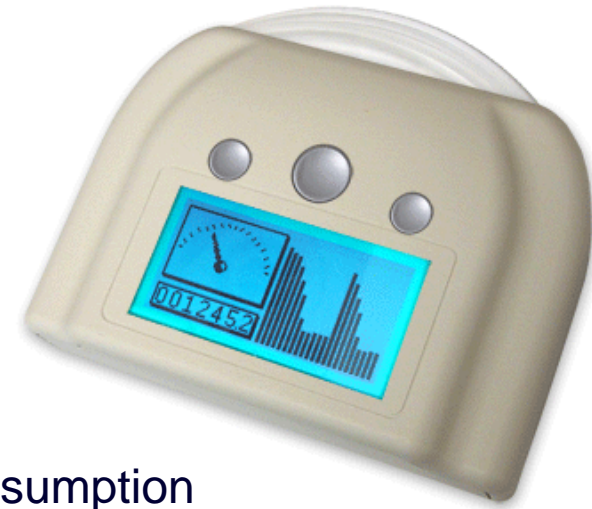
Riga Development

- Company based in Toronto

- Core business is smart Zigbee thermostats for hotel rooms

- EnergyAxis product is a remotely programmable thermostat and load control switch

Riga – How it Works

A3 ALPHA Collector

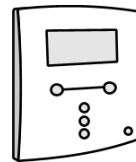**EnergyAxis 900 MHz**

WAN
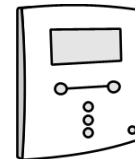
Metering Automation Server

REX Meter

REX Meter

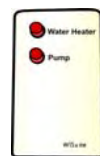## Two–Way Communication to the end point

Network Zigbee Mesh

Network Zigbee Mesh

Riga Thermostat   Riga Load Control Switches

Riga Thermostat

Riga Load Control Switch

Riga – Features

- Temperature set points can be set by the homeowner or in MAS

- Separate set points and load control switch settings for each TOU tier

- Utility can issue a temporary override through MAS

  - Override temperature and load control settings

- Set points and overrides can be broadcast to a group of meters or sent to one individual meter

- Uses 2.4 GHz Zigbee communication within the home

- Uses the meter as a gateway for communication between the MAS and the in-home devices

  - Thermostat & switch settings are stored in the meter

- Requires an option board in the meter

  - Measurement Canada approval application submitted Feb 2007
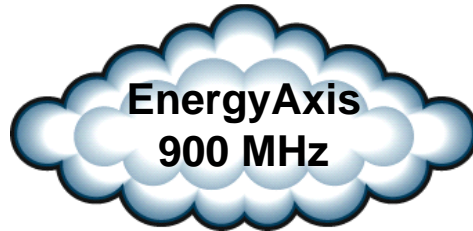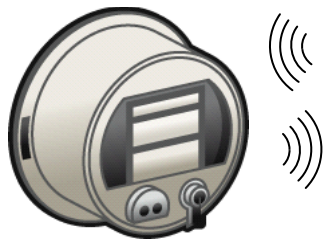
Blue Line Innovations

- Company based in St. John's, NL

- Manufacturer of in-home display devices for electromechanical meters

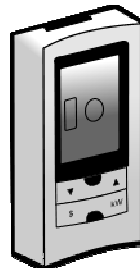- Blue Line has adapted their existing product to work with Elster EnergyAxis REX meters

Blue Line – How it Works

A3 ALPHA Collector

REX Meter

EnergyAxis 900 MHz

EnergyAxis 900 MHz

Blue Line In-Home Display

Blue Line – Features

Data	Description
Current data	Current energy consumption in dollars/hr or kW.
Current Rate	Disk emulator shows current rate of consumption
Status	Signal quality indicator and low battery indicator.
Consumption History	Graphical representation of highest 24 hour value as well as peak value for last 24 hours
Total Consumption History	Cumulative total electricity consumed since the display was last reset – Displayed in dollars or kWh.
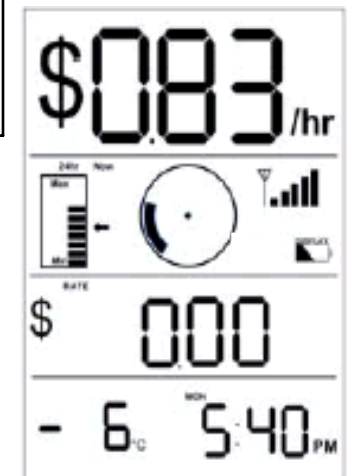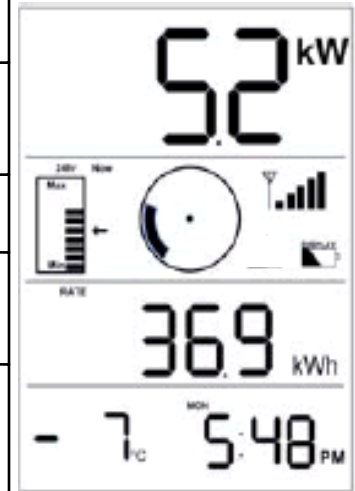
So the question is….

Who will step up and buy enough of these solutions to turn them into a commercial reality?

Thank you…