

# ENERGY STAR

Compliance for RCW 19.27A.190

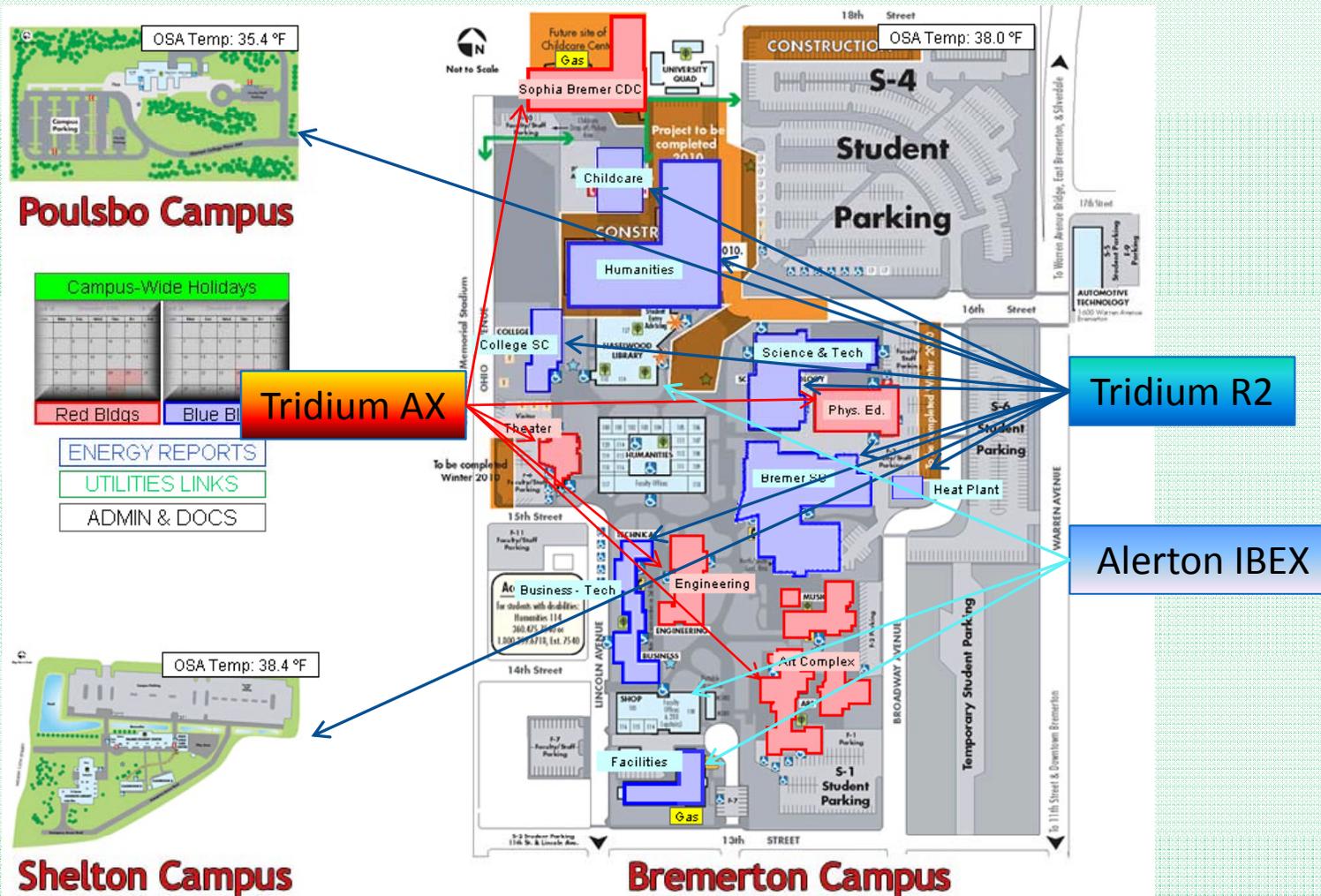


# OLYMPIC COLLEGE Campus EMS Systems

Consists of multiple EMS control systems

- Tridium Niagara AX
  - System has two different vendor-supplied platforms
    - 1- system open
    - 1- system proprietary (currently being relicensed as an open system)
- Tridium Niagara R2
- Alerton IBEX

## OLYMPIC COLLEGE Campus EMS Systems



# OLYMPIC COLLEGE Campus EMS Systems

## Current Communication Protocols

Tridium AX

- LON

Tridium R2

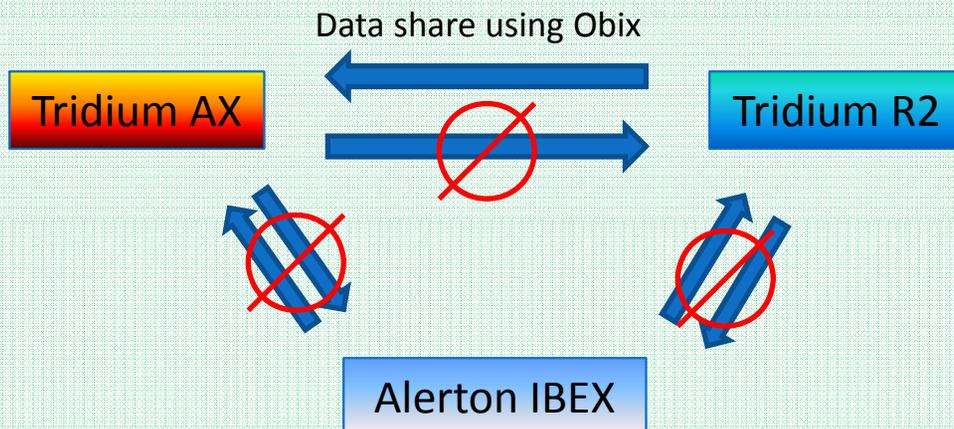
- LON, BACnet, Modbus

Alerton IBEX

- Alerton IBEX proprietary (products no longer available)

# OLYMPIC COLLEGE Campus EMS Systems

Making use of existing EMS systems to collect and share energy data



## OLYMPIC COLLEGE Campus EMS Systems

Bridging the communication gaps

- Tridium R2 can share data with AX, however AX cannot share data with R2
- Alerton IBEX cannot share data with Tridium

How can we pull energy data from all three systems into one front-end and generate reports?

- Upgrade Alerton Buildings to BACTalk
- Extend Tridium systems to Alerton Buildings
- Use a third party system to collect the data

## OLYMPIC COLLEGE Campus Energy Acquisition and Reporting

### Collecting Energy Information

- Power
  - Shark 200s Sub Meters
- Campus Heating Water
  - Onicon BTU Meters
  - *Maverick* IP Sub Meters
- Natural Gas
  - *Maverick* IP Sub Meters

# OLYMPIC COLLEGE Campus Energy Acquisition and Reporting

Shark 200s and Onicon BTU Meters Displayed in Tridium R2

### BSC Power Meter

	Voltage V L-L	Current I	Power			Power Factor PF	Frequency F
			Active P	Reactive Q	Apparent S		
Real Time	488 Volts	160 Amps	120 kW	65 KVAR	136 KVA	0.88	60.01 Hz
% Unbalanced	0.3 %	3.1 %					

#### METER DETAILS

SN	Make	Model	Firmware
0048089130	Shark	Shark200 v.33	0012

### BSC BTU Meter

	Energy Rate BTU/Hr	Energy MBTUs	Flowrate GPM	Supply Temp °F	Return Temp °F
Real Time	402286528.00 btu/hr	2139.00 Mbtu	37.30 gal/min	176.31 °F	154.43 °F

#### METER DETAILS

Meter Mode	Meter Type	Status
Heating	Single Turbine	Normal

[Back to Utilities Main Page](#)

# OLYMPIC COLLEGE Campus Energy Acquisition and Reporting

*Maverick* IP Sub Meter Built-In Web-Server

09:57:07
IP Sub Metering Appliance: Building Power
February 17, 2011

[Main](#)



**Main**

**Data Logging**

**Configuration**

**CONSUMPTION**

Total Accumulated Pulses: 1206

**MINUTE USAGE**

Current: 0KWh  
Previous: 0KWh  
Alert Status: Normal  
Countdown:

**HOURLY USAGE**

Current: 47KWh  
Previous: 0KWh  
Alert Status: Normal  
Countdown:

**DAY USAGE**

Current: 47KWh  
Previous: 0KWh  
Alert Status: Normal  
Countdown:

**WEEK USAGE**

Current: 47KWh  
Previous: 0KWh  
Alert Status: Normal  
Countdown:

**MONTH USAGE**

Current: 1206KWh  
Previous: 0KWh  
Alert Status: Normal  
Countdown:

# OLYMPIC COLLEGE Campus Energy Acquisition and Reporting

Shark 200s Installed at Facilities Services Building



# OLYMPIC COLLEGE Campus Energy Acquisition and Reporting

Onicon BTU Meter Installed at the  
Student Services Building



# OLYMPIC COLLEGE Campus Energy Acquisition and Reporting



*Maverick* IP Sub Meter Appliance

# OLYMPIC COLLEGE Campus Energy Acquisition and Reporting Communications

## Shark 200s Sub Meters

- Communication:
  - Modbus – TCP/IP

## Onicon BTU Meters

- Communication:
  - LON, also provides Pulse Output

## *Maverick* IP Sub Meters

- Communication:
  - No proprietary protocol
  - XML based built-in Web-server
  - Built-in Email Server

# Olympic College Campus Solution EMU Software

Custom software specifically designed around the campus systems

- Tridium AX and R2 are written in Java and are capable of having queries to any point
- Alerton IBEX presented a problem
  - Solution:
    - Install *Maverick* IP Sub Meters for all utilities in Alerton IBEX buildings. Tie the *Mavericks* into the campus IT Network and perform xml queries to the devices.

# Olympic College Campus Solution

 <b>CAMPUS HVAC SYSTEM CONTROLS</b> 			
Olympic College Energy Summary			Portfolio Manager Export
Building	Meter Name	Previous Month Usage	Current Month Usage
Bremerton - Art A (ATA)	Shark-48088331	NaN kWh	NaN kWh
Bremerton - Art B (ATB)	Shark-48088432	NaN kWh	NaN kWh
Bremerton - Bremer Automotive Tech (BAT)	Shark-48089433	NaN kWh	NaN kWh
Bremerton - Bremer Student Center (BSC)	Onicon-9	2324 MBtu	95 MBtu
Bremerton - Bremer Student Center (BSC)	Shark-48089130	NaN kWh	NaN kWh
Bremerton - Business & Technology (BUS & TEC)	Onicon-11	4425 MBtu	141 MBtu
Bremerton - Business & Technology (BUS & TEC)	Shark-47316223	NaN kWh	NaN kWh
Bremerton - Business & Technology (BUS & TEC)	Shark-48088836	NaN kWh	NaN kWh
Bremerton - College Service Center (CSC)	Onicon-1	2163 MBtu	86 MBtu
Bremerton - College Service Center (CSC)	Shark-48089029	NaN kWh	NaN kWh
Bremerton - Engineering (ENG)	Shark-48088533	NaN kWh	NaN kWh
Bremerton - Facilities Services Building (FSB)	Shark-48089230	NaN kWh	NaN kWh
Bremerton - Hazelwood Library (HL)	Shark-48088735	528575 kWh	18061 kWh
Bremerton - Health Occupations Center (HOC)	Onicon-3	785 MBtu	29 MBtu
Bremerton - Health Occupations Center (HOC)	Shark-48088230	NaN kWh	NaN kWh
Bremerton - Physical Education Department (PED)	Shark-48088937	NaN kWh	NaN kWh
Bremerton - Science & Technology (ST)	Onicon-2	5059 MBtu	152 MBtu
Bremerton - Science & Technology (ST)	Shark-48088634	NaN kWh	NaN kWh
Bremerton - Sophia Bremer Childcare Development Center (SBC)	Shark-56094428	NaN kWh	NaN kWh
Bremerton - Theater (THR)	Shark-48089332	NaN kWh	NaN kWh
Bremerton - Facilities Services Building (FSB)	Mav-1	36126 CCF	23078 CCF

# Olympic College Campus Solution

## Example OC ENERGY STAR Report

Microsoft Excel - EnergyStarReport 20 Feb 2011 01:49:25 .xls

A	B	C	D	E	F	G	H	I
Meter ID	Facility Name (Do Not Alter)	Meter Name (Do Not Alter)	Meter Type	Energy/Water Type (Units) (Do Not Alter)	Start Date (mm/yy)	End Date (mm/yy)	Energy/Water	Cost - US Dollars (optional)
3810849	Bremerton - Art A (ATA)	Shark-48088331	Energy	Electricity (kWh (thousand Watt-hours))	1/1/2011	1/31/2011	NaN	
3810862	Bremerton - Art B (ATB)	Shark-48088432	Energy	Electricity (kWh (thousand Watt-hours))	1/1/2011	1/31/2011	NaN	
3810866	Bremerton - Bremer Automotive Tech (BAT)	Shark-48089433	Energy	Electricity (kWh (thousand Watt-hours))	1/1/2011	1/31/2011	NaN	
3810906	Bremerton - Bremer Student Center (BSC)	Onicon-9	Energy	District Hot Water (MBtu (million Btu))	1/1/2011	1/31/2011		2324
3810904	Bremerton - Bremer Student Center (BSC)	Shark-48089130	Energy	Electricity (kWh (thousand Watt-hours))	1/1/2011	1/31/2011	NaN	
3810952	Bremerton - Business & Technology (BUS & TEC)	Onicon-11	Energy	District Hot Water (MBtu (million Btu))	1/1/2011	1/31/2011		4425
3810950	Bremerton - Business & Technology (BUS & TEC)	Shark-47316223	Energy	Electricity (kWh (thousand Watt-hours))	1/1/2011	1/31/2011	NaN	
3810948	Bremerton - Business & Technology (BUS & TEC)	Shark-48088836	Energy	Electricity (kWh (thousand Watt-hours))	1/1/2011	1/31/2011	NaN	
3810805	Bremerton - College Service Center (CSC)	Onicon-1	Energy	District Hot Water (MBtu (million Btu))	1/1/2011	1/31/2011		2163
3810753	Bremerton - College Service Center (CSC)	Shark-48089029	Energy	Electricity (kWh (thousand Watt-hours))	1/1/2011	1/31/2011	NaN	
3810958	Bremerton - Engineering (ENG)	Shark-48088533	Energy	Electricity (kWh (thousand Watt-hours))	1/1/2011	1/31/2011	NaN	
3810818	Bremerton - Facilities Services Building (FSB)	Shark-48089230	Energy	Electricity (kWh (thousand Watt-hours))	1/1/2011	1/31/2011	NaN	
3810887	Bremerton - Hazelwood Library (HL)	Shark-48086735	Energy	Electricity (kWh (thousand Watt-hours))	1/1/2011	1/31/2011		528575
3810845	Bremerton - Health Occupations Center (HOC)	Onicon-3	Energy	District Hot Water (MBtu (million Btu))	1/1/2011	1/31/2011		785
3810840	Bremerton - Health Occupations Center (HOC)	Shark-48088230	Energy	Electricity (kWh (thousand Watt-hours))	1/1/2011	1/31/2011	NaN	
3810891	Bremerton - Physical Education Department (PED)	Shark-48086937	Energy	Electricity (kWh (thousand Watt-hours))	1/1/2011	1/31/2011	NaN	
3914535	Bremerton - Science & Technology (ST)	Onicon-2	Energy	District Hot Water (MBtu (million Btu))	1/1/2011	1/31/2011		5059
3902972	Bremerton - Science & Technology (ST)	Shark-48088634	Energy	Electricity (kWh (thousand Watt-hours))	1/1/2011	1/31/2011	NaN	
3914627	Bremerton - Sophia Bremer Childcare Development	Shark-56094428	Energy	Electricity (kWh (thousand Watt-hours))	1/1/2011	1/31/2011	NaN	
3902967	Bremerton - Theater (THR)	Shark-48089332	Energy	Electricity (kWh (thousand Watt-hours))	1/1/2011	1/31/2011	NaN	
3914635	Bremerton - Theater (THR)	Mav-1	Energy	CCF	1/1/2011	1/31/2011		36126

Energy Data



# Project Summary

## What the customer said:

At the conclusion of the first phase of the project, Bill Wilkie, Director of Facilities at Olympic College stated,

*“Had I known about the Maverick’s at the beginning of the ESCO project I would have used them for all the sub metering”.*

The campus is currently undergoing a second phase of ESCo projects. The second phase will complete the energy monitoring for all buildings. This information will be added to the EMU Software system giving the campus a complete energy monitoring and reporting system.

Upon completion a Case Study will be conducted to detail the project.

# Olympic College Campus Solution

## What's Next

### Automating the Process and Additional Features

- Customizing the EMU Software report for minimal user intervention
  - Allow selection of meters in report
  - Provides additional reporting features
- Database for long term archiving of reports
- Addition of Automated Benchmarking System

Contact:

Wilkie

Olympic College Facilities Director

[Wilkie@oc.ctc.edu](mailto:Wilkie@oc.ctc.edu)

(360) 475-7835

Canter

Tempest Technologies

[Canter@tempestsys.com](mailto:Canter@tempestsys.com)

(360) 381-8208

(360) 286-6200



The following slides give alternative solutions.

# Energy Reporting Alternatives

Specialized software for monitoring

- EMS and meter companies offer energy packages
  - Systems are usually designed around per point pricing, the more you expand the more it costs
  - Cost for these front ends can get expensive
  - Installation, additions, or changes usually require the vendor to provide the programming and graphical updates
  - Requires a long term commitment to maintain
  - May require adding meters to acquire other energy sources
  - Energy reports still need to be sent to [ENERGY STAR](#)

# Energy Analysis & Reporting Solutions

## Energy Dashboards

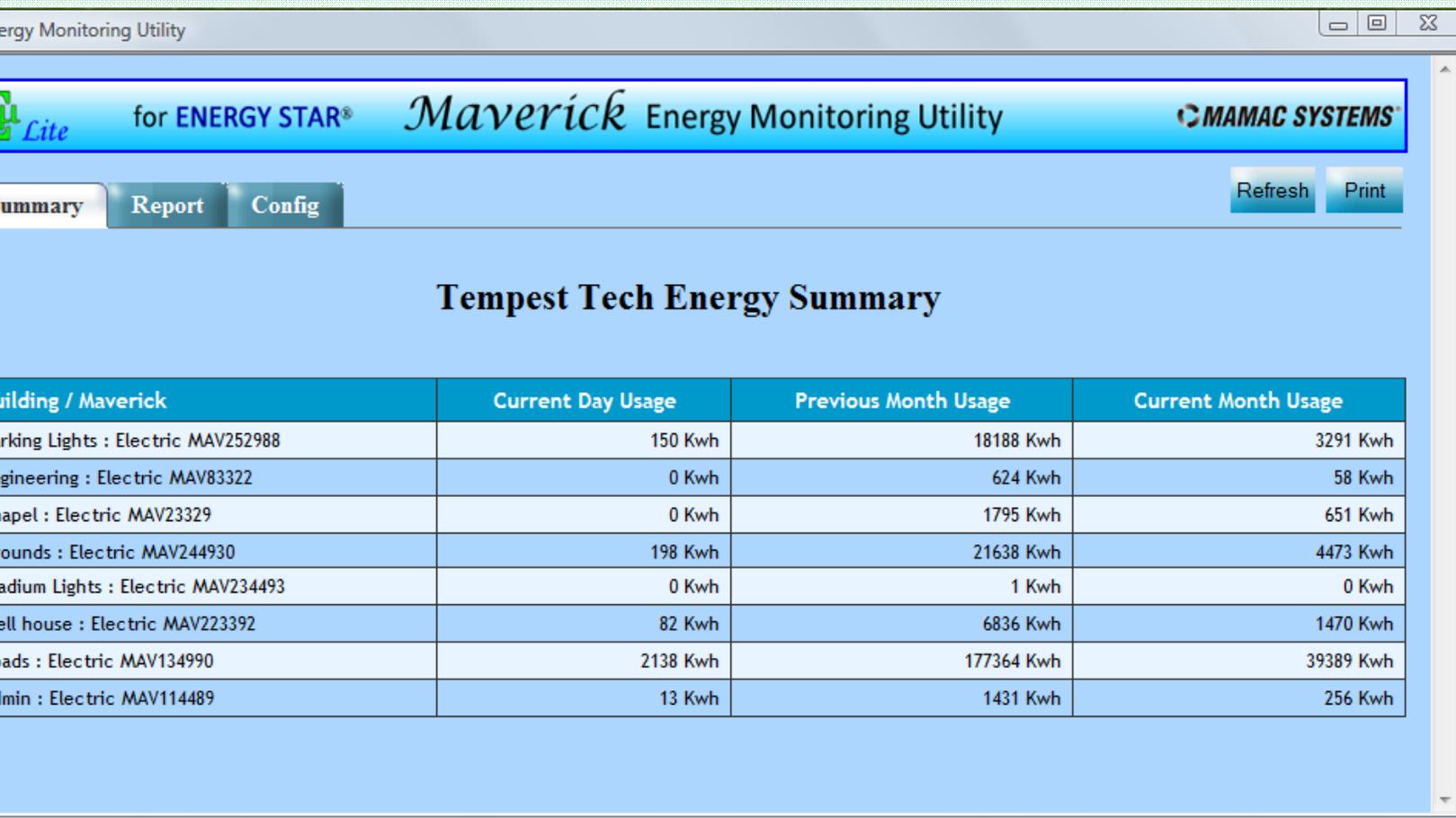
- EMU Software ([ENERGY STAR](#) reporting only)
- OpenKin Cloud Energy Database
- SkyFoundry SaaS or hosted solutions
- others

# EMU Software

- Designed specifically to capture energy data
- Takes advantage of features in *Maverick* IP Sub Meters
- Simple to use interface
  - Show current energy status
  - Show previous months energy usage
  - Provides formatted export to excel for **ENERGY STAR** Report

# EMU Software

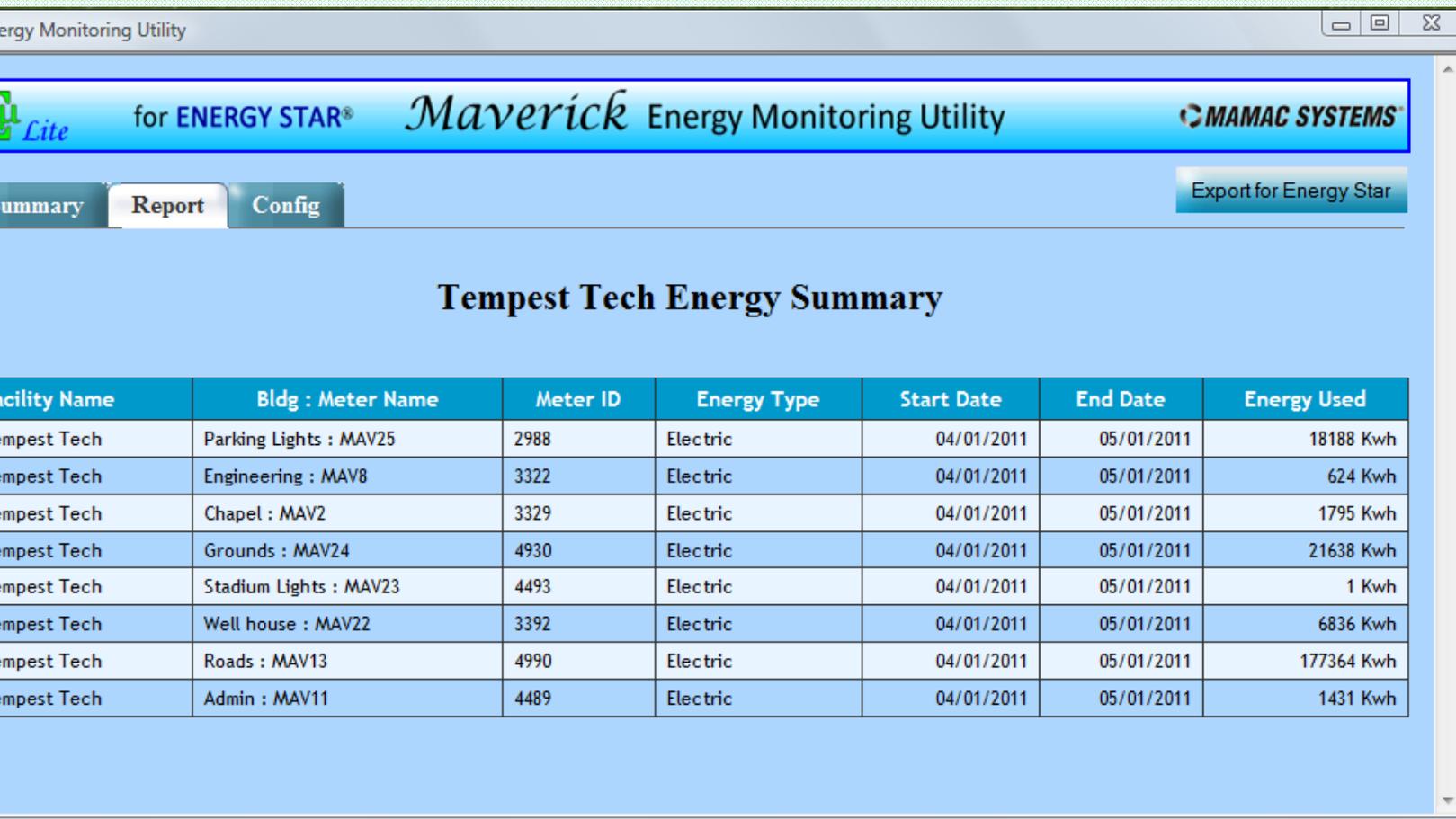
## Screen shot of facility energy summary



The screenshot shows the 'Energy Monitoring Utility' window. The title bar reads 'Energy Monitoring Utility'. The header area includes the 'Lite' logo, 'for ENERGY STAR®', the 'Maverick Energy Monitoring Utility' title, and the 'MAMAC SYSTEMS' logo. Below the header are three tabs: 'Summary' (selected), 'Report', and 'Config'. To the right of the tabs are 'Refresh' and 'Print' buttons. The main content area is titled 'Tempest Tech Energy Summary' and contains a table with energy usage data.

Building / Maverick	Current Day Usage	Previous Month Usage	Current Month Usage
Working Lights : Electric MAV252988	150 Kwh	18188 Kwh	3291 Kwh
Engineering : Electric MAV83322	0 Kwh	624 Kwh	58 Kwh
Chapel : Electric MAV23329	0 Kwh	1795 Kwh	651 Kwh
Foundry : Electric MAV244930	198 Kwh	21638 Kwh	4473 Kwh
adium Lights : Electric MAV234493	0 Kwh	1 Kwh	0 Kwh
ell house : Electric MAV223392	82 Kwh	6836 Kwh	1470 Kwh
ads : Electric MAV134990	2138 Kwh	177364 Kwh	39389 Kwh
min : Electric MAV114489	13 Kwh	1431 Kwh	256 Kwh

## Screen shot of facility energy report page



The screenshot shows a web browser window titled "Energy Monitoring Utility". The page header includes the "Maverick Energy Monitoring Utility" logo and the "MAMAC SYSTEMS" logo. Below the header, there are navigation tabs for "Summary", "Report", and "Config", with "Report" being the active tab. An "Export for Energy Star" button is also visible. The main content area is titled "Tempest Tech Energy Summary" and contains a table with the following data:

Facility Name	Bldg : Meter Name	Meter ID	Energy Type	Start Date	End Date	Energy Used
Tempest Tech	Parking Lights : MAV25	2988	Electric	04/01/2011	05/01/2011	18188 Kwh
Tempest Tech	Engineering : MAV8	3322	Electric	04/01/2011	05/01/2011	624 Kwh
Tempest Tech	Chapel : MAV2	3329	Electric	04/01/2011	05/01/2011	1795 Kwh
Tempest Tech	Grounds : MAV24	4930	Electric	04/01/2011	05/01/2011	21638 Kwh
Tempest Tech	Stadium Lights : MAV23	4493	Electric	04/01/2011	05/01/2011	1 Kwh
Tempest Tech	Well house : MAV22	3392	Electric	04/01/2011	05/01/2011	6836 Kwh
Tempest Tech	Roads : MAV13	4990	Electric	04/01/2011	05/01/2011	177364 Kwh
Tempest Tech	Admin : MAV11	4489	Electric	04/01/2011	05/01/2011	1431 Kwh

## Screen shot of facility ENERGY STAR report

A	B	C	D	E	F	G	H	I	J
Meter ID	Facility Name (Do Not Alter)	Meter Name (Do Not Alter)	Meter Type (Do Not Alter)	Energy/Water Type (Units) (Do Not Alter)	Start Date (mm/dd/yyyy)	End Date (mm/dd/yyyy)	Energy/Water Use	Cost - US Dollars (optional)	
4489	Tempest Tech	MAV11	Energy	Electric	4/1/2011	5/1/2011	1431		
4990	Tempest Tech	MAV13	Energy	Electric	4/1/2011	5/1/2011	177364		
3392	Tempest Tech	MAV22	Energy	Electric	4/1/2011	5/1/2011	6836		
4493	Tempest Tech	MAV23	Energy	Electric	4/1/2011	5/1/2011	1		
4930	Tempest Tech	MAV24	Energy	Electric	4/1/2011	5/1/2011	21638		
3329	Tempest Tech	MAV2	Energy	Electric	4/1/2011	5/1/2011	1795		
3322	Tempest Tech	MAV8	Energy	Electric	4/1/2011	5/1/2011	624		
2988	Tempest Tech	MAV25	Energy	Electric	4/1/2011	5/1/2011	18188		

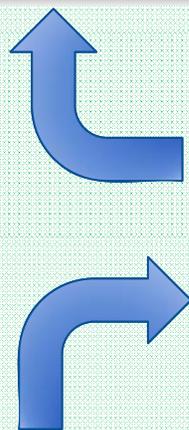
Best Technologies

# Openkin Energy Data Clouds



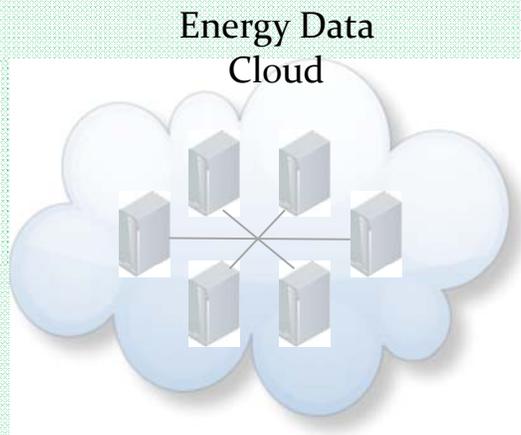
Energy STAR ABS

- Multi Service Access
- Standard Data Interface



Secure Data Access

Secure Data Push



- Security
- Data Access Management
- Data Integrity Management
- Data Normalization
- Historical Data Management
- Data Back-up
- Meta Data Management



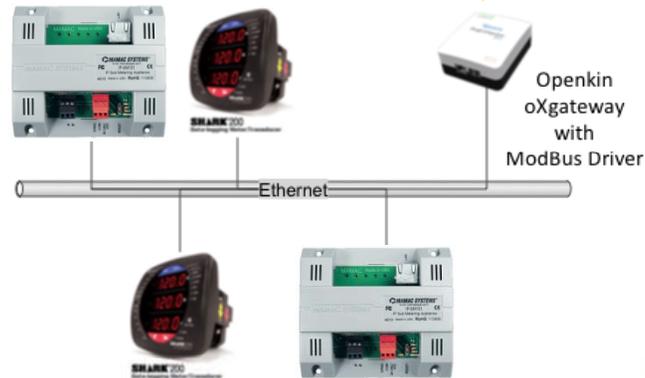
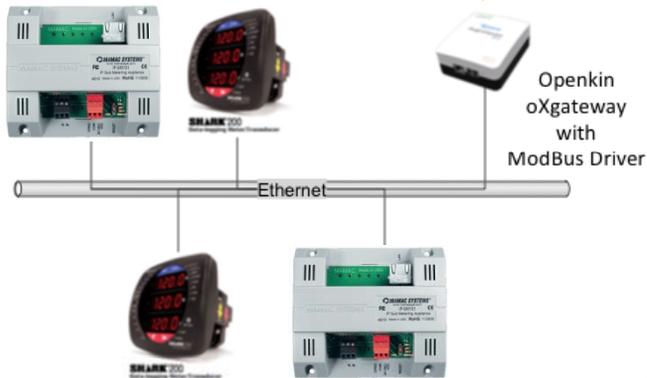
Multi Site

*Maverick*

- Multi-protocol Interface
- Multi-network Interface
- Network Security

# Implementation

Openkin  
Energy Data Cloud



Facility

Facility

# Openkin Energy Data Clouds

## Secure Data Push.

- No need for external IP or exposed network interfaces or ports
- No exposed security issues
- No involvement with on site IT support.

## Secure Data Access

- Automatic data push to Energy STAR ABS

Design and manage the hardware and software interfaces needed for the different meters installed currently or in the future.

Manage the data integrity of the connections to the meters to ensure the data is reliable.

Back up and archive all data.

Based on Open Source Software.

# What is Cloud Computing?

Cloud Computing uses the Internet as the means to share resources, hardware, software, and information on-demand.

Like with the electric utility, you don't own nor manage the generator or the wires. You just pay for what you use. Don't use much electricity while you are away on vacation, don't pay much. Put up 10,000 holiday lights, get a big bill in January.

The Cloud takes managed services and virtualization to the next logical step.

- You don't own anything other than the workstations.
- You don't manage anything but the workstations.
- You have no capital expense, everything is operating expense.
- And you can be agile.

Most Cloud Service Providers, the companies that actually own most all the equipment, will allow your resource utilization to grow as much as it needs to keep up with your business, and then automatically shrink when the resources are not needed.

### Calculate Your Server Costs

Use this handy calculator to run some rough numbers of what it might cost to use Cloud Servers™ for your project.

---

**Operating System:**

Linux  Windows (Minimum size of 1024MB for Windows)

Add Managed Service Level (What is this?)  
(Adds \$0.12 per hour per server plus a flat \$100/month account fee)

---

**Server Size** (Memory in Megabytes)

256 512 1024 2048 4096 8192 15872

**Number of Servers:**

**Monthly Hours of Service:**  **hr**

**Number of Red Hat Servers:**

**Incoming Bandwidth:**  **GB**

**Outgoing Bandwidth:**  **GB**

**Estimated Monthly Total:**

# Cloud Computing Advantages

Enterprise grade services and management

Highly scalable

Highly secure infrastructure

High quality of service

Highly reliable

Highly elastic

Full backup and redundancy

Full emergency power backup

Full database backup and archiving

Multi-user secure access

- Easy installation and startup
- Easy expansion
- No hardware maintenance
- No software maintenance
- No IT support costs
- No customer IT costs
- Reduced manpower
- Reduced overheads
- Customer evaluation support
- Pay for what you use
- Increased profits

est Technologies



**SkySpark**  
by SkyFoundry

**Licensed Software -or- Hosted Solution**

Analytics Software for

Energy Management and Building Systems Optimization

**Runs on a Cloud Database** September 2010

**or Local IT Network**

# ackground

We now have access to the data...

- IP/web connected automation systems and smart devices
- Standard protocols
  - BACNet
  - oBIX
  - LON
  - html
- Standard data formats
  - SQL
  - Readable XML schemas, CSV, etc



Hidden in this data  
are the keys to  
better building  
performance

How can we turn the data into useful information?



Folio



Settings



User



Debug



Help



Energy



Historian



Jobs



Report



Site



Spark



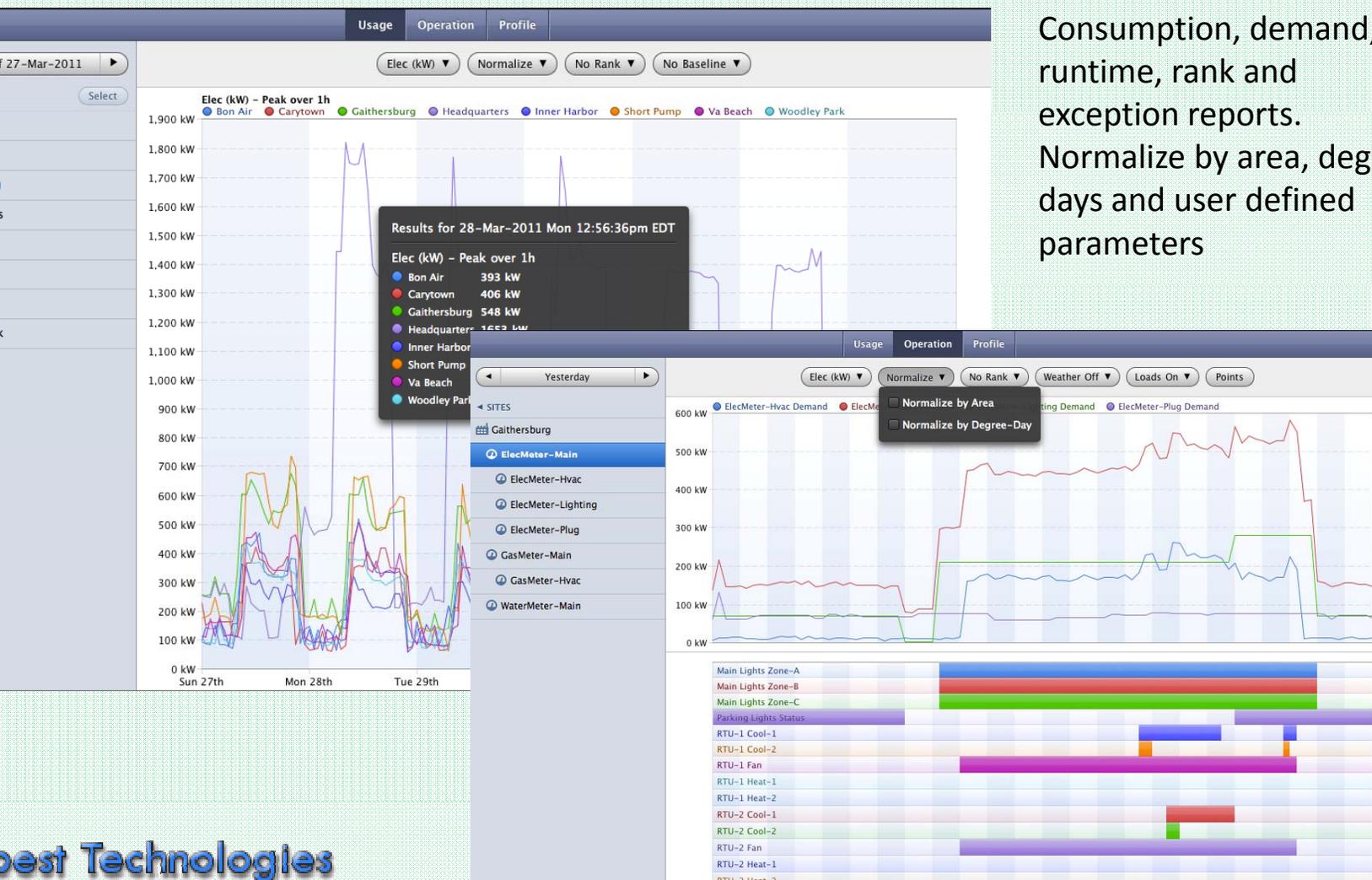
Weather

# SkySpark Applications and Tools

## Overview of the Energy App

# The Energy App – The Essential Energy Reports in One Simple Tool

Consumption, demand, runtime, rank and exception reports.  
Normalize by area, degree days and user defined parameters



est Technologies

For additional information contact:

# Tempest Technologies

Bill Canter

[bill@tempestersys.com](mailto:bill@tempestersys.com)

[www.tempestersys.com](http://www.tempestersys.com)

1-800-381-8208

1-360-286-6200