

Development of a Cost-Effective Energy Management Information System

Presented by **Alvaro Rozo** on behalf of **Katherine van Nes – Hatch Ltd.**

ArcelorMittal Hamilton East (AMHE) Energy Management Information System

Presentation Topics

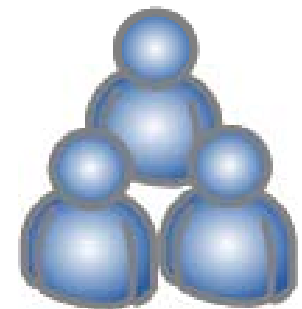
- Project Background
- Approach
- Components of an EMIS
- Components of the AMHE EMIS

Project Cost Effectiveness Highlights

ArcelorMittal Hamilton East

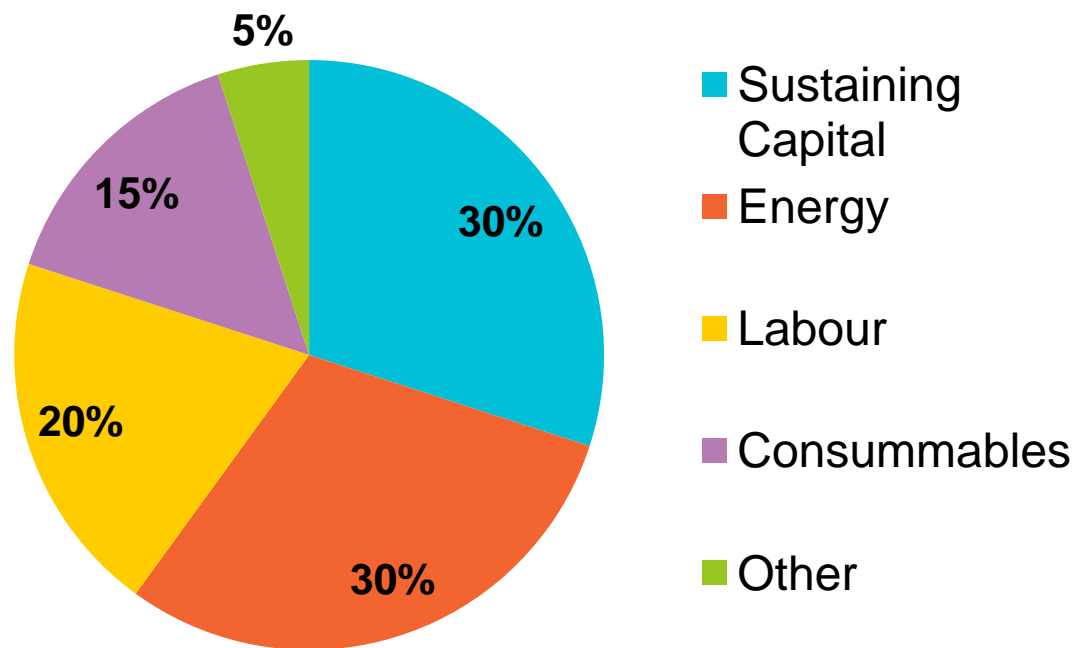


ArcelorMittal Montreal



Focus on Energy

- Approximated Operational Costs (Mining)

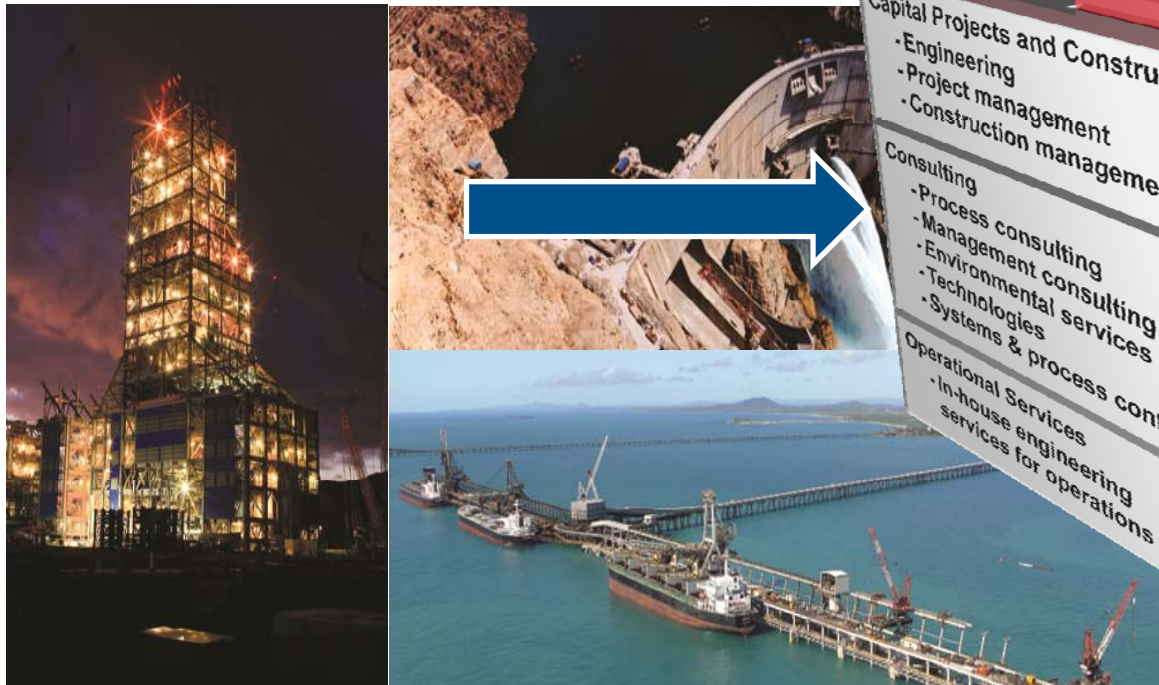


ArcelorMittal Hamilton East



- Part of ArcelorMittal Long Carbon North America
- Produces variety of steel wire products
- Renown for cold heading products and oil-tempered wire

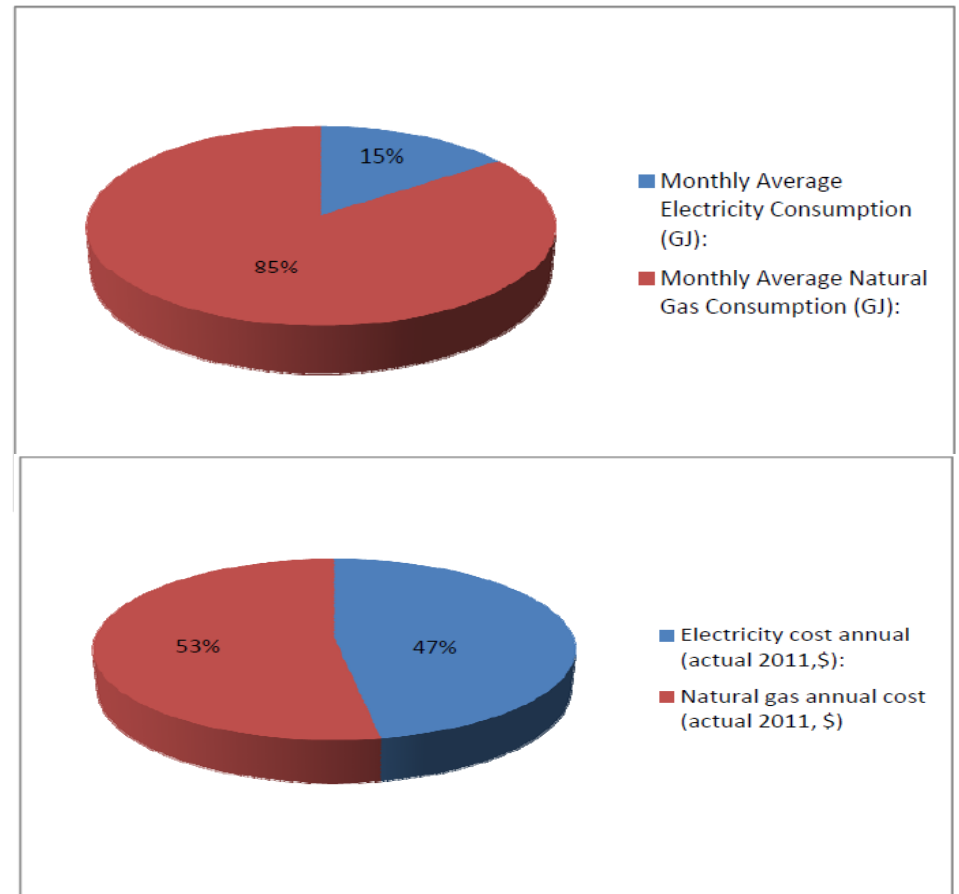




Project Drivers

- Small facility
- Several million on natural gas and electricity costs
- Natural Gas (including steam) accounting for 85% of energy consumption (GJ)
- Electricity disproportionately accounting for 50% of overall cost

Expected savings 5 – 8 %



Energy Management Audit

- Benchmarked AMHE energy management practices via ISO50001 gap analysis
- Identified and ranked preliminary energy savings opportunities
- Preliminary energy models created
- Energy drivers determined
- Preliminary implementation plan and architecture (cost assessment)
- Feasibility of EMIS examined
- Paid for via OPA Industrial Accelerator program

SECTION
Section 1 - Executive Management Responsibility
Section 2 - EnMS Leader Responsibility
Section 3 - Energy Policy
Section 4 - Energy Management Plan
Section 5 - Baselines, Performance Indicators, Objectives, Targets and Action Plans
Section 6 - Communication, Training and Comprehension
Section 7 - Documentation and Operational Control
Section 8 - Design and Procurement
Section 9 - Monitoring, Measurement, Analysis and Evaluation
Section 10 - Internal Auditing and Corrective Actions
Section 11 - Management Review of the Energy Management System
TOTAL AGGREGATE SCORE

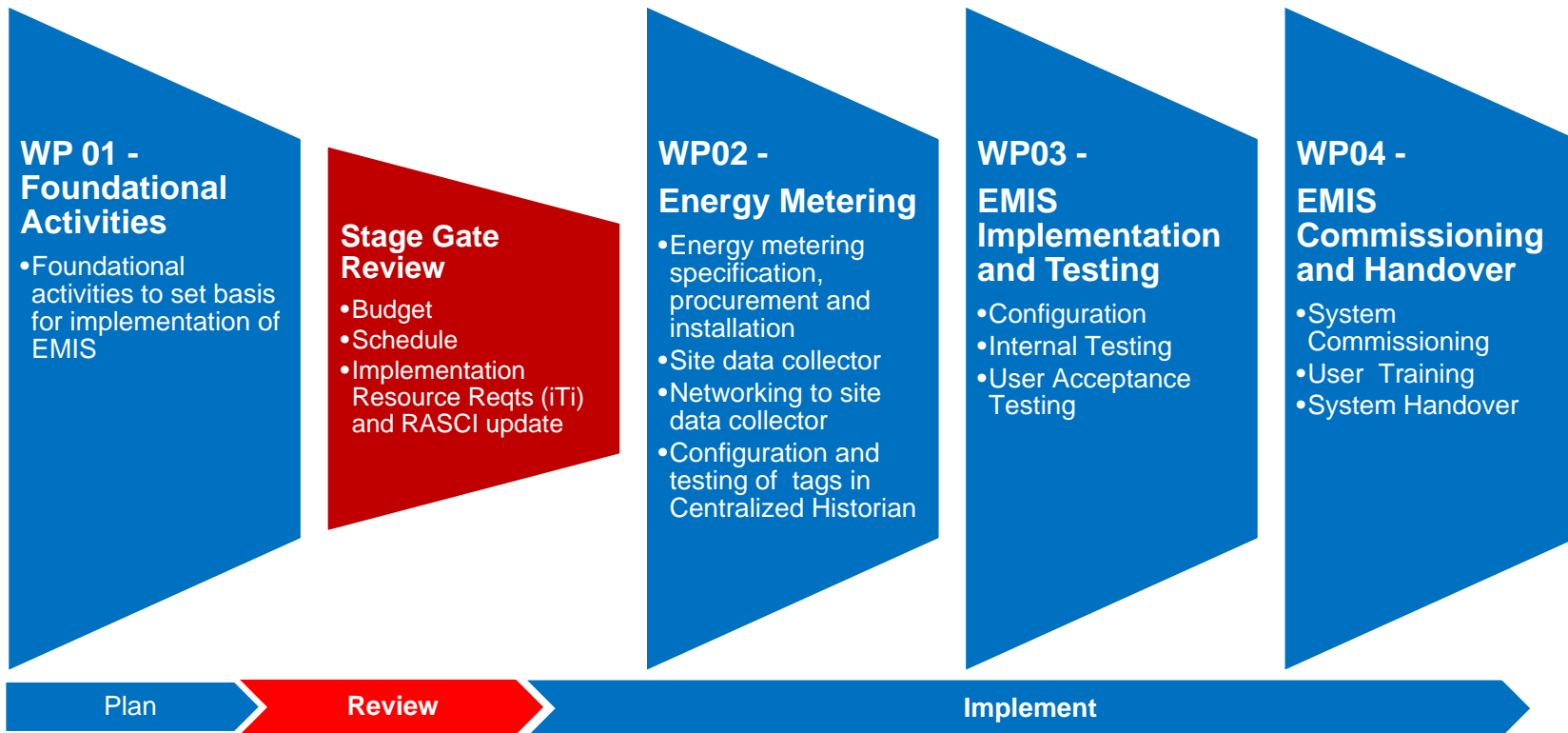
EMIS Audit Options

Features of the Solution	1. Spreadsheet	2. NI LabVIEW Ext.	3. EMIS COTS	4. SaaS EMIS	5. Corporate Centralised Solution
Manual Data Entry Only	✓	✗	✗	✗	✗
Frequency of Meter Readings	Shift / Day at best	Real-time (min / hour)	Real-time (min / hour)	Real-time (min / hour)	Real-time (min / hour)
Networking Connections to Meters	✗	✓	✓	✓	✓
Data Historian Application Required on Site (Required Site Hardware, Software Licensing, Support)	✗	✗ (Use existing SQL Express)	✗ (Corporate Data Historian, Local data)	✗	✗ (Corporate Data Historian, Local data)

1. Spreadsheet	2. NI LabVIEW Ext.	3. EMIS COTS	4. SaaS EMIS	5. Corporate Centralised Solution
Energy data analysis services	✗ (by AMHE)	✗ (by AMHE)	✗ (by AMHE)	✓ (Incl. by Supplier)
Approx. EMIS Implementation Cost incl. Software licensing, excl. meter purchase and installation	Minimal (by AMHE)	Not Available	\$ 210, 000 <u>excl</u> data historian, energy consulting, project management and expenses	\$ 6, 000 <u>excl</u> energy consulting, project management and expenses
Approx. Annual Cost	Minimal (by AMHE)	Not Available	\$ 12, 000	\$ 1, 500 / month (Incl. Portal Services, Energy Analyst Services, Model Maintenance)

\$ Savings Note

Project Approach



\$ Savings Note

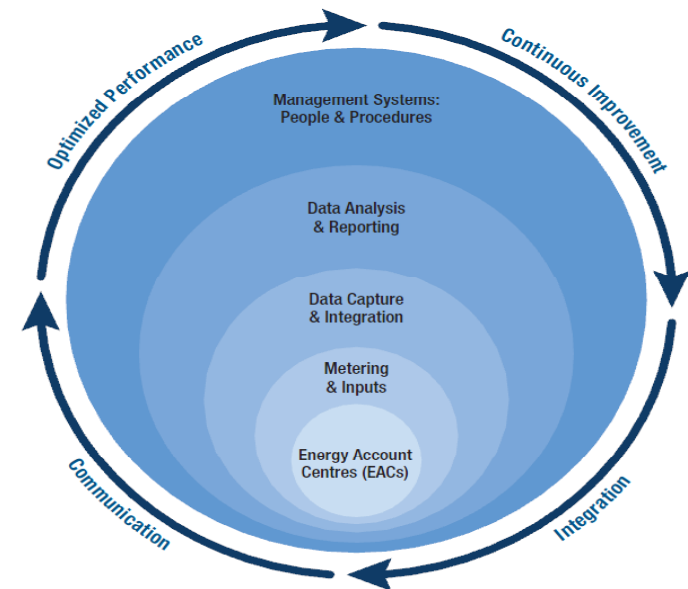
Components of an EMIS

- Energy Account Centers
- Meters and Inputs
- Data Capture and Integration
- Data Analysis and Reporting
- Management Systems, People and Procedures



Source: Natural Resources Canada's
"Energy Management Information Systems Planning Manual and Tool"

Energy Account Centers Metering and Inputs

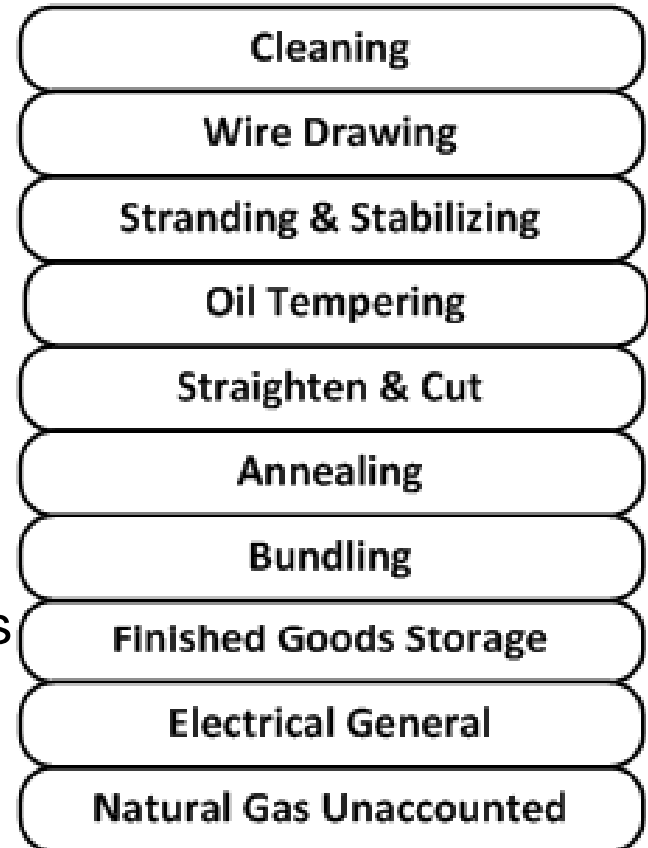


Energy Account Centers

Energy Account Centre (EAC): “The organization level at which energy performance should be managed”

EAC Definition Principles:

- Combined (i.e. all energy sources)
- Process Areas as starting point
- General mapping to finance cost centers
- Target largest AMHE energy drivers
- Maximum information / minimum cost



\$ Savings Note

Typical Mining EACs

Primary Energy Account Centre	Secondary Energy Account Centre
1 - Mining	Drilling Blasting Excavation Transport Handling of waste rock Dewatering
2 – Crushing & Conveying	Primary Crushing Pebble Crushing Conveying

Primary Energy Account Centre	Secondary Energy Account Centre
3 – Mill Processing	Grinding Gravity Recovery Screening & Thickening Leach/Carbon-in-Leach Carbon Stripping Cyanide Destruction Tailings Reclaim
4 – Surface Facilities	Camp Water & HVAC Water Treatment Plant Oxygen Plant

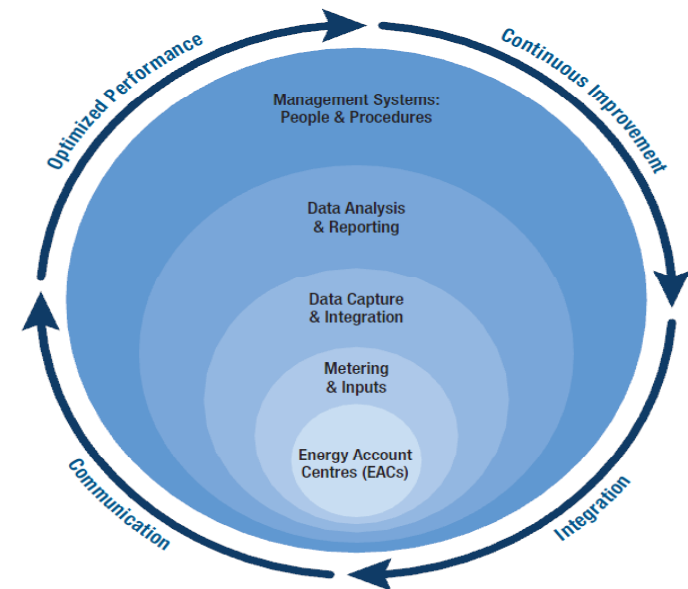
A Note on Metering

- Meters are expensive
- Strategic planning in identified derived and needed meters

Meter Identifier	Location	Description
1	Substation 'C'	61-frame East
		61-frame West
		62-frame
2	Substation 'C'	63,64,65,66 - Frames
		Oil Temper
		Stabilizer Drive / Strander
3	Substation 'D'	23,24,25,26,27,28,55- Frames
4	Substion 'A'	Stabilizer Heating
		Wire Mill South (30,31,34 - frame)
5	Old Boiler Room	Surface Furnace & Rx Gen
		Kaeser Compressor
		Main Natural Gas Meter
6	Substation 'B'	13-Frame
		#1 Cleaning line
7	Substation 'B'	14-Frame
8	#2 Cleaning Line	#2 Cleaning Line & #3 Crane

\$ Savings Note

Data Capture and Integration

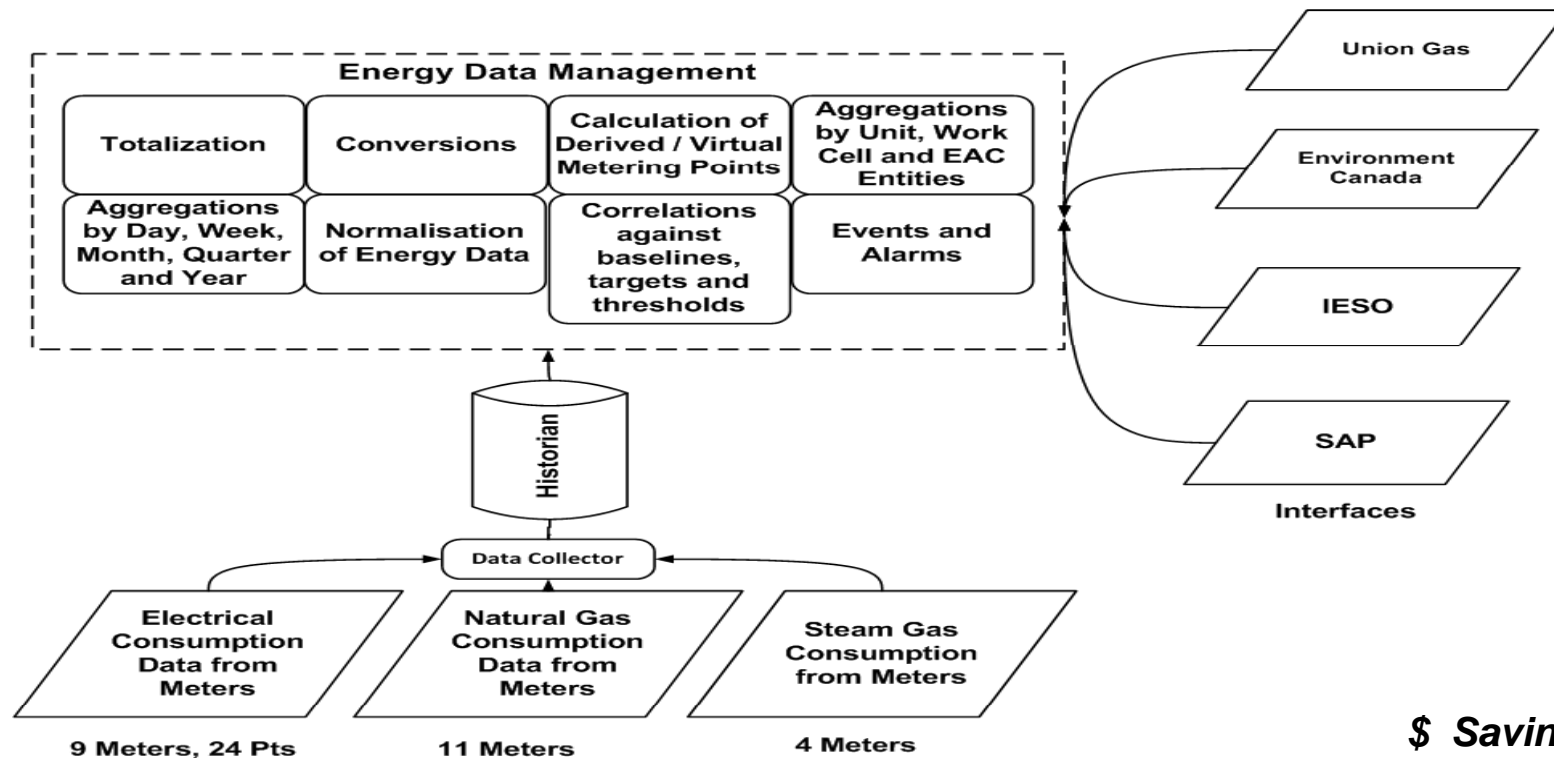


AMHE Site Characteristics

- 10 separate process areas
- Over 50 active energy consumers
- Electricity, natural gas, steam
- Minimal plant floor data collection
- Equipment independently controlled
- PI System infrastructure in AMM/Contrecouer (No PI components in AMHE)
- Existing Ekho installation in Contrecouer



Resultant Architecture



\$ Savings Note

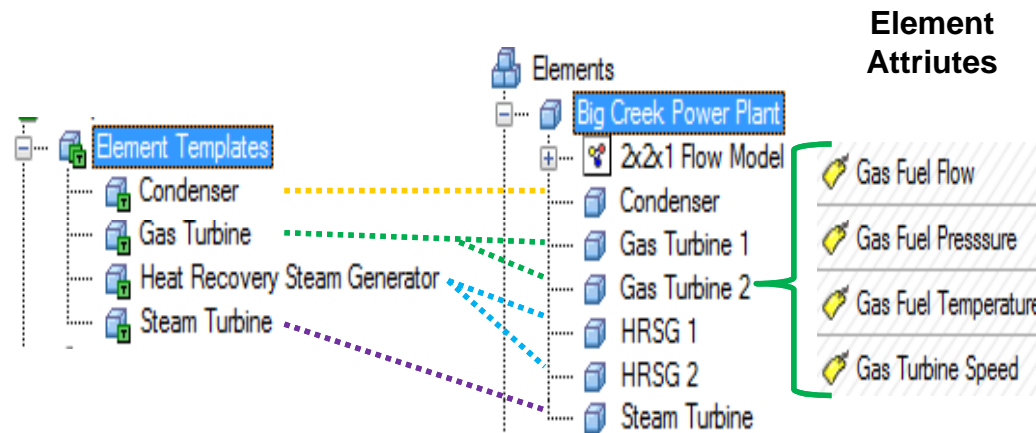
PI Infrastructure

- No additional onsite physical infrastructure
- Connection to sub-metering (no PLCs)
- Bring back all available variables
- Detailed variable analysis
- Calculations
 - Derived meters (today and future)
 - Totalizations in required contexts (kW to kWh, flow to scf/lbs)
 - Conversion (steam to natural gas)

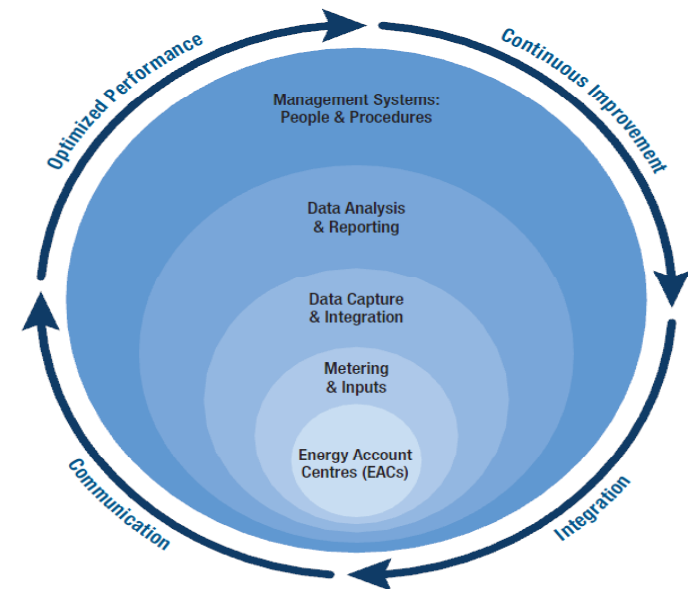
Meter 3 Input 1 Breaker D516-13 Wh delivered
Meter 3 Input 1 Breaker D516-13 varh delivered
Meter 3 Input 1 Breaker D516-13 VAh delivered
Meter 3 Input 1 Breaker D516-13 Watts
Meter 3 Input 1 Breaker D516-13 var
Meter 3 Input 1 Breaker D516-13 VA
Meter 3 Input 1 Breaker D516-13 pf
Meter 3 Input 6 Breaker D516-55 pf
Meter 3 Input 7 Breaker D516-56 pf
Meter 3 Input 8 Breaker D516-57 pf
Meter 3 Input 1 Breaker D516-13 Phase 1 Current
Meter 3 Input 1 Breaker D516-13 Phase 2 Current
Meter 3 Input 1 Breaker D516-13 Phase 3 Current
Meter 3 Input 1 Breaker D516-15 Phase1-Phase2 Volt
Meter 3 Input 1 Breaker D516-15 Phase2-Phase3 Volt
Meter 3 Input 1 Breaker D516-15 Phase3-Phase1 Volt
Meter 3 Input 1 Breaker D516-13 Peak Demand TS
Meter 3 Input 1 Breaker D516-13 Peak Demand for M
Meter 3 Input 1 Breaker D516-13 Present Demand Av

PI Infrastructure – Future Opportunities

- Leverage Asset Framework and Asset Framework Templates
- Leverage Enhanced Calculation Engine and Templates

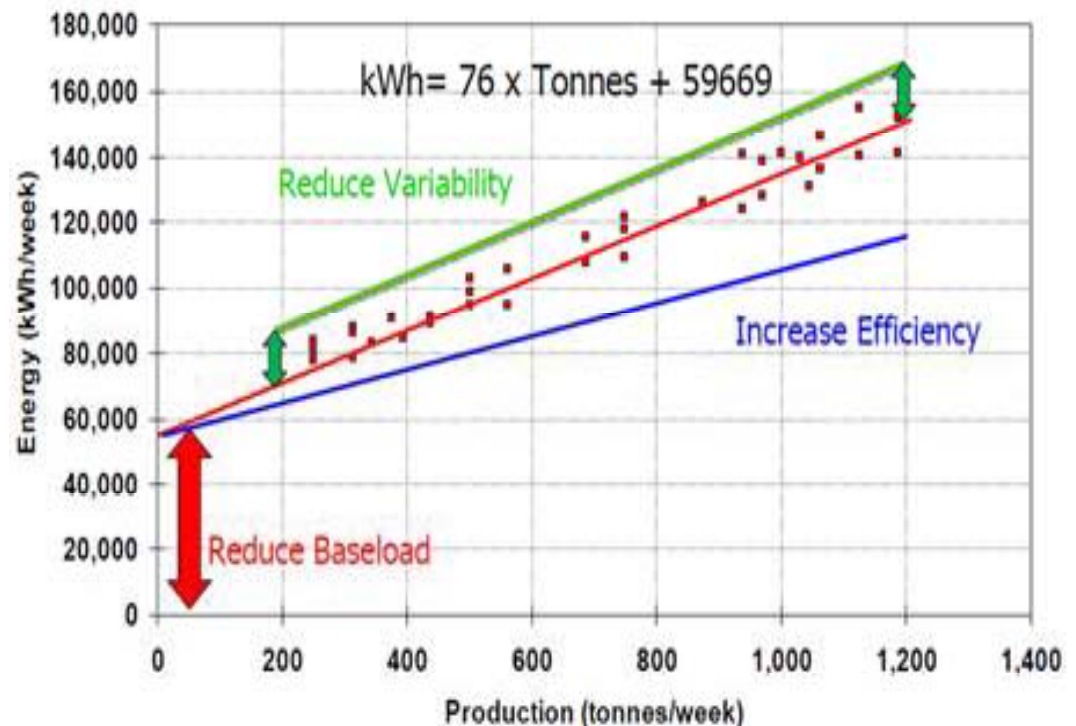


Data Analysis and Reporting

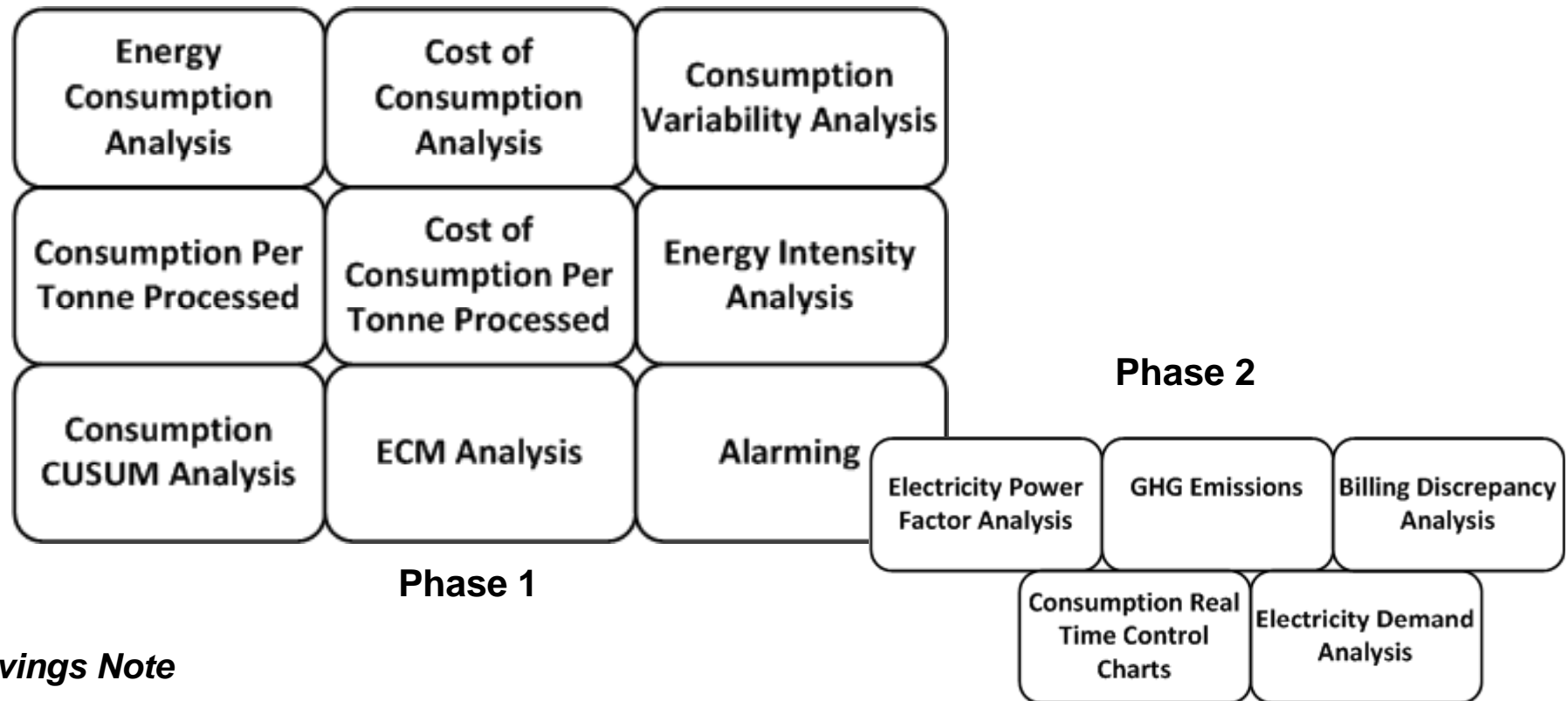


AMHE Key Functionality

1. Reduced base load
2. Reduced variability (against energy drivers)
3. Increased efficiency (via operational opportunities)



Specific Functionality Geared to AMHE

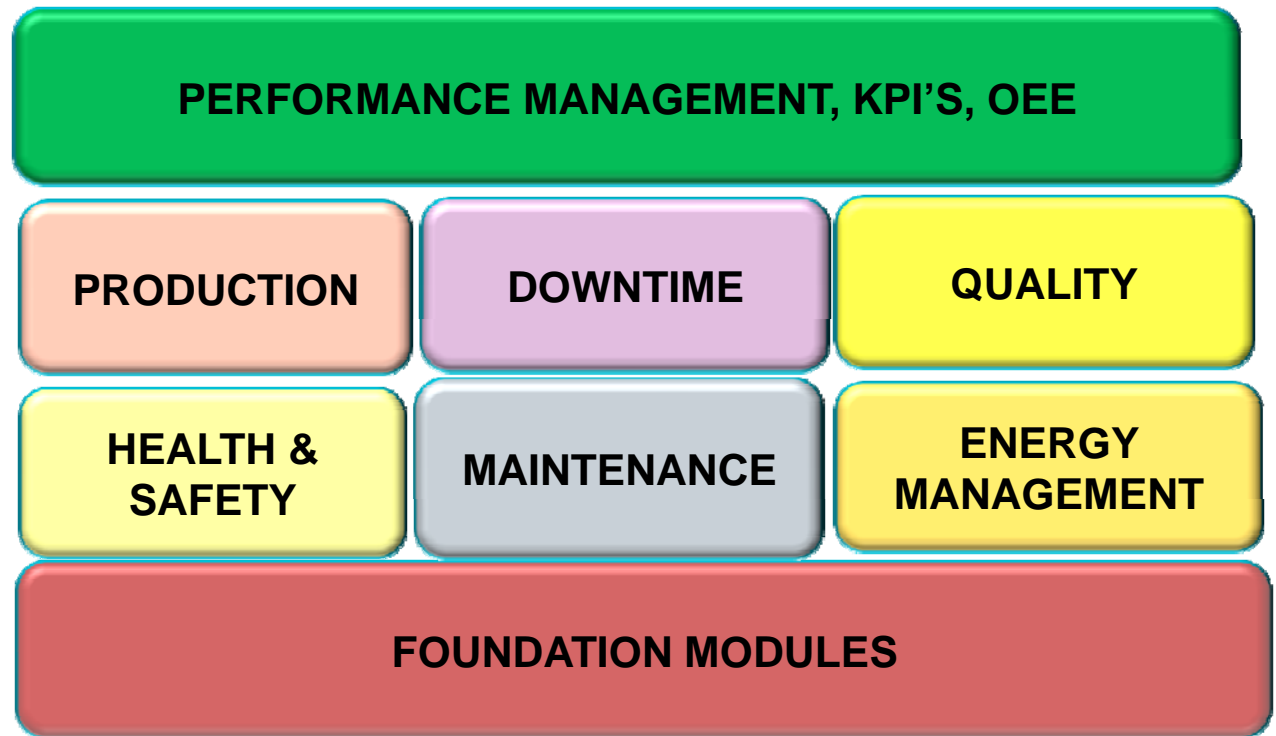


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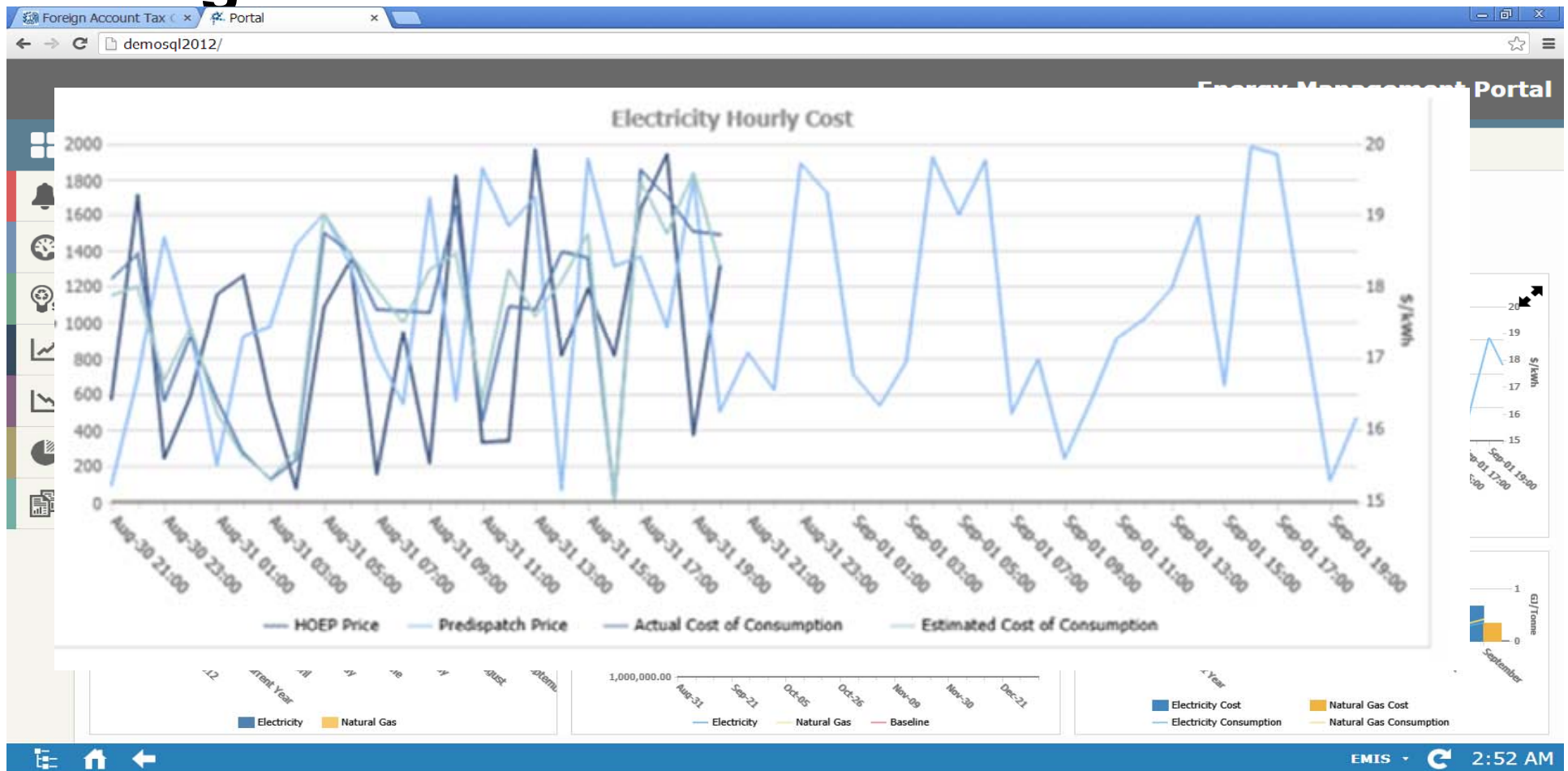


- Operational Management and Intelligence Software

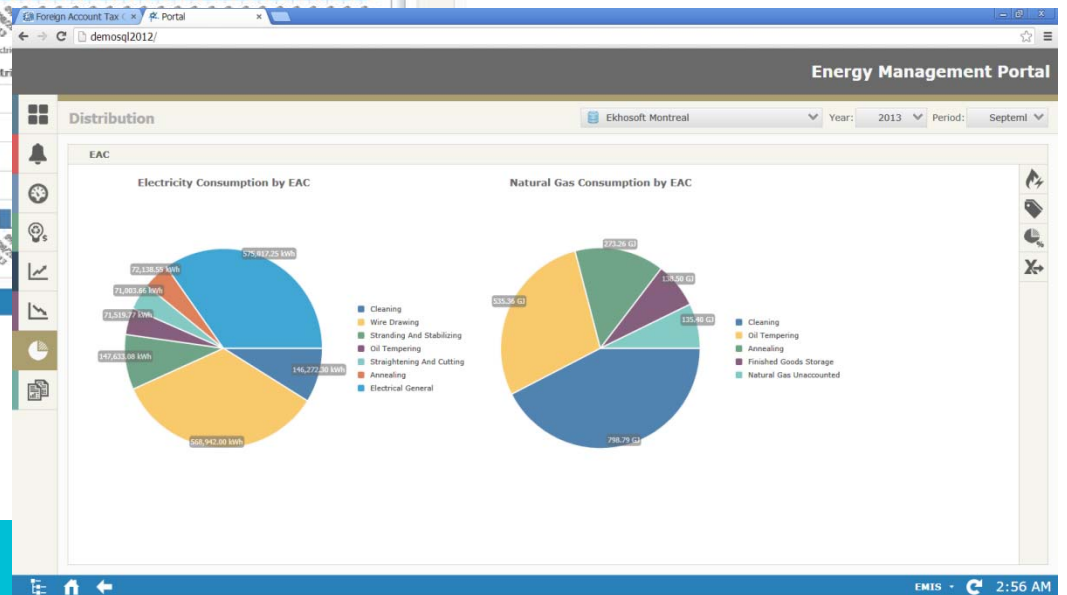
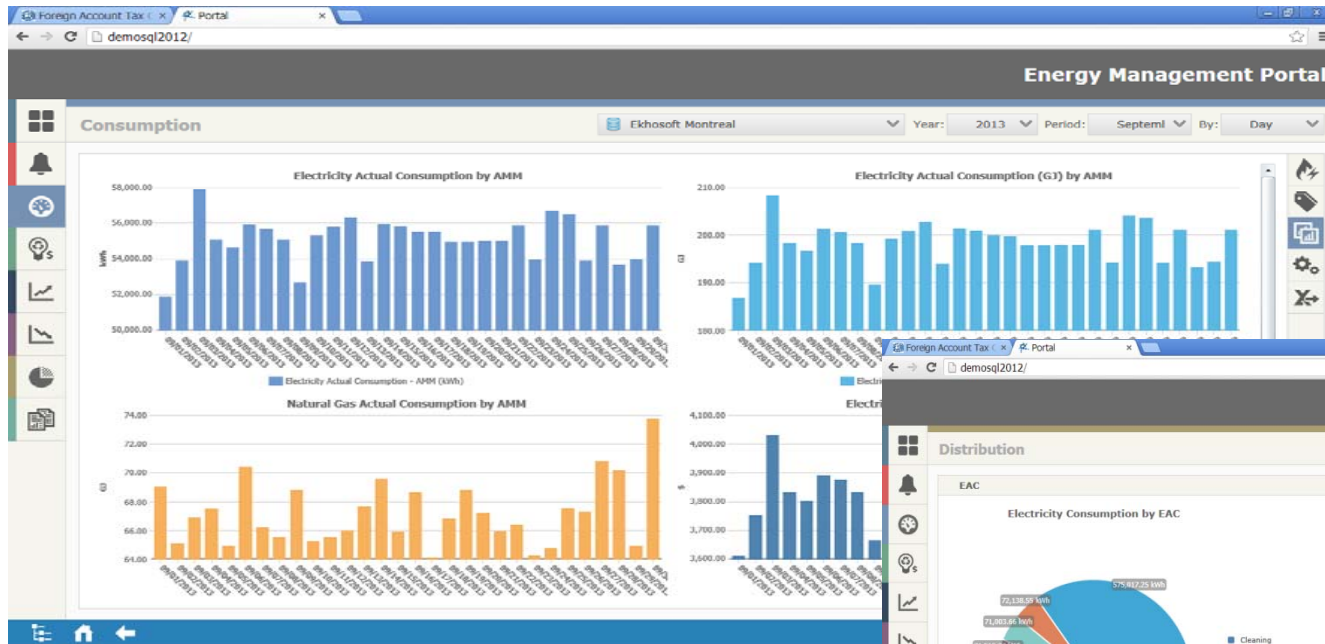
Ekho Functionality



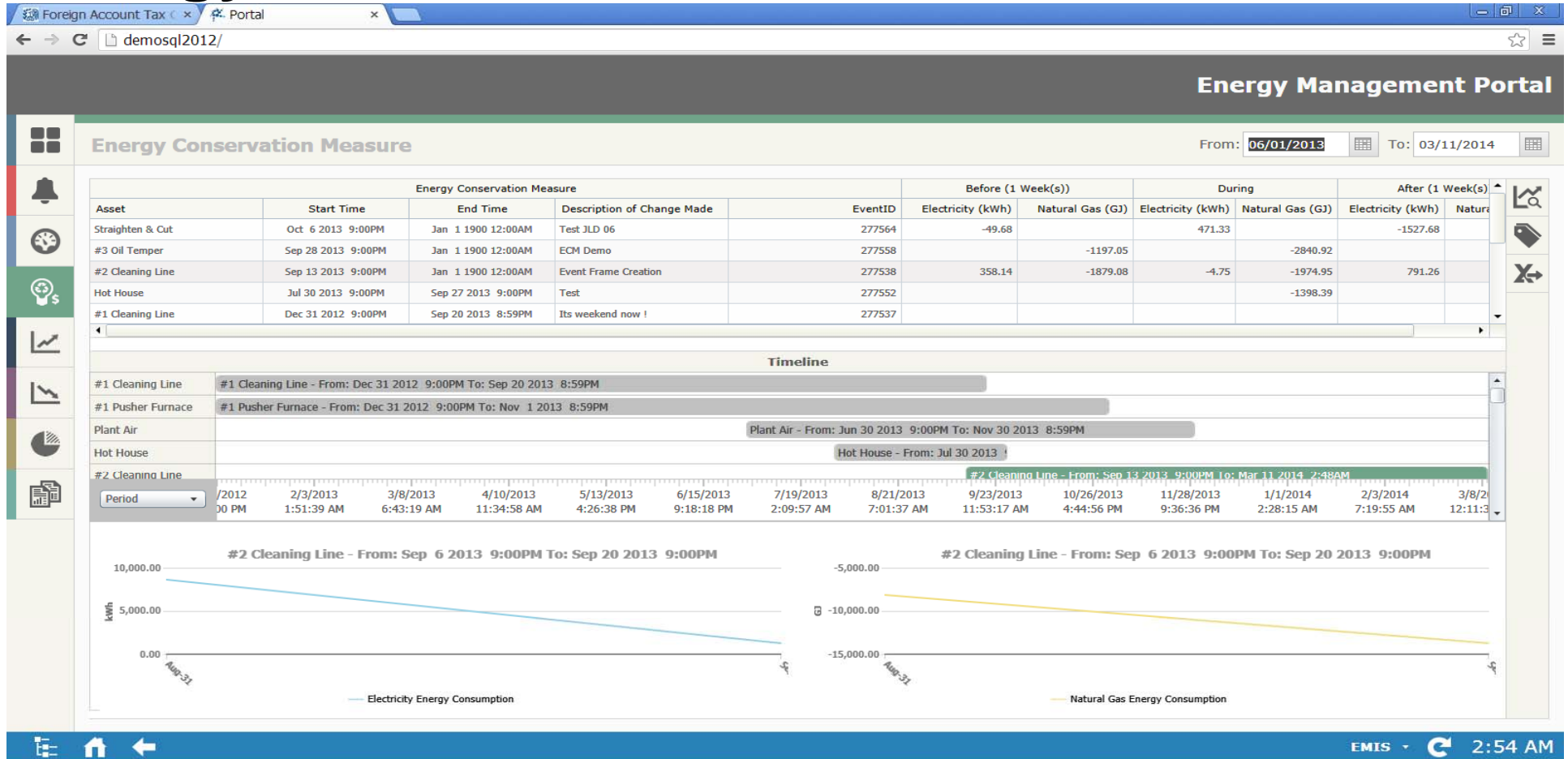
Management Dashboard



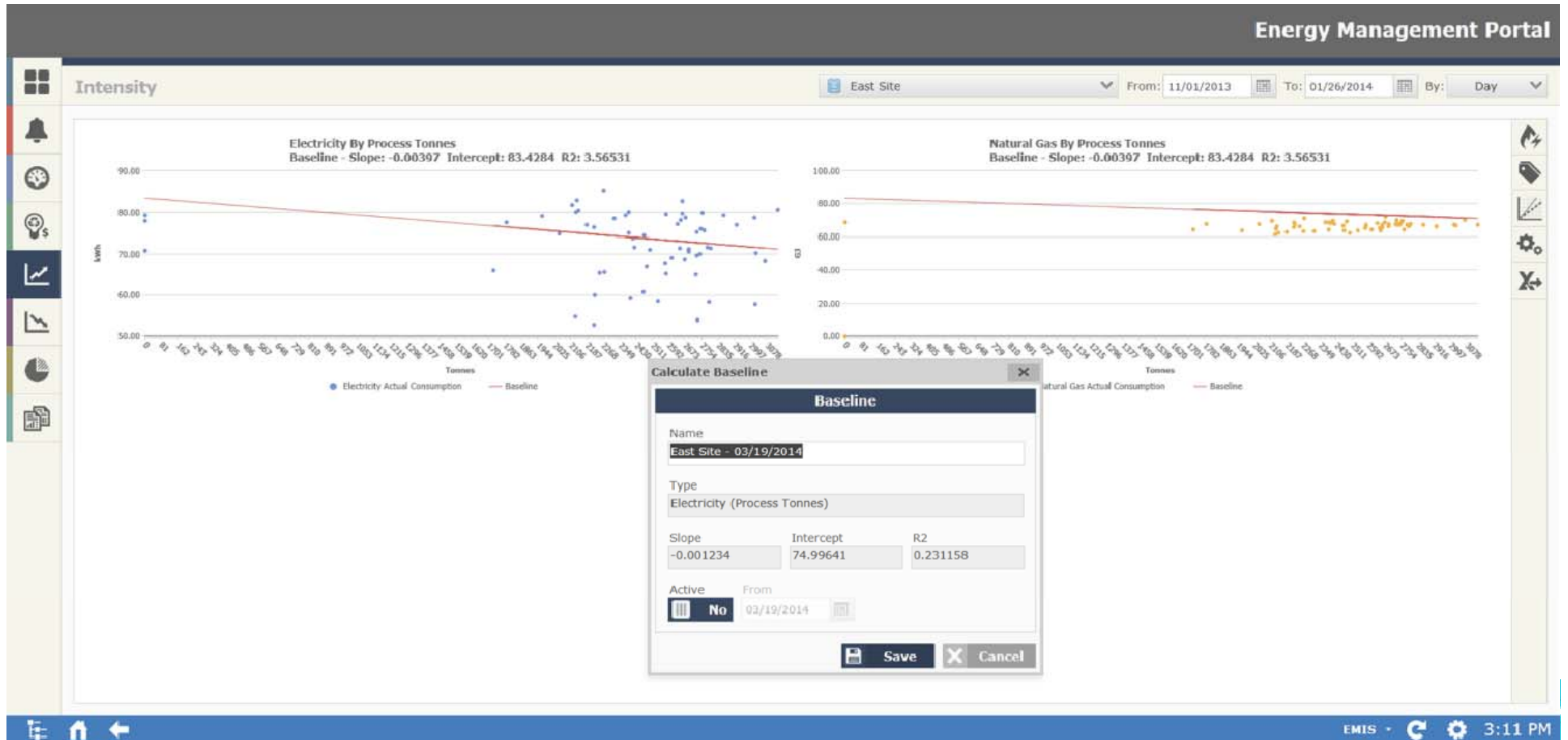
Energy Consumption



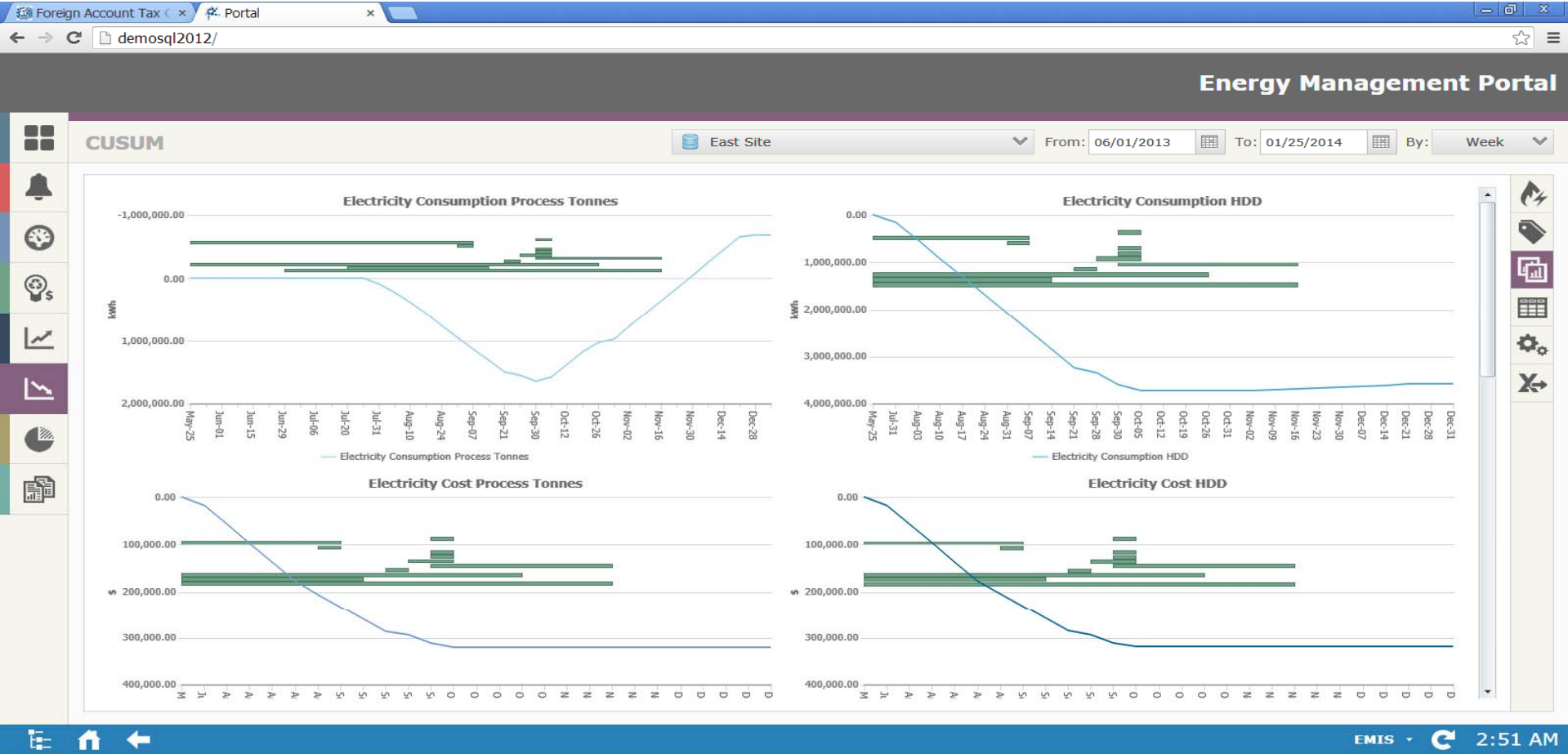
Energy Conservation Measure



Energy Intensity and Baseline Calculation



CUSUM Analysis



Wrap Up

Cost Effective EMIS Development

- Audit
- Options analysis
- Stage gate review following planning
- EAC definition
- Meter placements
- Meter selection
- Architecture
- Functional Requirements definition geared to need

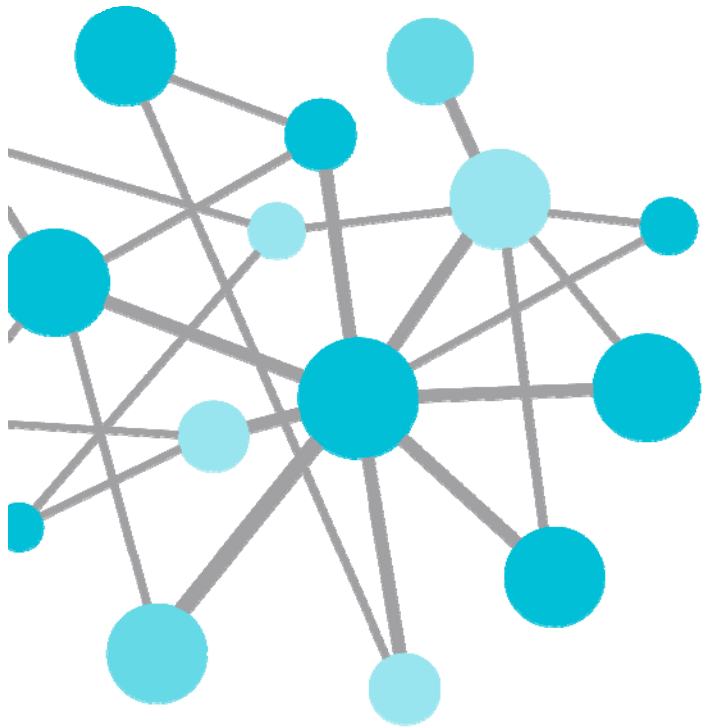
Funding

Ontario Power Authority Industrial Accelerator Program

- Audit financed
- Horizon Utilities
80% up to \$75,000
- Union Gas
50% up to \$100,000

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