Digital transformation of Oil & Gas and asset performance management

May 2, 2017

Digital transformation of industries and asset performance

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CAUTION CONCERNING FORWARD-LOOKING STATEMENTS:
This document contains "forward-looking statements" – that is, statements related to future events that by their nature address matters that are, to different degrees, uncertain. For details on the uncertainties that may cause our actual future results to be materially different than those expressed in our forward-looking statements, see http://www.ge.com/investor-relations/disclaimer-caution-concerning-forwardlooking-statements as well as our annual reports on Form 10-K and quarterly reports on Form 10-Q. We do not undertake to update our forward-looking statements. This document also includes certain forward-looking projected financial information that is based on current estimates and forecasts. Actual results could differ materially. to total risk-weighted assets.]

NON-GAAP FINANCIAL MEASURES:
In this document, we sometimes use information derived from consolidated financial data but not presented in our financial statements prepared in accordance with U.S. generally accepted accounting principles (GAAP). Certain of these data are considered “non-GAAP financial measures” under the U.S. Securities and Exchange Commission rules. These non-GAAP financial measures supplement our GAAP disclosures and should not be considered an alternative to the GAAP measure. The reasons we use these non-GAAP financial measures and the reconciliations to their most directly comparable GAAP financial measures are posted to the investor relations section of our website at www.ge.com. [We use non-GAAP financial measures including the following:

- Operating earnings and EPS, which is earnings from continuing operations excluding non-service-related pension costs of our principal pension plans.
- GE Industrial operating & Verticals earnings and EPS, which is operating earnings of our industrial businesses and the GE Capital businesses that we expect to retain.
- GE Industrial & Verticals revenues, which is revenue of our industrial businesses and the GE Capital businesses that we expect to retain.
- Industrial segment organic revenue, which is the sum of revenue from all of our industrial segments less the effects of acquisitions/dispositions and currency exchange.
- Industrial segment organic operating profit, which is the sum of segment profit from all of our industrial segments less the effects of acquisitions/dispositions and currency exchange.
- Industrial cash flows from operating activities (Industrial CFOA), which is GE’s cash flow from operating activities excluding dividends received from GE Capital.
- Capital ending net investment (ENI), excluding liquidity, which is a measure we use to measure the size of our Capital segment.
- GE Capital Tier 1 Common ratio estimate is a ratio of equity

World Economic Forum

350 million tonnes of CO2e* emissions reduced

$745B Value Digital Asset LCM

Beyond the Barrel

Integrated Customer Services

$945B

Industry Value

$637B

Societal Impact

$170B

Cost Savings for Customers

* Estimated numbers.
Source: Accenture research for the Digital Transformation of Industries Project

Software Is Impacting Every Industry

airbnb

$20BN

Hotel Service

The world's largest accommodation provider that owns no real-estate

$18BN

Consumer App Economy

The world's largest consumer hardware company only creates a few apps

$50BN

Taxi Service

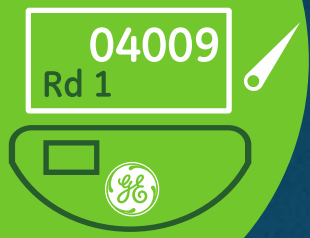
The world's largest taxi company that owns no vehicles

AIRBNB™, APPLE™, and UBER™ and their respective logos are trademarks of their respective owners. * Estimated numbers. Source: Accenture research for the Digital Transformation of Industries Project

Digital Industrial In Full Force

Installed base of Smart Meters to grow

+1B by 2020



By 2020 over

100M

internet connected light bulbs

Cars connected to Internet grow six fold by 2020

152M

by 2020

10^6 Terabytes

a day generated by GE Machines

Enabled Via Digitally Connected Asset Ecosystems

What Does It Mean To Be Digital Industrial?

“Digital DNA” Required	
Customer Ecosystems	We need to lead the change … both from the bottom & the top
New Business Models	
Fast + Agile	Our employees want a digital company …
Deep Digital Talent	Digital is not a function, it’s something everyone has to do
Partners + Ecosystems	

Immersive + Pervasive…Enabling the digital thread

Transforming Industrial Operations

Asset Performance Management

Maximize performance and asset availability

Operations Optimization

Increase system efficiency across operations

Digital Twin/ Digital Thread

Optimize lifecycle of design, manufacturing, service, & repair cycles

Creating New Value

1. Improved operational performance and efficiency
2. New customer services and business models
3. Continuous innovation and faster time to market

Powerful Apps on a Powerful Platform

Business Optimization

Operations Optimization

Asset Performance

Better, faster decisions

Deeper insights

Real-time actions

Outcomes

Greater Profitability

Greater Productivity

Greater Reliability

Cyber Security

Advanced Controls

Accessibility

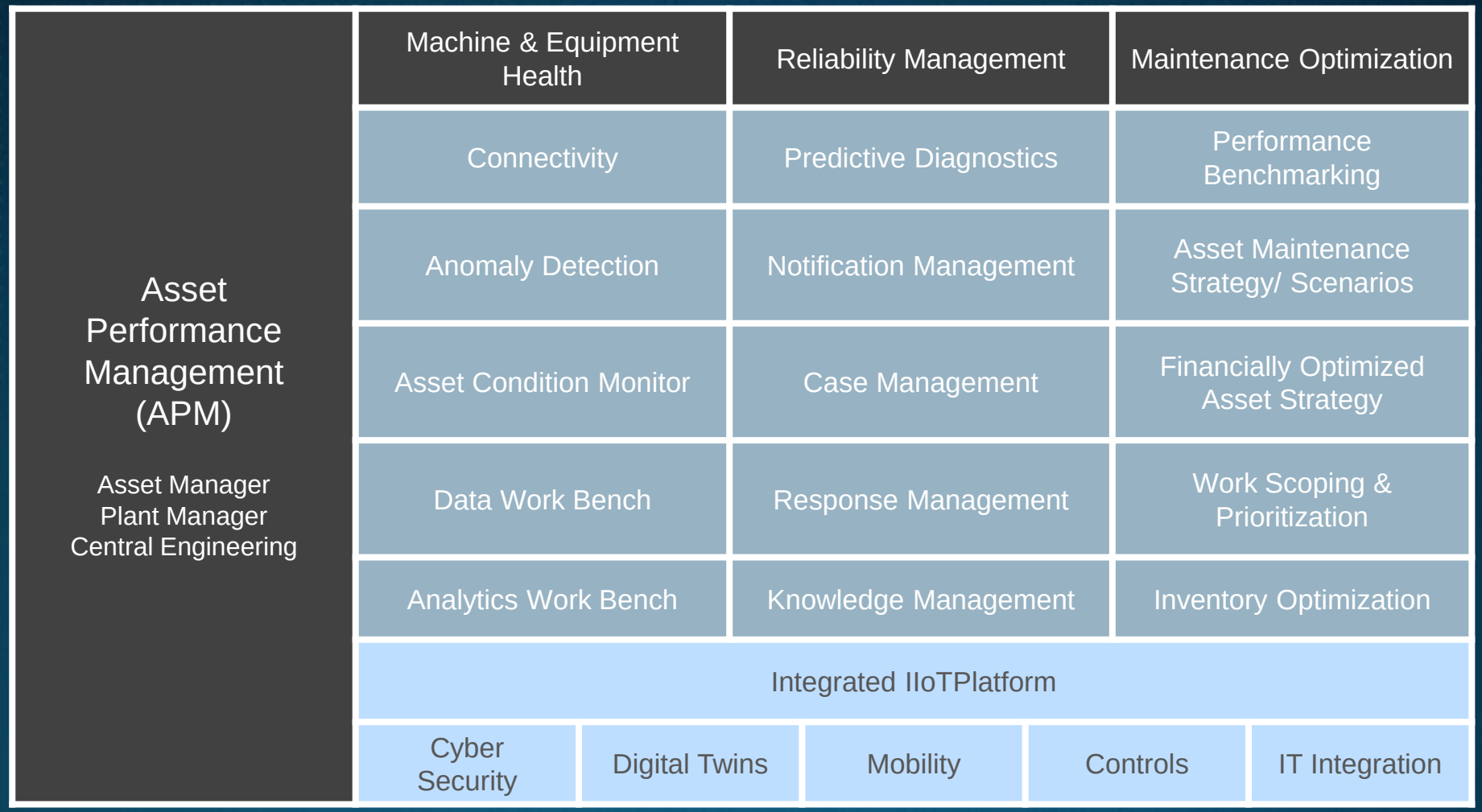
Scalability

IIoT Platform

Ecosystem

Custom Apps

Asset Performance Management (APM)



How is GE leading this in the gas compression space?

GE’s Digital Industrial Journey




OIL & GAS

- Maximize Production
- Predictive Maintenance
- Remote Collaboration
- Reduced Risk
- Environmental Control

POWER GENERATION

- Maximize Production
- Longer Repair Intervals
- Reduce Emissions
- Predictive Maintenance
- Longer Asset Life

POWER DISTRIBUTION

- Revenue Protection
- Meter Health
- Power Quality
- Load Forecasting
- Predictive Maintenance

WIND

- Maximize Farm Power
- Wind Wake Protection
- Outage Detection
- Continuous Operation

WATER

- Operational Integrity
- Minimize Water Use
- Control Emissions
- Minimize Cost

AVIATION

- Maximize Fuel Use
- Risk Management
- Predictive Maintenance
- Efficient Operations
- Customer Satisfaction

RAIL

- Maximize Fuel Use
- Enhanced Operation
- Network Velocity
- Predictive Maintenance
- Supplier Collaboration

HEALTHCARE

- Patient Experience
- Improved Hand Hygiene
- Cost Reduction
- Efficient Operations
- Regulatory Compliance

MANUFACTURING

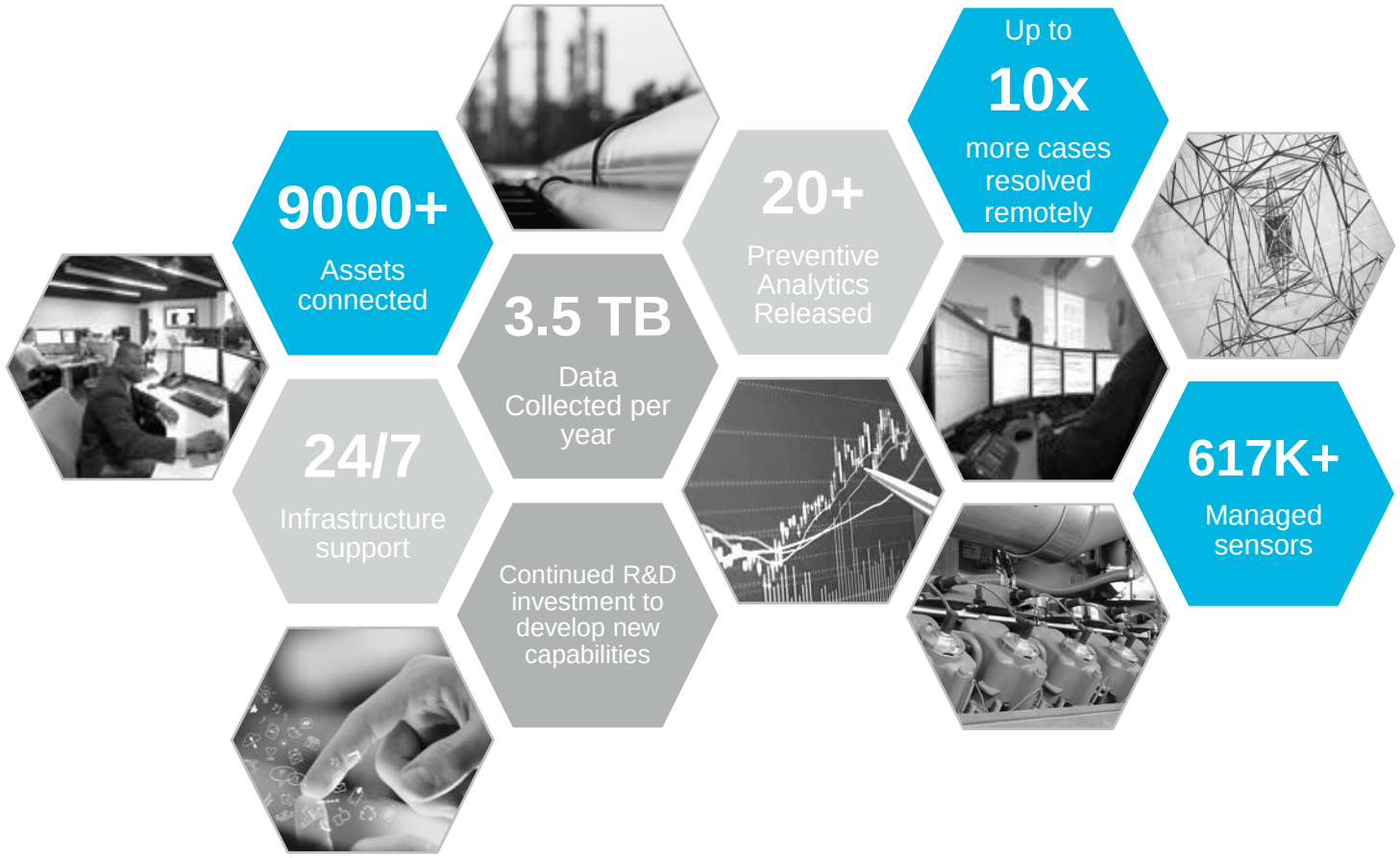
- Cost Reduction
- Consumer Protection
- Efficient Operations
- Regulatory Compliance
- Predictive Maintenance

MINING

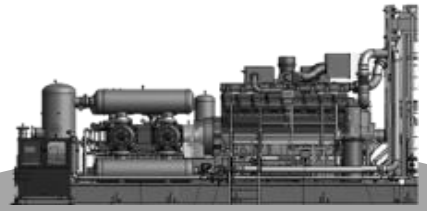
- Maximize Production
- Efficient Operations
- Safe Operations
- Predictive Maintenance

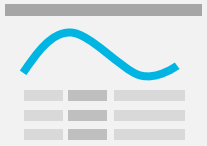
Delivering customer value through **APM**

- **Reduced Maintenance Costs**… trip reduction via remote access, early issue detection and condition-based maintenance
- **Increased Reliability**… faster return to service and lower unplanned downtime
- **Lower Operating Costs**... centralized fleet-level access to data, mobility and automated reporting



Customer Service Value Chain **Transformation**

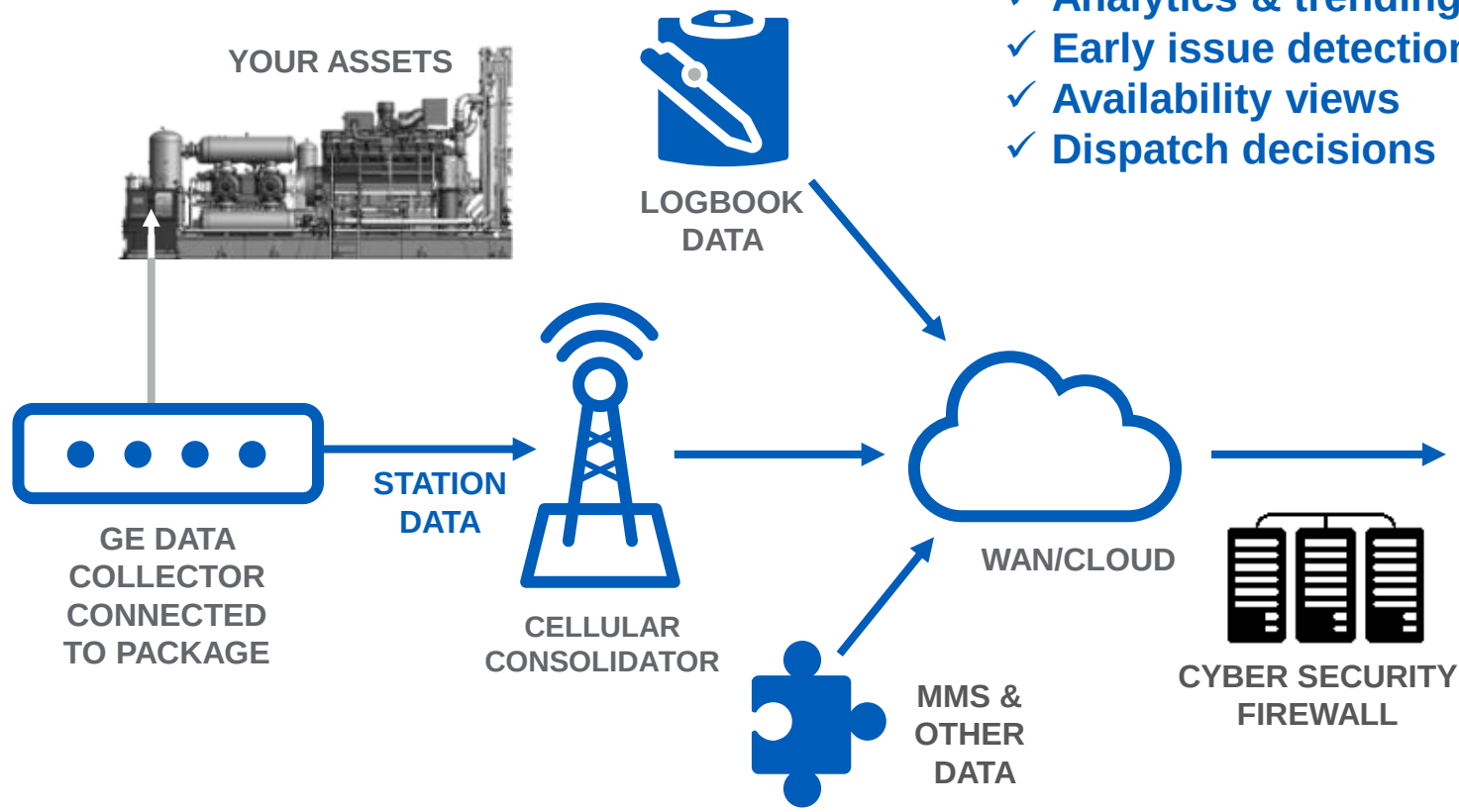


Issue Detection		Personnel	Tools		Reporting
Proactive	**Reactive**		**Maintenance**	**Troubleshooting**	
					
	Call Service Provider		Traditional Tools	Traditional Sources	Manual Data Gathering
Today					
					
Predictive Analytics	Instant Access to Data + Notifications	Advanced Mobile App	Remote e-Help	Diagnostic Workbench	Automated Reporting & Dashboards

Implementation

Deploying an asset performance management system

- ✓ Real time unit updates
- ✓ Analytics & trending
- ✓ Early issue detection
- ✓ Availability views
- ✓ Dispatch decisions

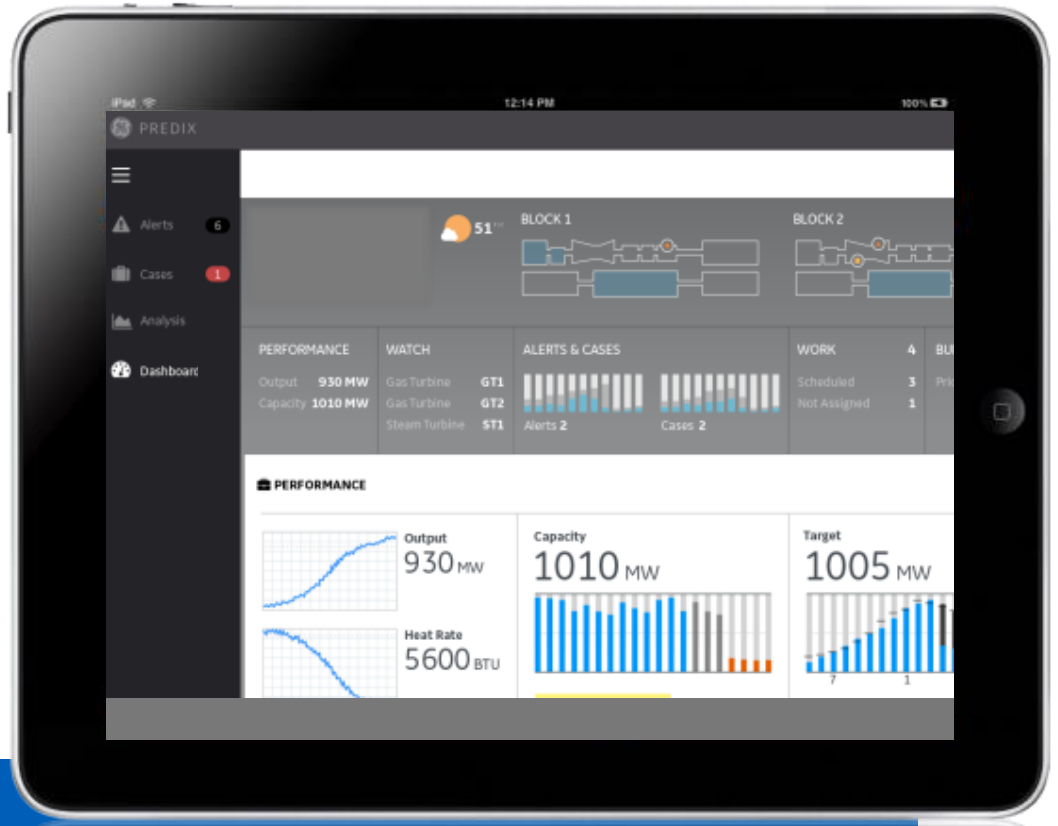


SOFTWARE ANALYTICS & WEB/MOBILE ACCESS

Step 1. Data consolidation & asset visibility

- Stream package data
- Disposition downtime (e.g. planned vs unplanned)
- Transition from uptime to availability management
- Enable onsite/mobile field automation tools (iPad)

up to **1-2%**
INCREASED AVAILABILITY



Making decisions… simpler & faster

Step 2. Scheduled maintenance optimization

- Implement case management
- Integrate real-time notification services
- Advanced decision-making for capital expenses (pocket automation, piston mods, compressor bore changes, etc)
- Improved alignment and potential extension of PM intervals of plant assets

up to **2-3%** LOWER OPERATING COSTS + **2-3%** INCREASED AVAILABILITY

Making decisions in new ways to enable greater productivity

Step 3. Unplanned downtime reduction

- Case management system
- Continuous improvement processing
- Monitoring and diagnostics tooling and services
- Unscheduled/forced-outage downtime & callouts reduced through predictive analytics
- Active emissions optimization

up to **3-5%** LOWER OPERATING COSTS + **1-2%** INCREASED AVAILABILITY

Minimize production loss

Prevent additional maintenance cycles

The most advanced decision making… turning unplanned into planned

Customer value, case studies and analytics

Business Case in Gathering & Processing

Value drivers: Productivity + maintenance cost ↓ + vol. flow ↑

Field Operator Productivity	Maintenance cost reduction	Volumetric Flow increase
Value prop: Remote asset visibility	**Value prop: Maintenance extension analytic**	**Value prop: Flow optimization analytic**
• Avg FO site visits/day: 10 – 20 • Avg. visits/site: 1 per day • Avg. distance btn sites: 15 miles • Avg. # pkgs/site: 4 • Avg. work-hours/day: 10 hrs • Avg. FO rate: $80/hr	• Avg maint. cost/engine: $90/hp/yr * • Avg. engine hp: 900hp • Avg. maint. cost/engine: $81k/yr • Compressor maint. Cost: $27k/yr (1/3rd) * • Total maint. Cost: $108k/pkg/yr	• Avg. engine hp: 900 • Industry metric: 110hp/mmscfd * • Customer margin: $ 0.2/mmbtu • Total margin/engine: $ 500k/yr
• **Outcome: 1 site visit/week**	• **Outcome: 10% ↓ in maint. cost**	• **Outcome: 10% ↑ in flow**
• **Savings: $2.8k/pkg/yr**	• **Savings: $10.8k/pkg/yr**	• **Addn. margin: $50k/pkg/yr**

Potential customer margin ↑ per package: $ 63.6k

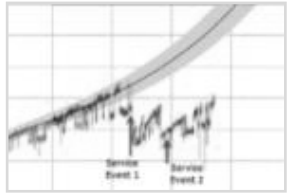
Note: This is an illustrative example of potential value drivers and benefits

* Source: Spears & Associates, Inc.

Increasing Customer Value with Analytics…

Detect

Sticking valves



Remaining life on spark plug

Diagnose

Head inspected & changed

APM system checks comparables

Predict

Repaired during PM

PM intervals optimized

Outcomes

Power Generation

+1% Engine Availability

up to **$30K** Annual Revenues / Engine[1]

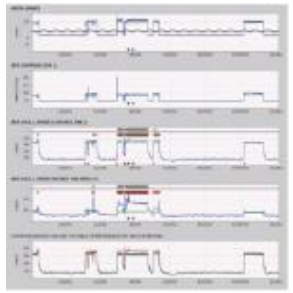
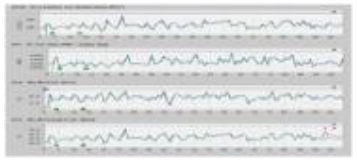
Gas Compression

-8h Unplanned Downtime

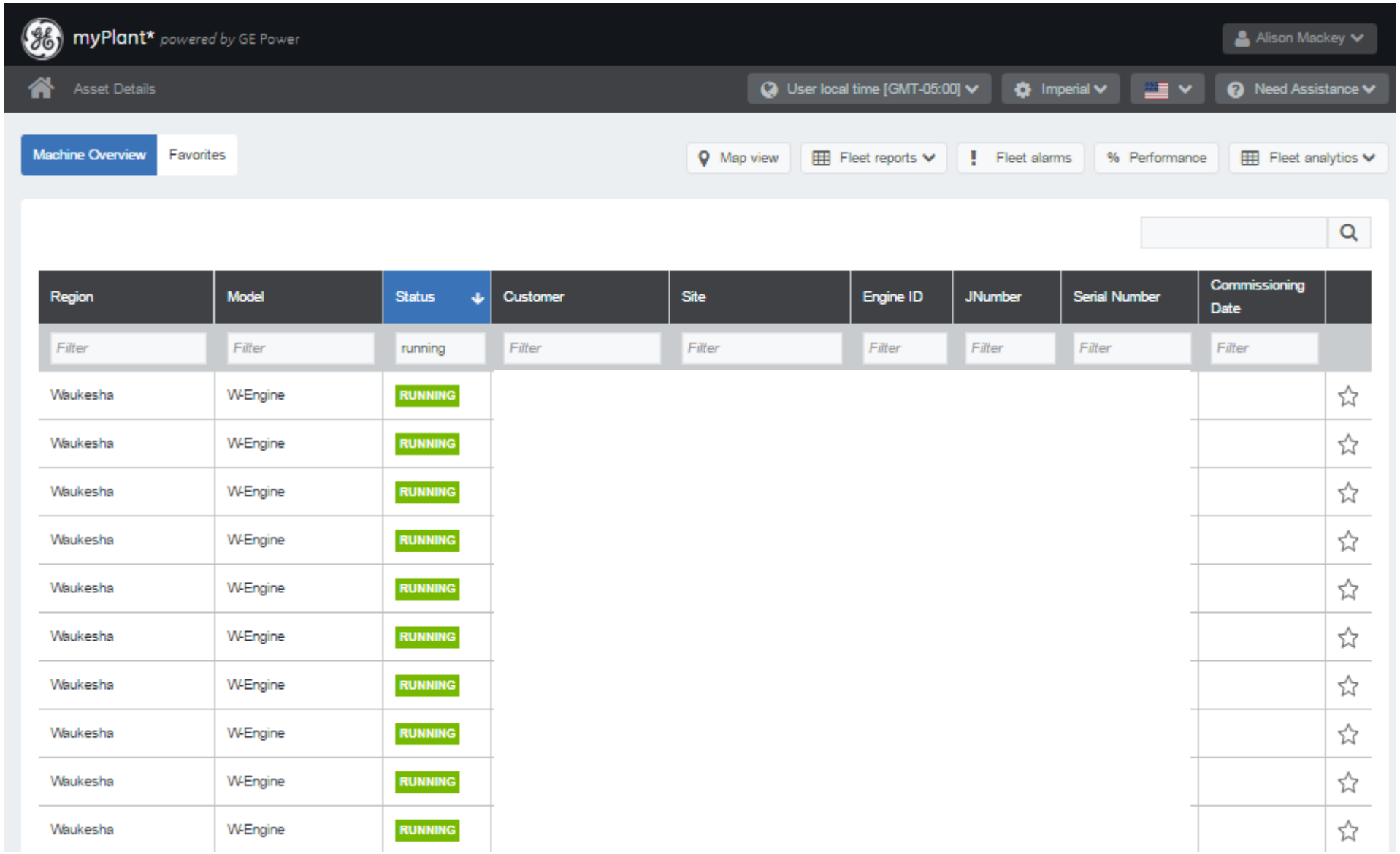
up to **$400K** Annual Revenues / Engine[2]

[1] – Jenbacher Engine: Analytic based on exhaust gas temp. worst case piston failure scenario, 4 days to repair, excl. collateral damage
[2] – Waukesha Engine: Analytic based on ignition voltage, highly utilized gas compression unit, $50K/hour revenue generated

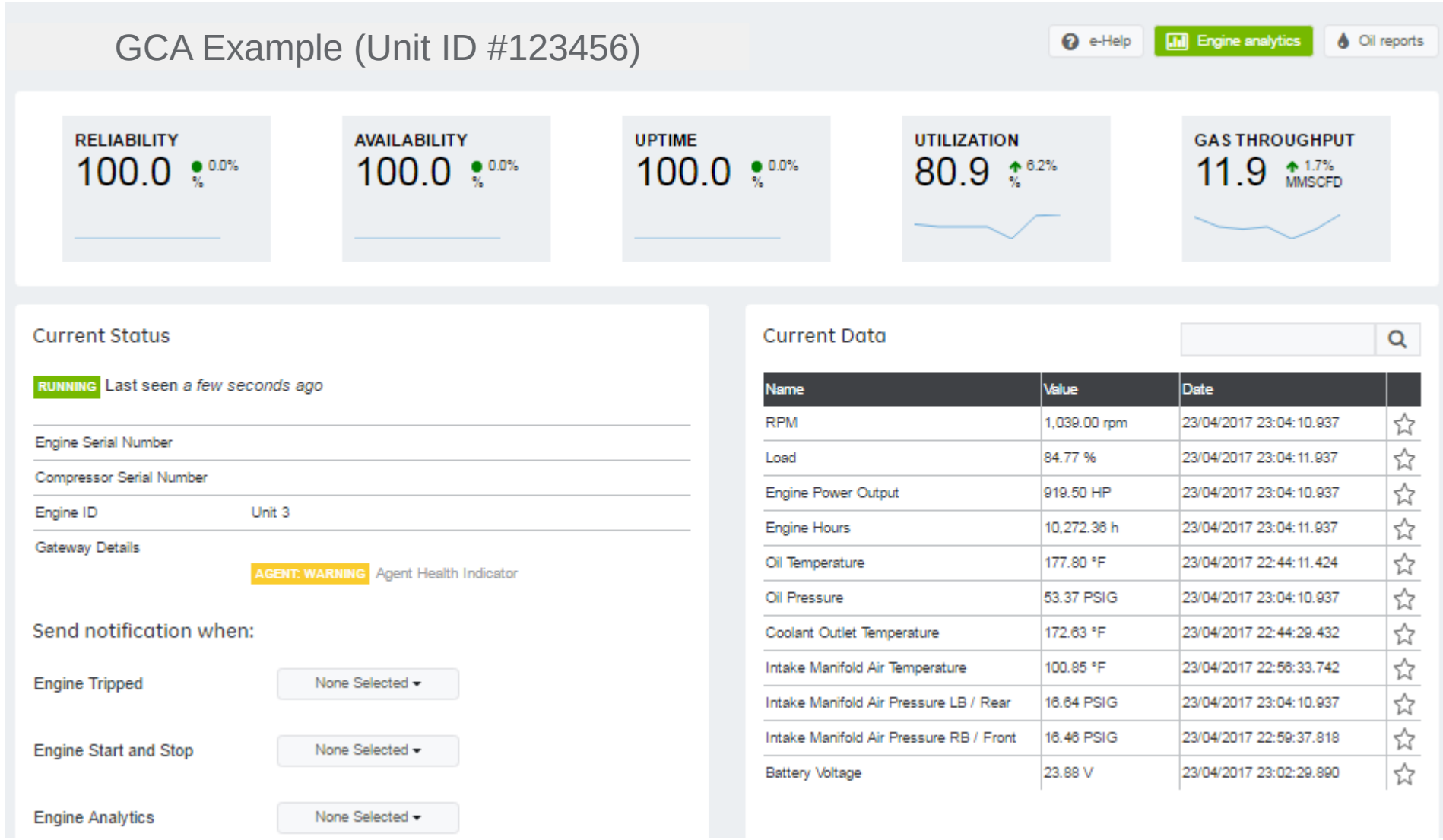
Increasing Customer Value with Analytics…

Detect	Diagnose	Predict	Outcomes
 *Recip compressor cylinder 4 disch. temperature ↑*	Cylinder 4 valves were faulty and needed to be replaced.	Customers Replaced valves during PM	up to **$47K** Savings
 *Increase in outer ring fuel flow on a gas turbine at an O&G pipeline*	New fuel metering valve had not been remapped and was still using the old valve's mapping.	Identification of the source of wasted fuel minimized operational cost	up to **$20K** Savings

Dashboard View



Asset Detail View

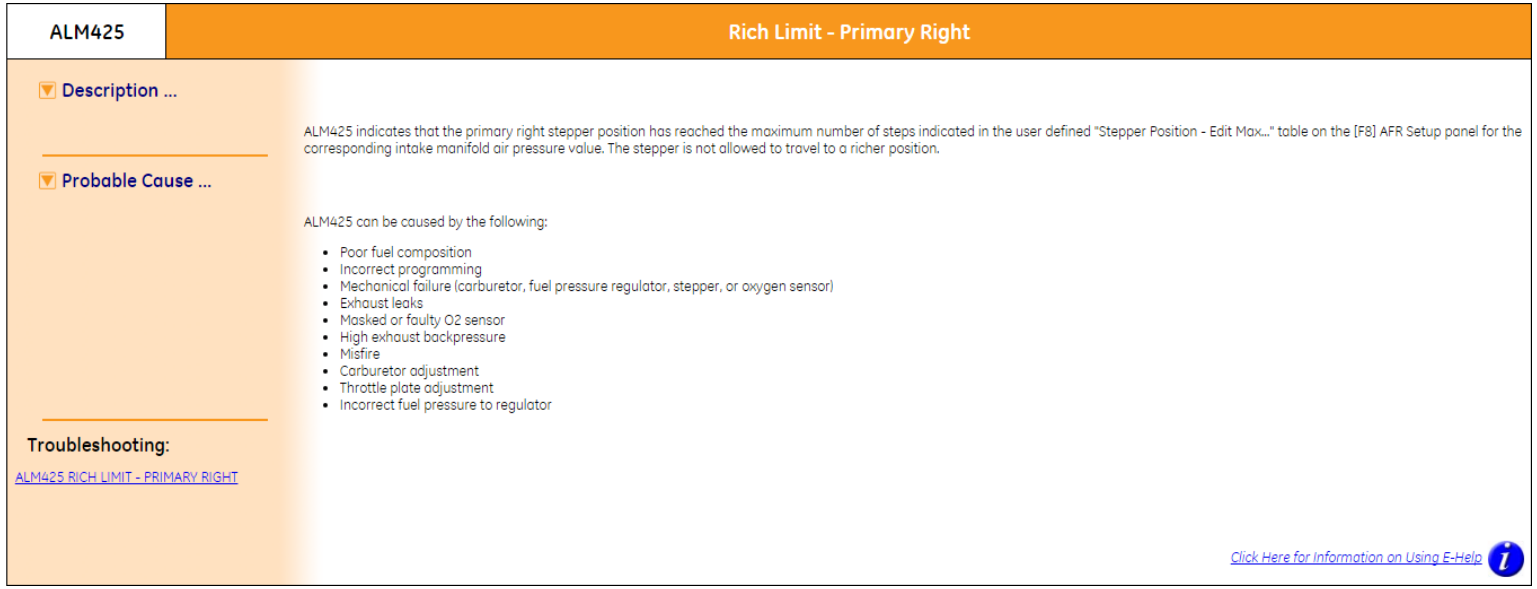


Alarm View & eHelp

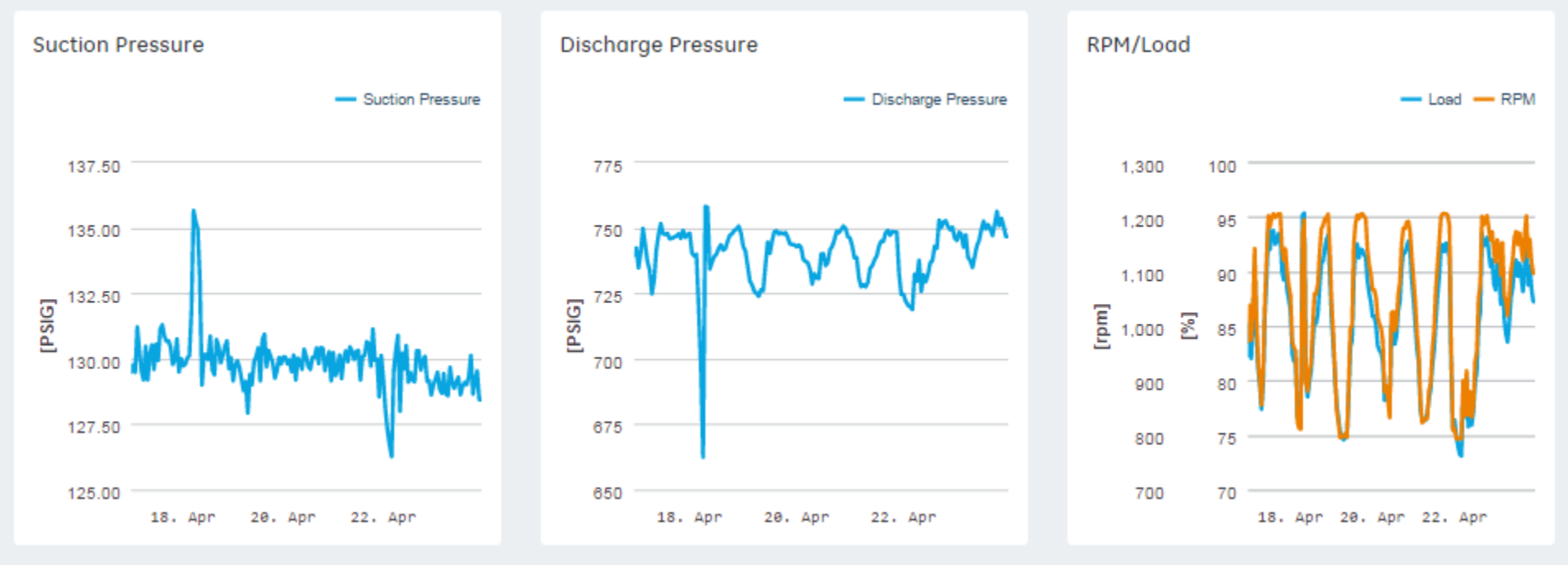
Recent Alarms

Severity	Code (e-Help)	Description	Timestamp
WARNING	ALM-425	Rich Limit - Primary Right	18/04/2017 08:59:01.822
WARNING	ALM-343	Left Bank Oxygen Sensor	18/04/2017 08:58:01.791
WARNING	ALM-345	Right Bank Oxygen Sensor	18/04/2017 08:58:01.791
TRIP	ESD-222	Customer Emergency Shutdown	15/04/2017 00:38:31.202
TRIP	ESD-222	Customer Emergency Shutdown	15/04/2017 00:09:09.373
TRIP	ESD-222	Customer Emergency Shutdown	13/04/2017 21:53:07.390
TRIP	ESD-222	Customer Emergency Shutdown	13/04/2017 21:40:03.017
TRIP	ESD-222	Customer Emergency Shutdown	13/04/2017 21:34:57.873
TRIP	ESD-222	Customer Emergency Shutdown	13/04/2017 21:27:27.692
TRIP	ESD-222	Customer Emergency Shutdown	11/04/2017 13:20:11.256

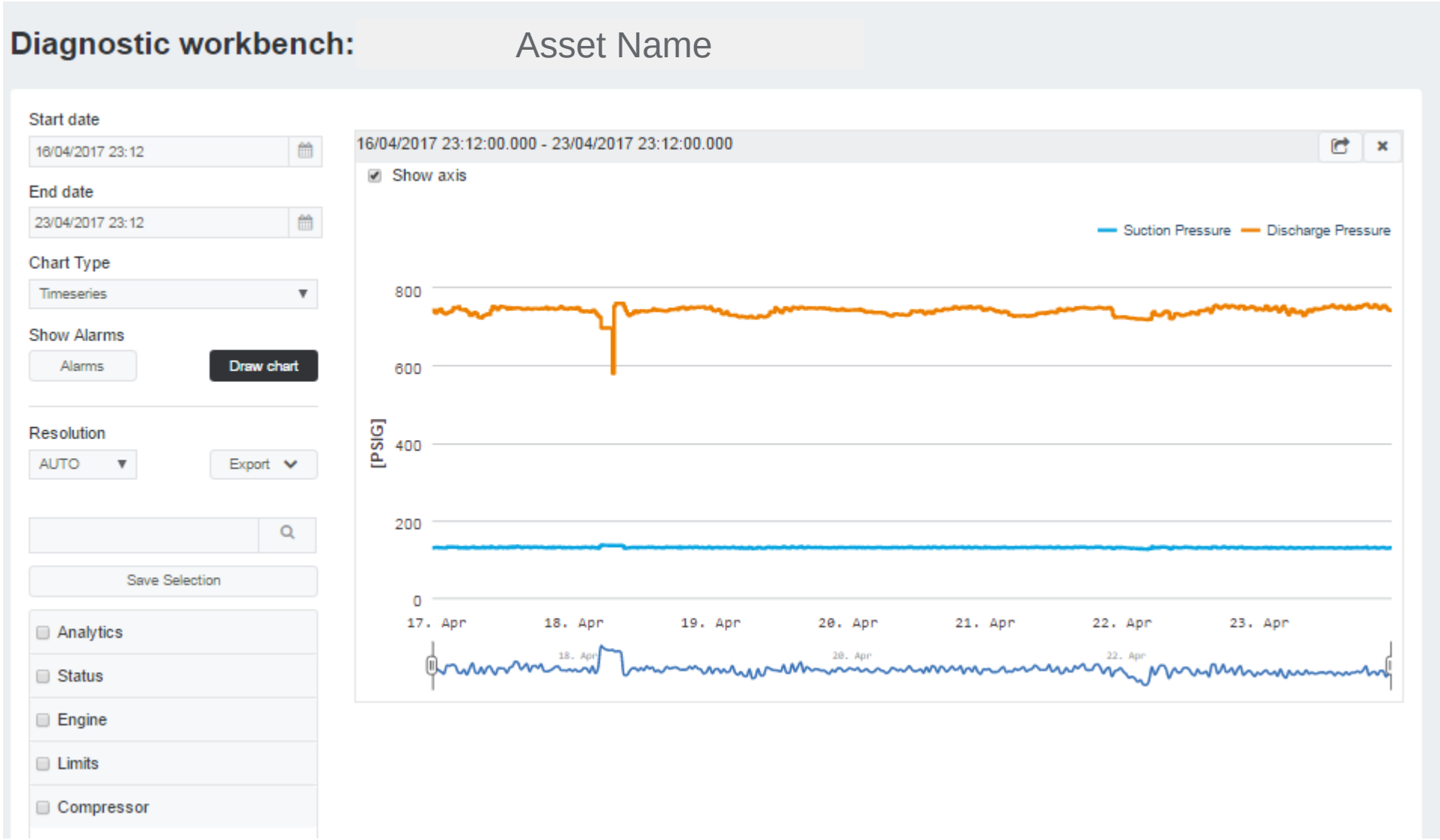
Show more alarms



Graph View



Diagnostic Workbench View



Imagination at work