Metasys® Enterprise Optimization (MEO)

Assets • Energy • Operations

Raymond Kang
Building Technologies
Integrated Solutions



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Market needs – what we are hearing from our customers

- Performance visibility across systems, buildings, and real estate portfolios
- Managed uptime and availability of key facility assets supporting the organization's mission
- Reduced energy cost, consumption, and related carbon footprint
- Streamlined service and maintenance efficiencies – doing more with less
- Simplified reporting and compliance



"Make it simple."

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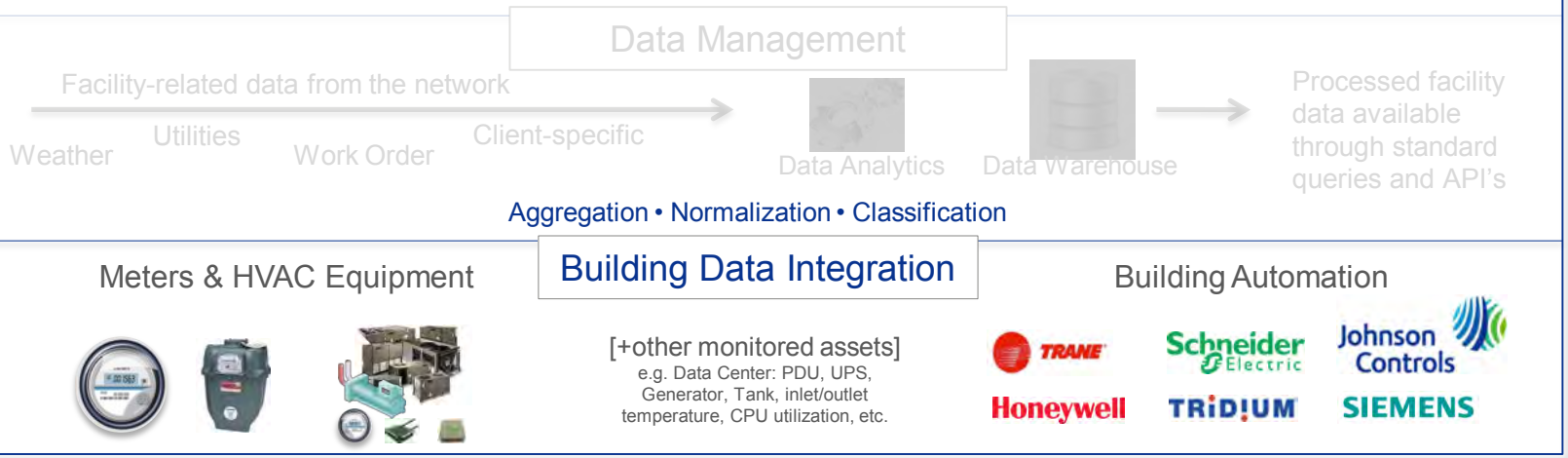
Metasys Enterprise Optimization – how it works

- **Building Data Integration**
  - Data is collected from meters, HVAC equipment, building management systems, and other sources with sample rates ranging from 1 minute intervals to on-demand (common sample rate is 15 minute intervals)
  - Data sources are not limited to Johnson Controls products -- thousands of products are supported from many venders
  - Integration Engine software is used to aggregate the data into a single source of truth
  - Data is normalized to remove any vendor-specific conventions
  - Data is classified to common groupings (e.g. AHU's, meters, etc.) to facilitate mapping to applications
  - The resulting processed data is delivered to the next layer in the open architecture – Data Management



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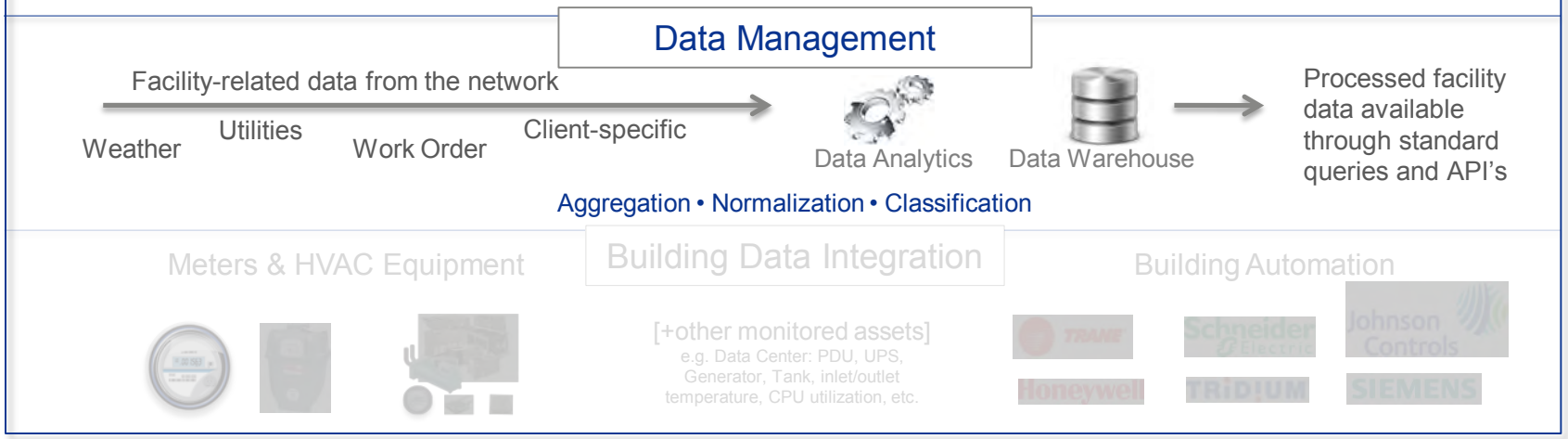
Metasys Enterprise Optimization – how it works

- **Data Management**
  - Time series building performance data is combined with other data sources available on the client's network, such as weather data, forecasts, utility data, work orders, and anything else that might be helpful or needed
  - The resulting combined data is processed through data analytic algorithms and stored in a data warehouse – either in a shared remote server, or as directed by the client
  - The stored data is then available through standard queries and application programmer interfaces for use by the client, or third parties at the client's direction
  - Building data integration and data management can be core components of the Johnson Controls Building-Wide Systems Integration (BWSI) offering where additional systems and networks are applied



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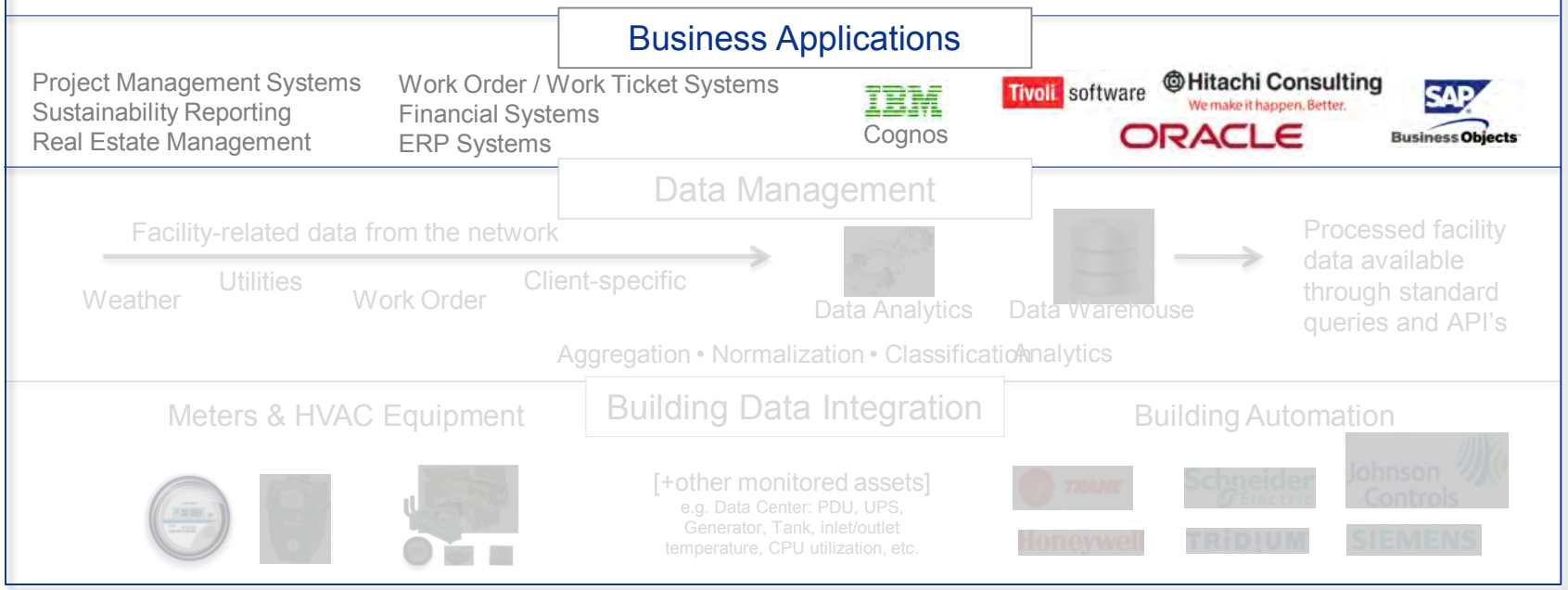
Metasys Enterprise Optimization – how it works

- **Business Applications**
  - Sometimes, building performance data can be helpful to other applications already being used by the client. For example, energy data can be helpful in financial reports between utility billing cycles, or to provide cost allocation inside the client's organization. It can also be used to report on the facility-related energy or carbon footprint per occupant or piece part off manufacturing line.
  - Johnson Controls does not need to get involved with this layer of the architecture for many of these uses cases as the client has more knowledge and experience with their needs and existing business applications.



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Metasys Enterprise Optimization – how it works

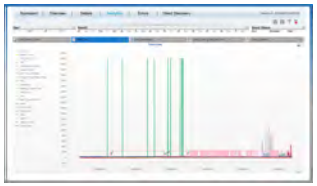
Metasys Enterprise Optimization Applications



GREEN KIOSK DASHBOARD



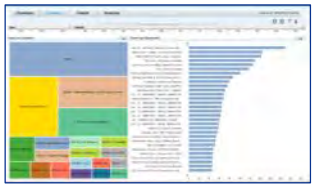
METER ANALYSIS TOOL



FAULT ANALYSIS TOOL



OPERATIONS DASHBOARD



WORK ORDER MANAGEMENT

Business Applications

Project Management Systems
Sustainability Reporting
Real Estate Management

Work Order / Work Ticket Systems
Financial Systems
ERP Systems

Cognos

Tivoli software

Hitachi Consulting

ORACLE

SAP Business Objects

- Metasys Enterprise Optimization Applications
  - These applications are authored by Johnson Controls to specifically target asset uptime and availability, energy management and related carbon footprint, and operations productivity.
  - The applications range from a public-facing kiosk, through ad hoc exploration and reporting, analytics, prioritization, and operations workflow management.
  - All the applications have access to the same data set and run on a common IT infrastructure

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Open IT architecture

Metasys Enterprise Optimization Applications


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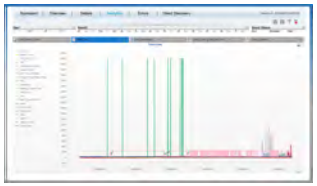
FAULT ANALYSIS TOOL


OPERATIONS DASHBOARD


WORK ORDER MANAGEMENT

Business Applications

Project Management Systems
Sustainability Reporting
Real Estate Management

Work Order / Work Ticket Systems
Financial Systems
ERP Systems

IBM Cognos
Tivoli software
Hitachi Consulting — We make it happen. Better.
ORACLE
SAP Business Objects

Data Management

Facility-related data from the network

Weather
Utilities
Work Order
Client-specific

Data Analytics
Data Warehouse

Processed facility data available through standard queries and API's

Aggregation • Normalization • Classification

Building Data Integration

Meters & HVAC Equipment



[+other monitored assets]
e.g. Data Center: PDU, UPS, Generator, Tank, inlet/outlet temperature, CPU utilization, etc.

Building Automation

TRANE
Schneider Electric
Johnson Controls
Honeywell
TRIDIUM
SIEMENS

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Metasys Enterprise Optimization applications build on the industry leading Metasys Building Automation System delivering advanced reporting, visualization and analytics

- Green Kiosk
- Meter Analysis Tool
- Fault Analysis Tool
- Operations Dashboard
- Work order Analysis Tool

G	Gather Data from BAS or business systems or equipment
N	Normalized collected data into common language
A	Analyzed data to make decision that impact outcomes
V	Visualized data in easy to understand dashboard

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Green Kiosk

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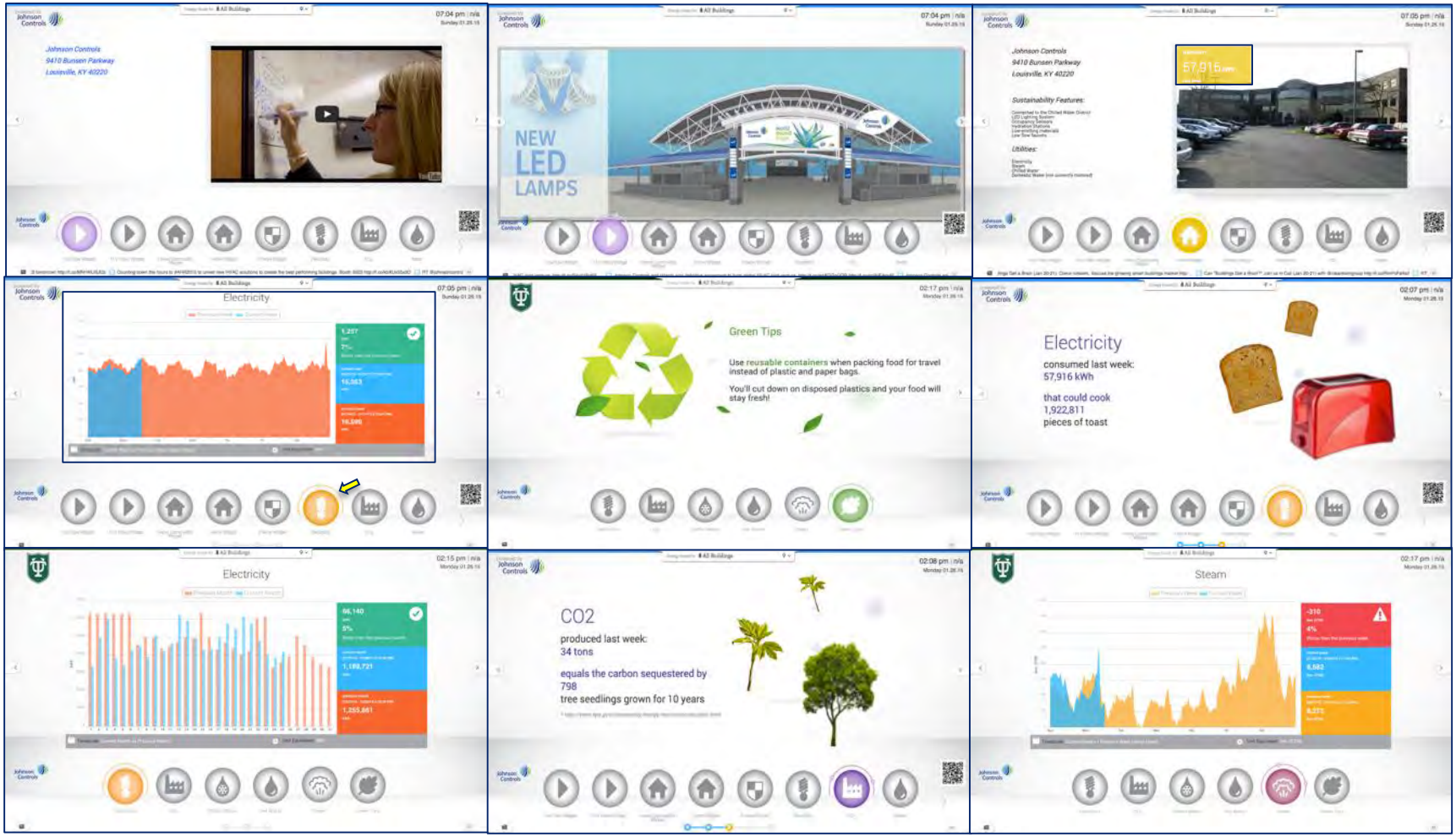
Green Kiosk Dashboard – Building performance - Simplified



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Meter Analysis Tool

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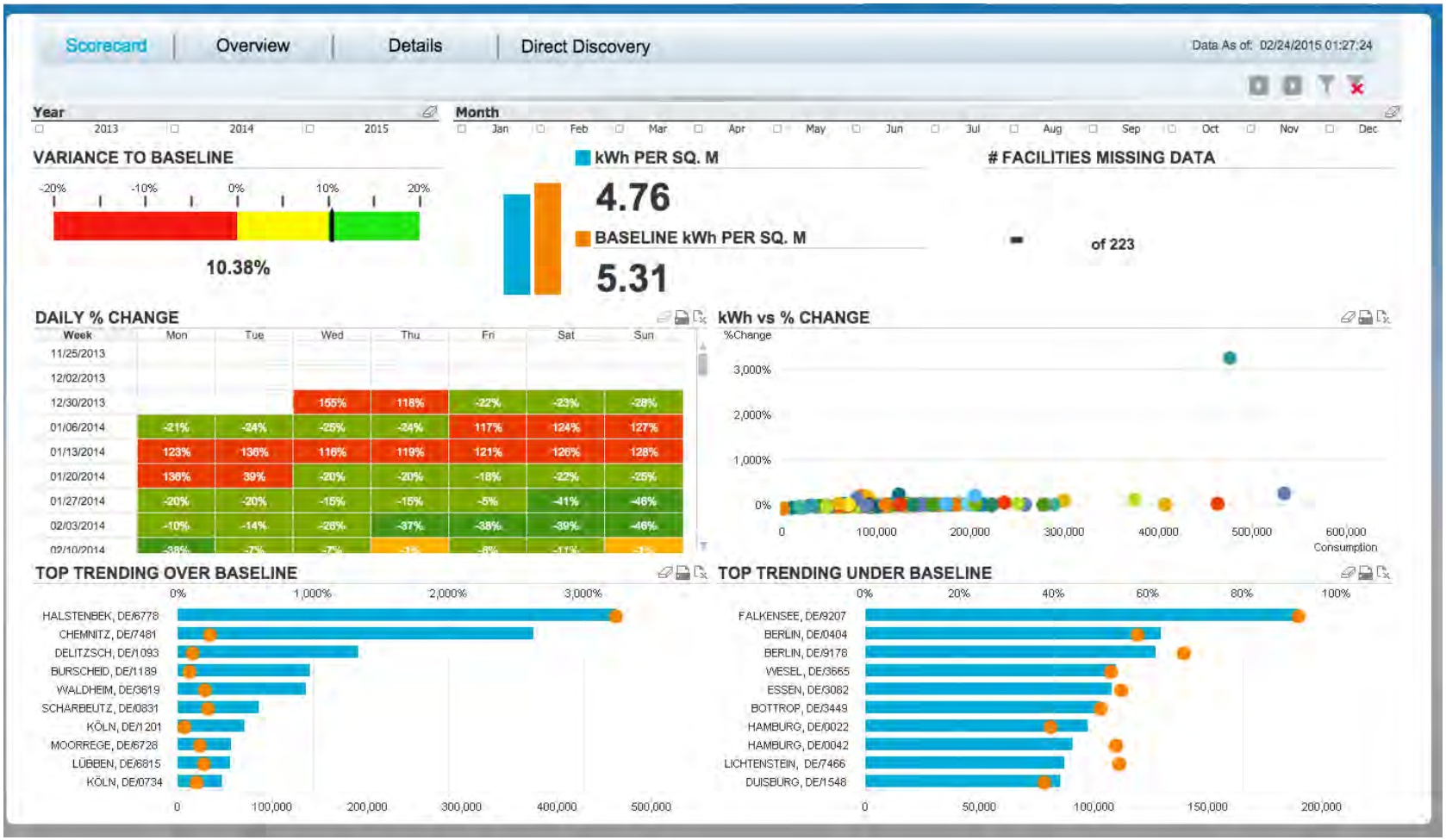
Meter Analysis Tool – What is my overall energy performance?



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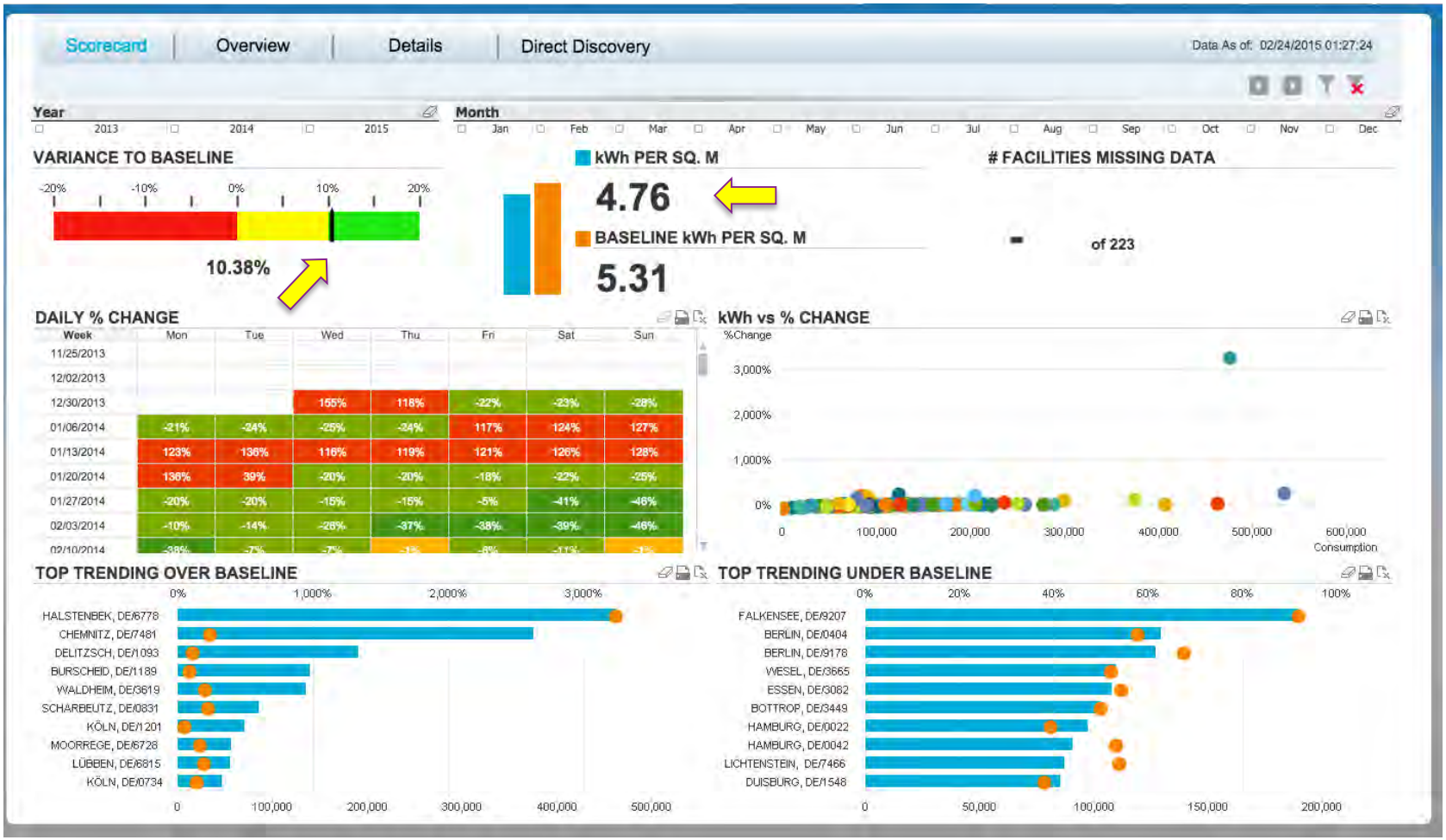

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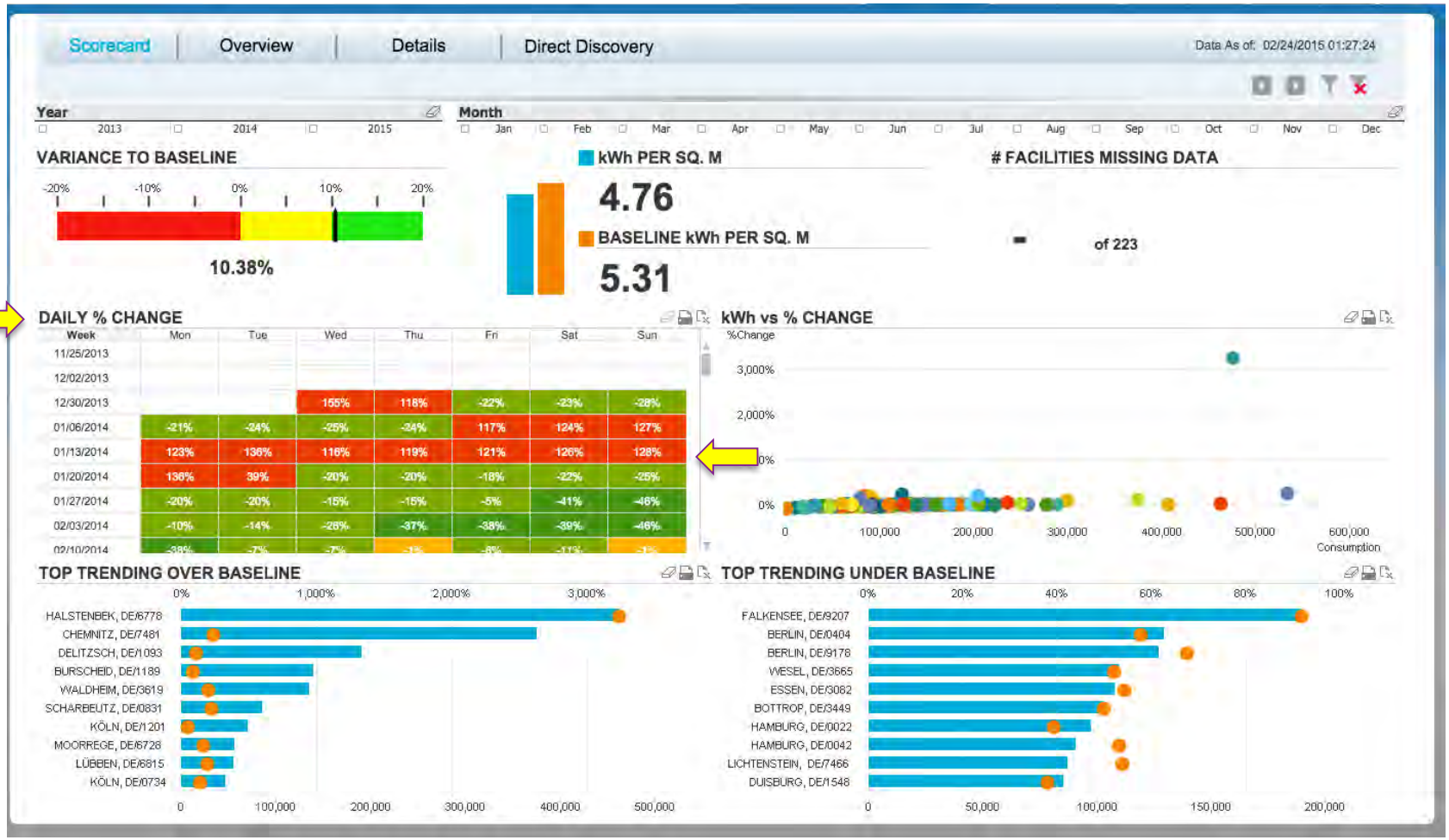
Meter Analysis Tool – How did the portfolio do this month?



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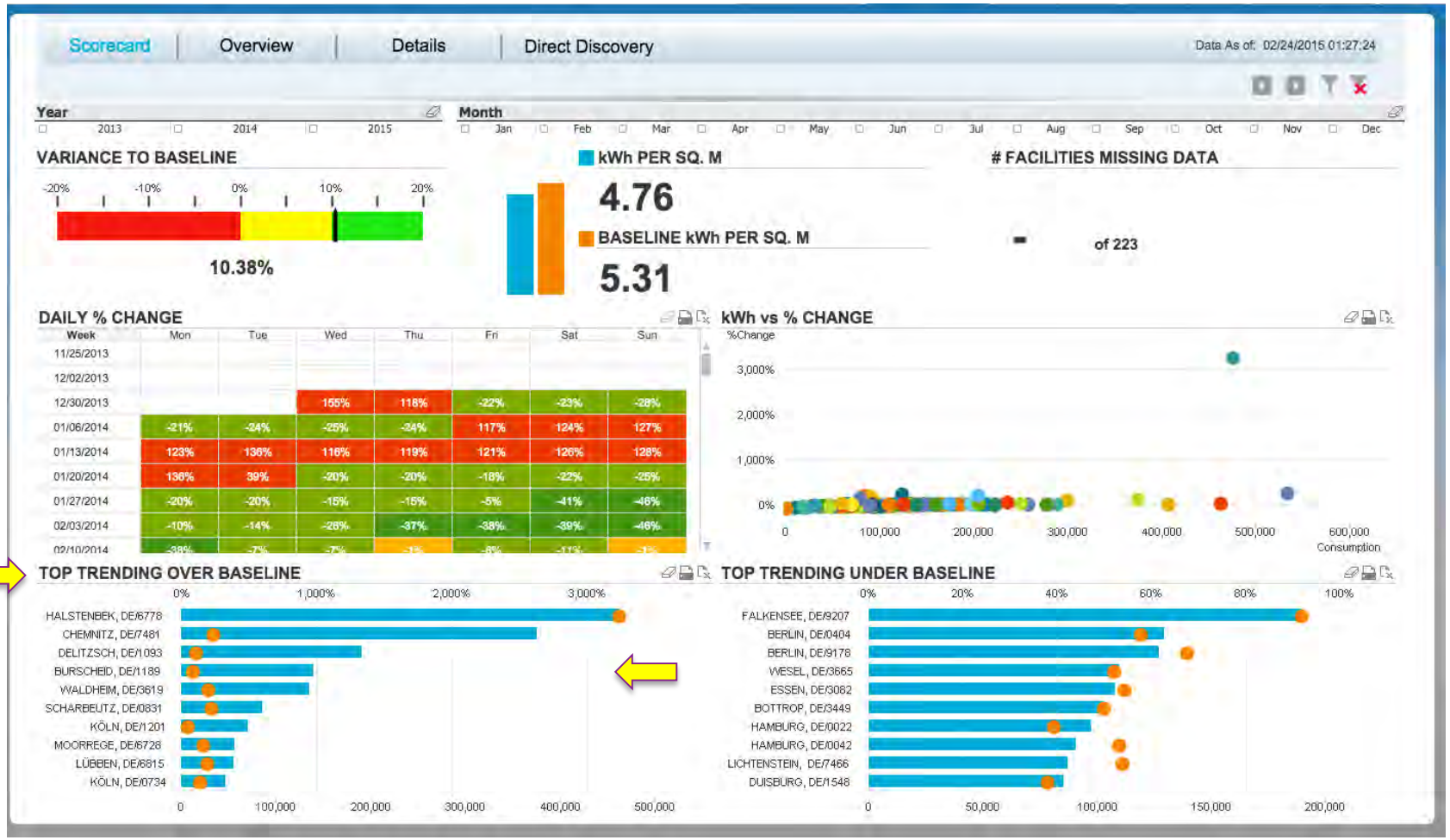
Meter Analysis Tool – What were my 10 worst performing facilities?



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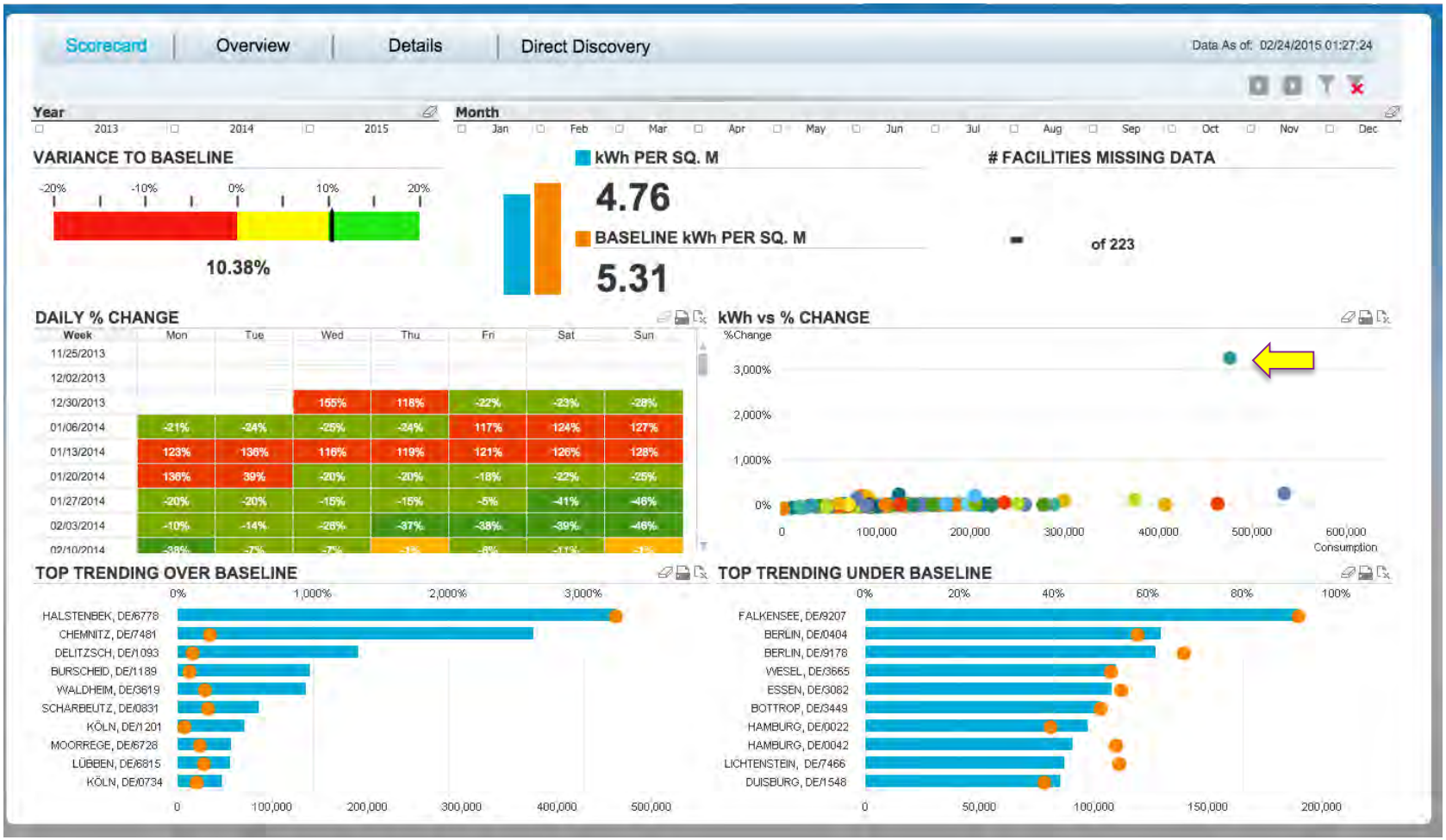
Meter Analysis Tool – Which facilities deviated from the rest?



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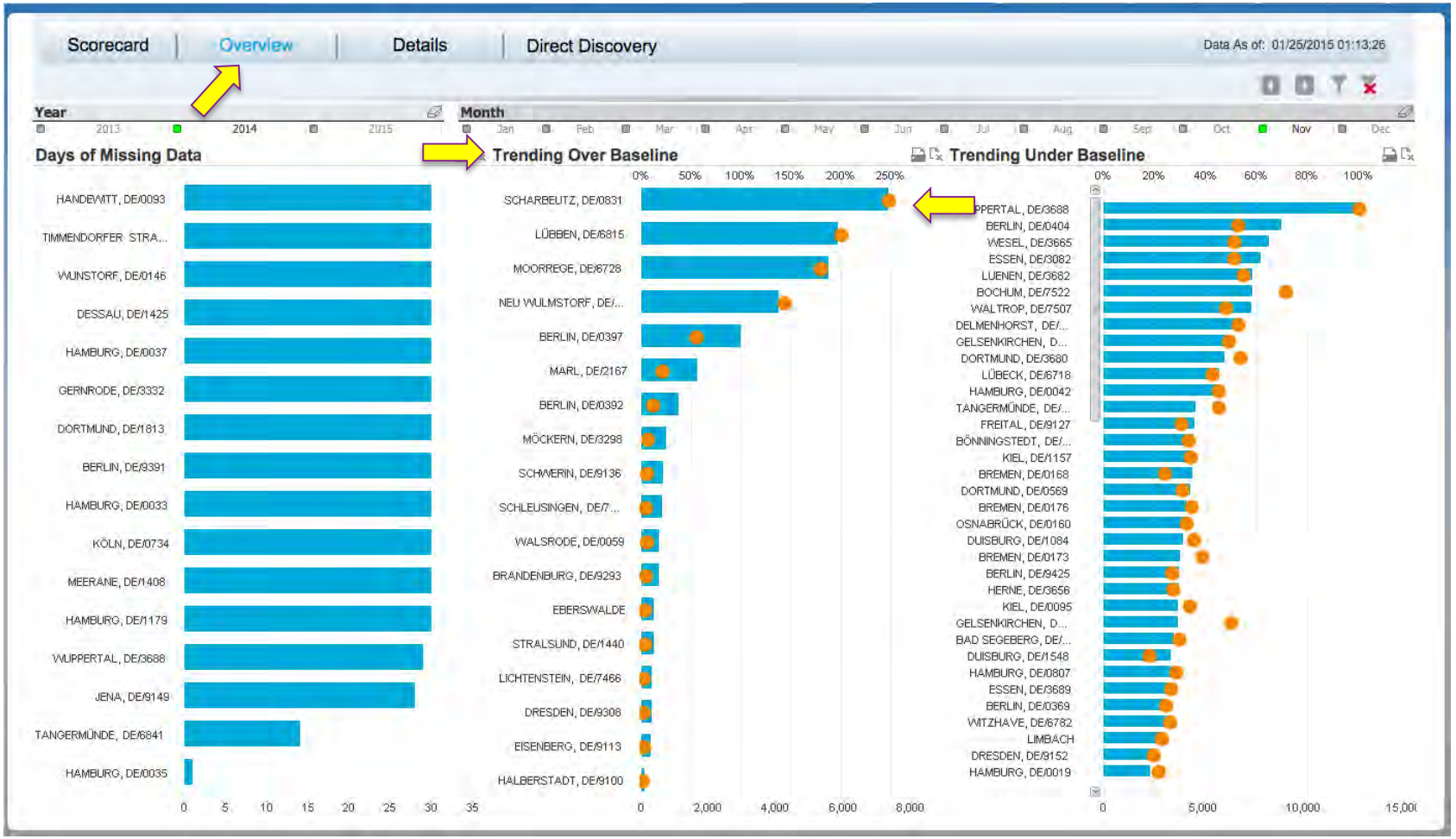
Meter Analysis Tool – Where should I focus my attention?



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Meter Analysis Tool – What are some ways to explore energy use?



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Fault Analysis Tool

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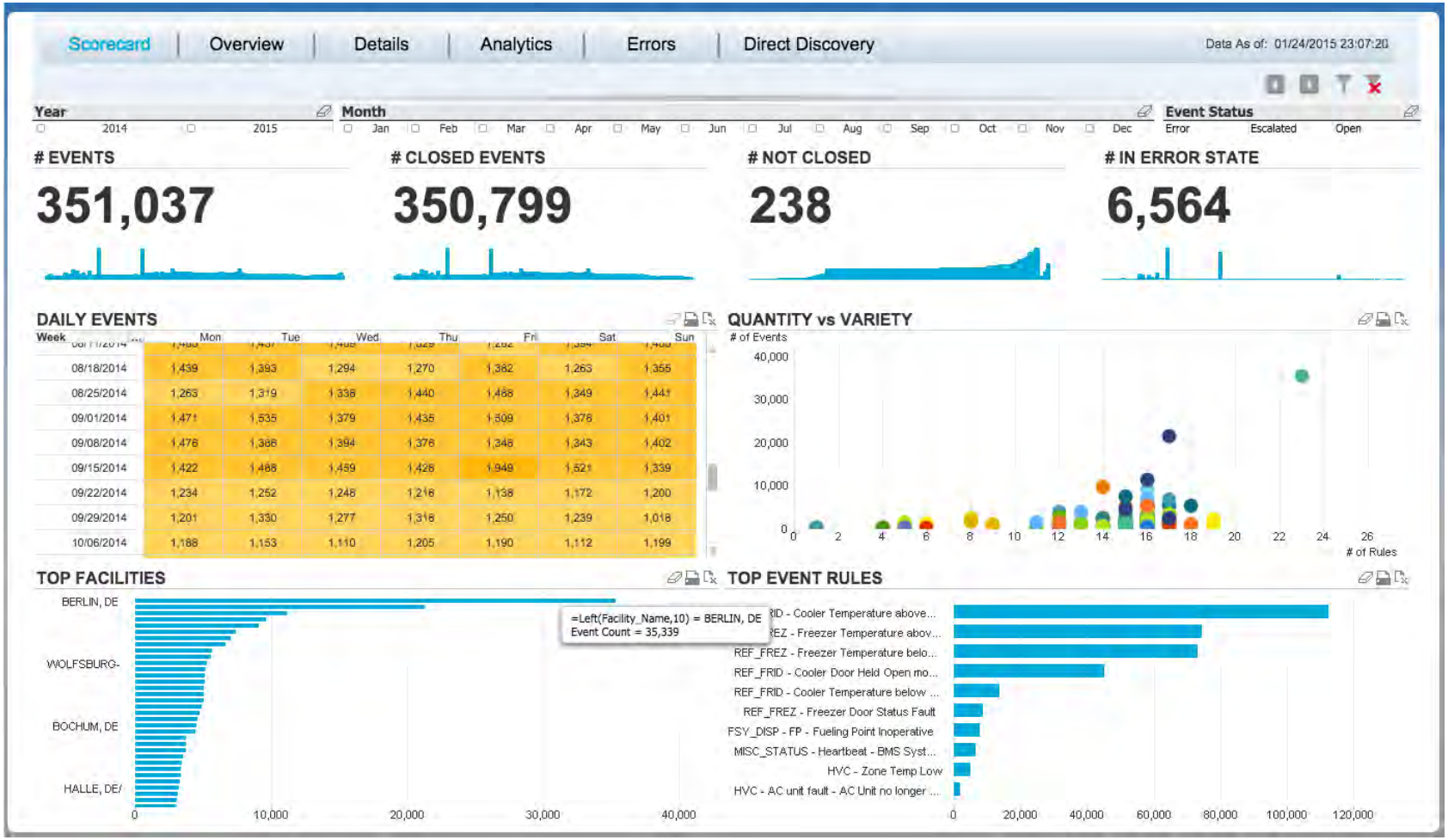
Fault Analysis Tool – How many problems were detected?



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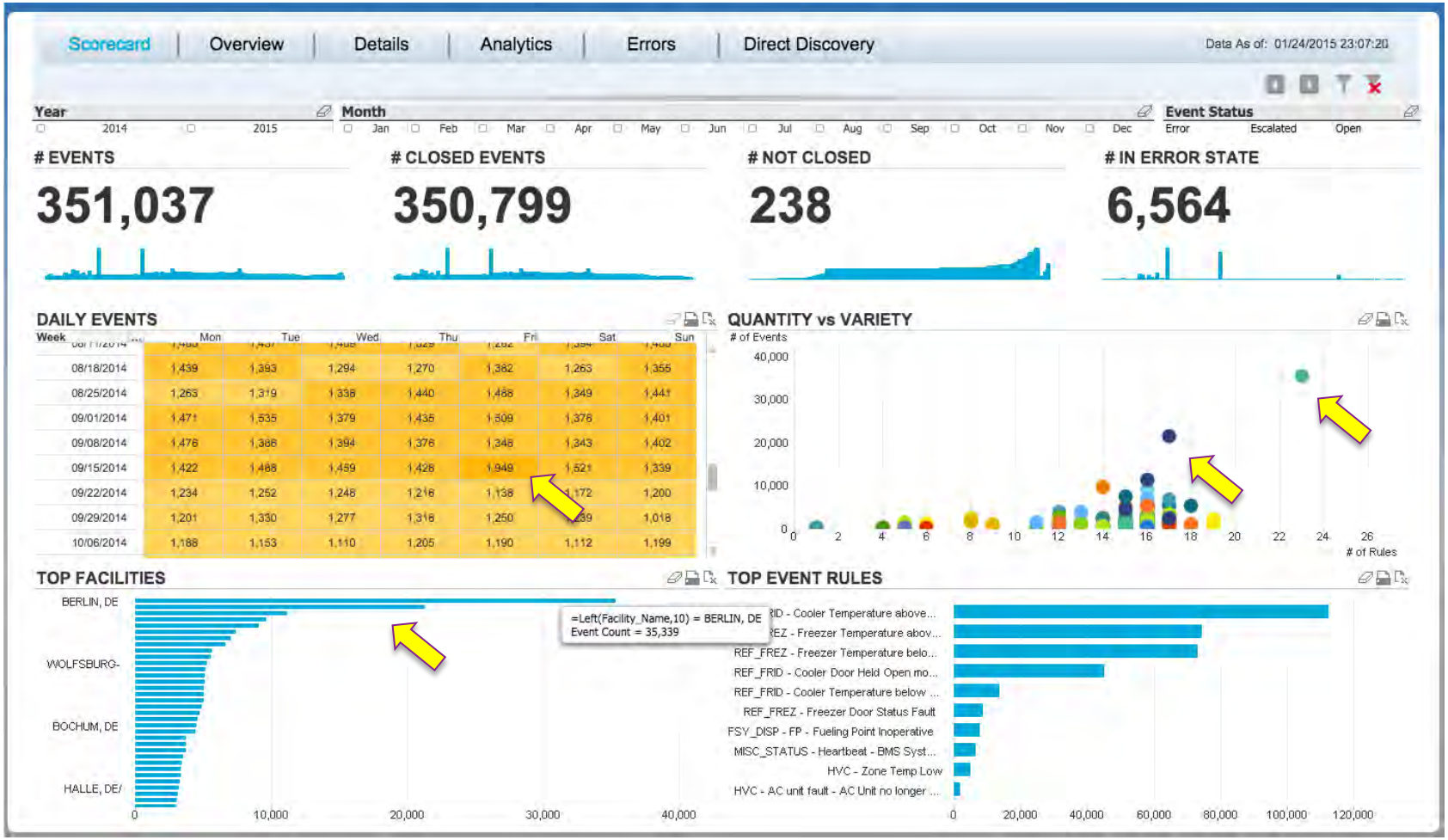
Fault Analysis Tool – Where should I focus my team's attention?



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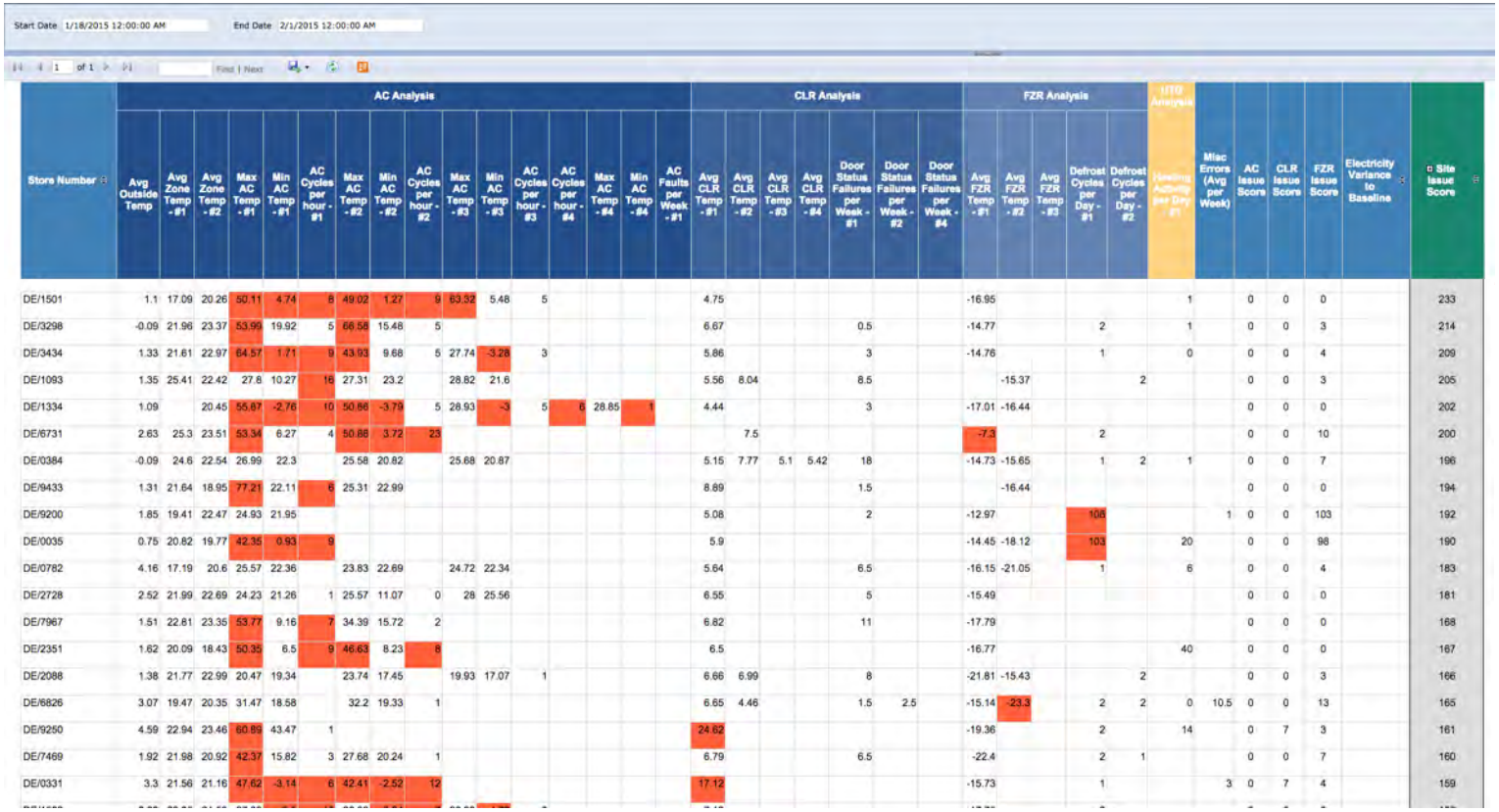
Fault Analysis Tool – What problems are most common and where?



Start Date 1/18/2015 12:00:00 AM End Date 2/1/2015 12:00:00 AM

Store Number	AC Analysis																CLR Analysis							FZR Analysis					HTF Analysis	Misc Errors (Avg per Week)	AC Issue Score	CLR Issue Score	FZR Issue Score	Electricity Variance to Baseline	Site Issue Score
	Avg Outside Temp	Avg Zone Temp - #1	Avg Zone Temp - #2	Max AC Temp - #1	Min AC Temp - #1	AC Cycles per hour - #1	Max AC Temp - #2	Min AC Temp - #2	AC Cycles per hour - #2	Max AC Temp - #3	Min AC Temp - #3	AC Cycles per hour - #3	AC Cycles per hour - #4	Max AC Temp - #4	Min AC Temp - #4	AC Faults per Week - #1	Avg CLR Temp - #1	Avg CLR Temp - #2	Avg CLR Temp - #3	Avg CLR Temp - #4	Door Status Failures per Week - #1	Door Status Failures per Week - #2	Door Status Failures per Week - #4	Avg FZR Temp - #1	Avg FZR Temp - #2	Avg FZR Temp - #3	Defrost Cycles per Day - #1	Defrost Cycles per Day - #2	Heating Activity per Day - #1					
DE/1501	1.1	17.09	20.26	50.11	4.74	8	49.02	1.27	9	63.32	5.48	5					4.75							-16.95					1		0	0	0		233
DE/3298	-0.09	21.96	23.37	53.99	19.92	5	66.58	15.48	5								6.67				0.5			-14.77			2		1		0	0	3		214
DE/3434	1.33	21.61	22.97	64.57	1.71	9	43.93	9.68	5	27.74	-3.28	3					5.86				3			-14.76			1		0		0	0	4		209
DE/1093	1.35	25.41	22.42	27.8	10.27	16	27.31	23.2		28.82	21.6						5.56	8.04			8.5				-15.37			2			0	0	3		205
DE/1334	1.09		20.45	55.67	-2.76	10	50.66	-3.79	5	28.93	-3	5	6	28.85	1		4.44				3			-17.01	-16.44						0	0	0		202
DE/6731	2.63	25.3	23.51	53.34	6.27	4	50.88	3.72	23									7.5						-7.3			2				0	0	10		200
DE/0384	-0.09	24.6	22.54	26.99	22.3		25.58	20.82		25.68	20.87						5.15	7.77	5.1	5.42	18			-14.73	-15.65		1	2	1		0	0	7		196
DE/9433	1.31	21.64	18.95	77.21	22.11	6	25.31	22.99									8.89				1.5				-16.44						0	0	0		194
DE/9200	1.85	19.41	22.47	24.93	21.95												5.08				2			-12.97			108			1	0	0	103		192
DE/0035	0.75	20.82	19.77	42.35	0.93	9											5.9							-14.45	-18.12		103		20		0	0	98		190
DE/0782	4.16	17.19	20.6	25.57	22.36		23.83	22.69		24.72	22.34						5.64				6.5			-16.15	-21.05		1		6		0	0	4		183
DE/2728	2.52	21.99	22.69	24.23	21.26	1	25.57	11.07	0	28	25.56						6.55				5			-15.49							0	0	0		181
DE/7967	1.51	22.81	23.36	53.77	9.16	7	34.39	15.72	2								6.82				11			-17.79							0	0	0		168
DE/2351	1.62	20.09	18.43	50.35	6.5	9	46.63	8.23	8								6.5							-16.77					40		0	0	0		167
DE/2088	1.38	21.77	22.99	20.47	19.34		23.74	17.45		19.93	17.07	1					6.66	6.99			8			-21.81	-15.43			2			0	0	3		166
DE/6826	3.07	19.47	20.35	31.47	18.58		32.2	19.33	1								6.65	4.46			1.5	2.5		-15.14	-23.3		2	2	0	10.5	0	0	13		165
DE/9250	4.59	22.94	23.46	60.89	43.47	1											24.62							-19.36			2		14		0	7	3		161
DE/7469	1.92	21.98	20.92	42.37	15.82	3	27.68	20.24	1								6.79				6.5			-22.4			2	1			0	0	7		160
DE/0331	3.3	21.56	21.16	47.62	-3.14	6	42.41	-2.52	12								17.12							-15.73			1			3	0	7	4		159

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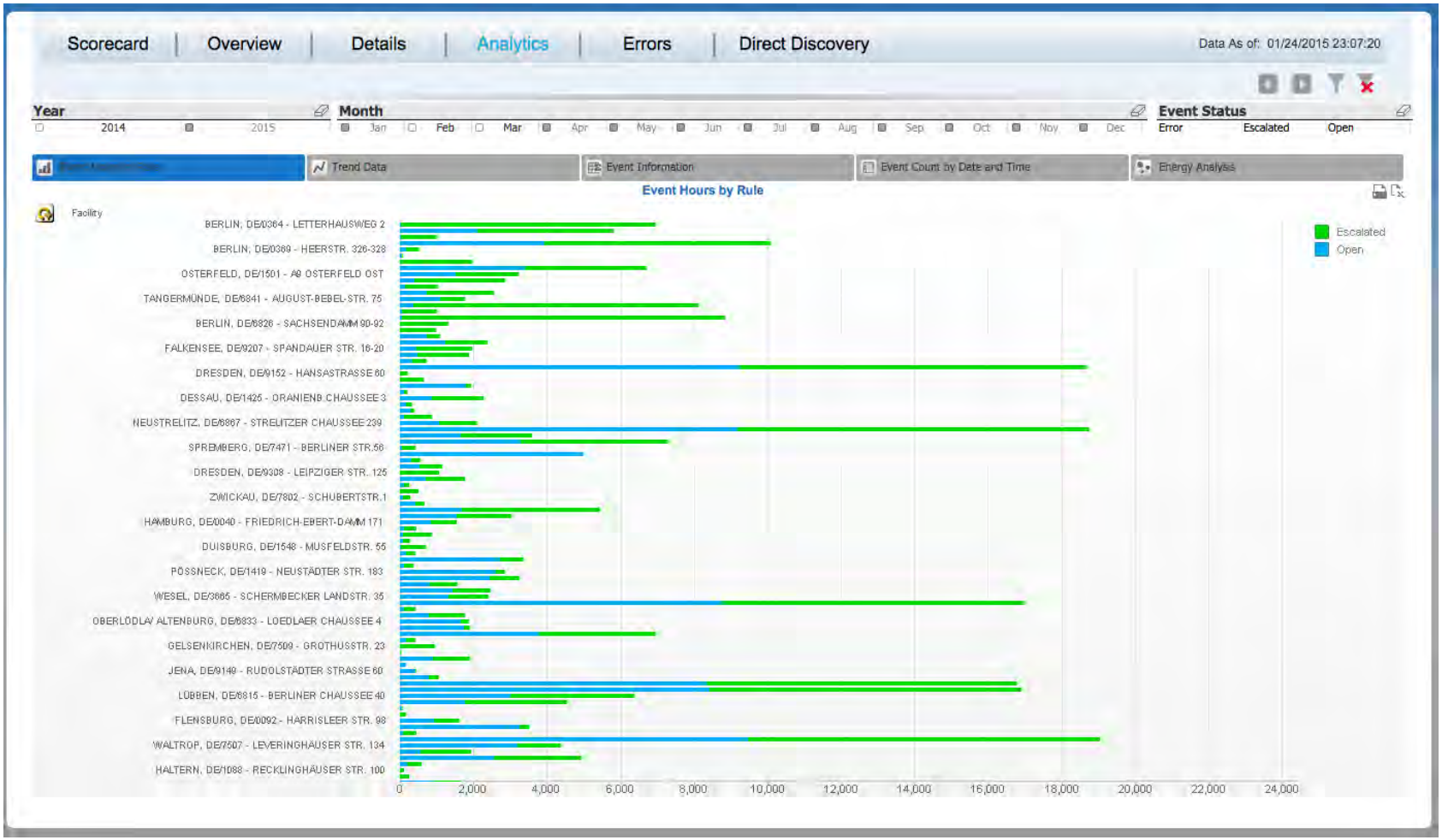
Fault Analysis Tool – Where are problems most persistent?



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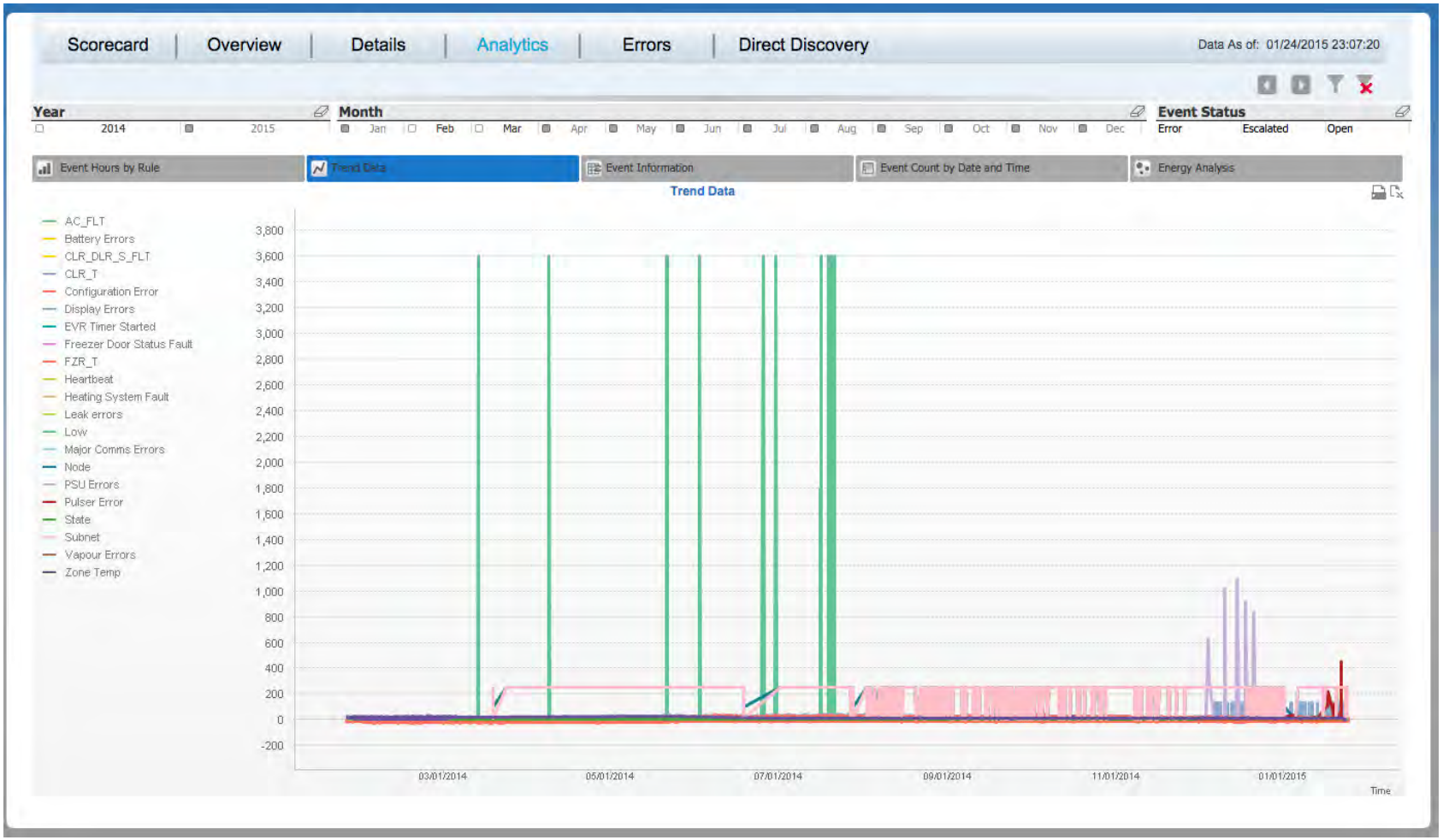
Fault Analysis Tool – What was the root cause?



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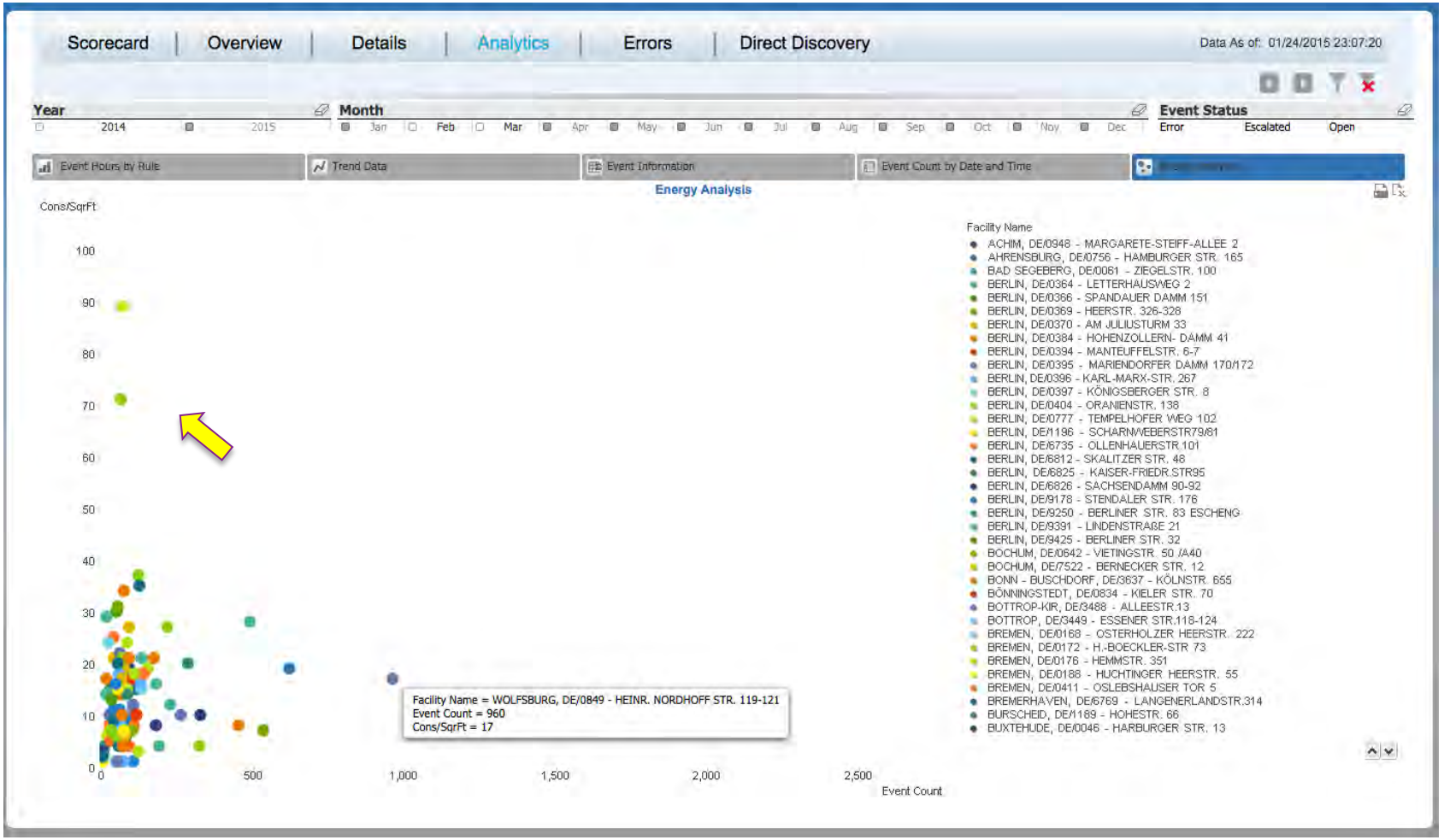
Fault Analysis Tool – Which faults are affecting energy performance?



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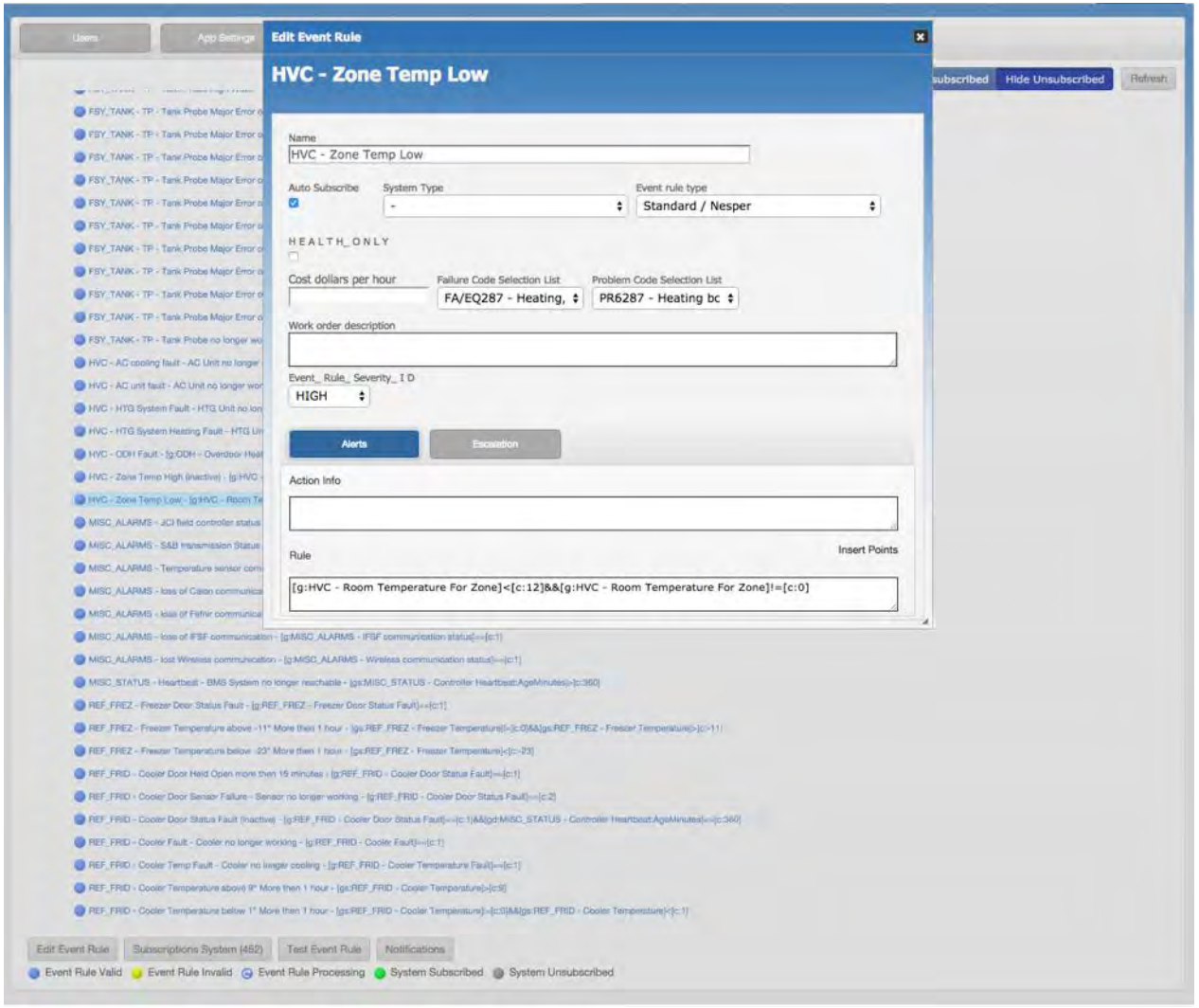
Fault Analysis Tool – Select additional rules, or write your own rules



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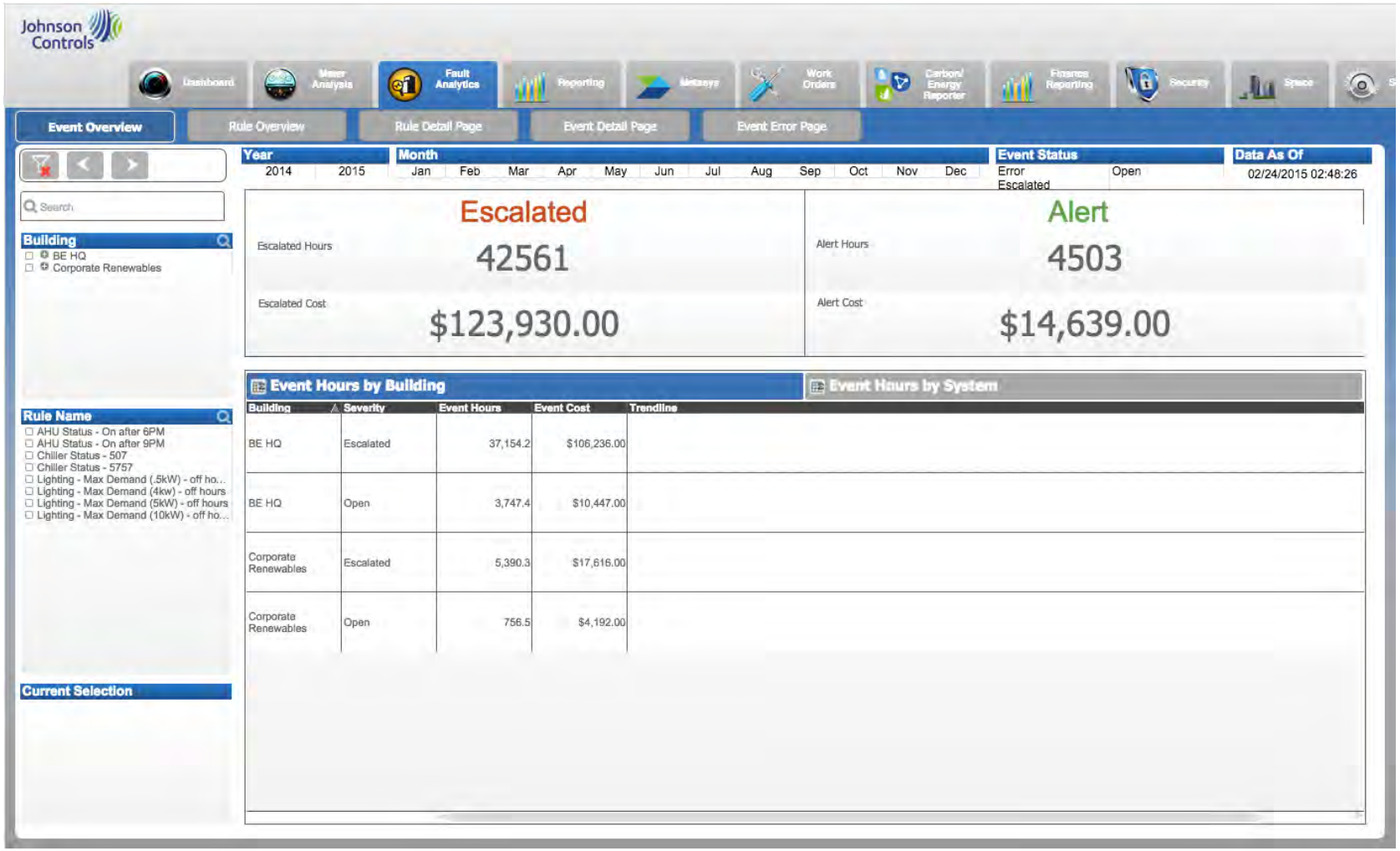
Fault Analysis Tool – Use calculated cost avoidance to prioritize action



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Operations Dashboard

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Operations Dashboard – Convert faults to work orders



Events pop up as blue dots on a GIS map with numeric indicators for the number of faults active at that site.

The same events scroll in the left window with the ability to drag and drop specific events into a claim window for processing outside of the queue.

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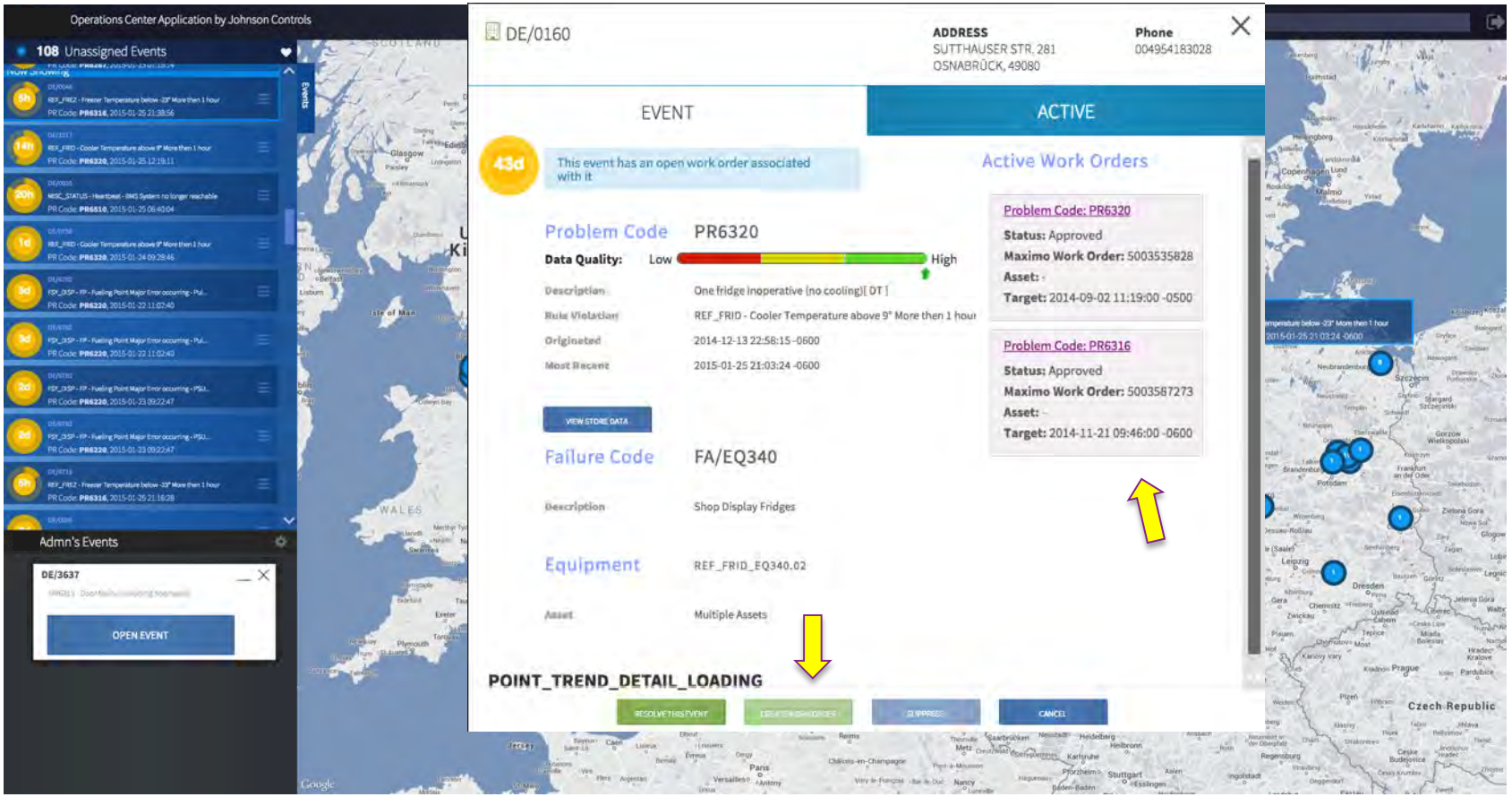
Operations Dashboard – Convert faults to work orders



Claimed events are automatically searched for open work orders at that site if the Operations Dashboard has been integrated with a Work Order system.

Remote operators review the information and make decisions on resolution – with the option to queue up a new work order.

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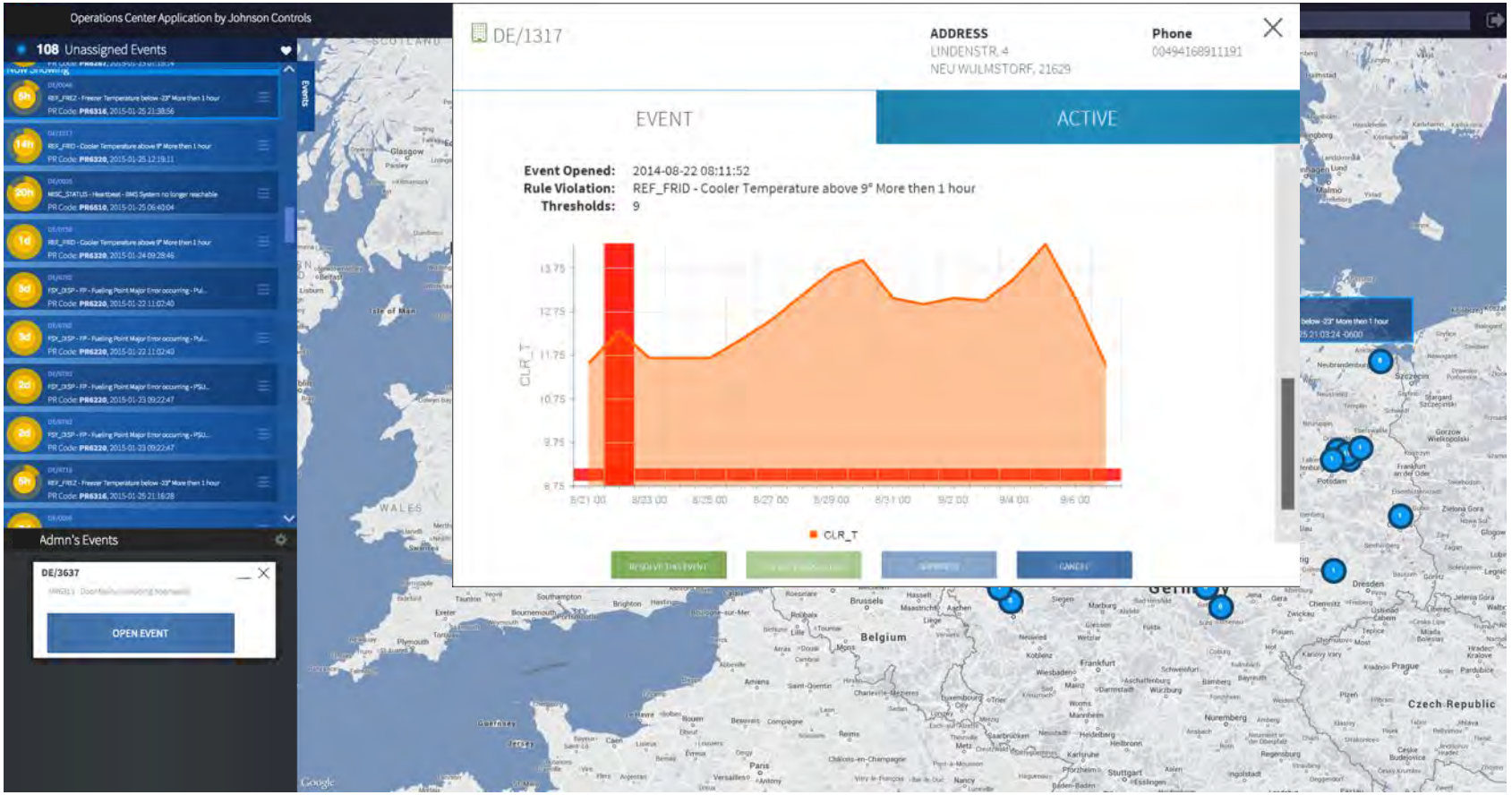
Operations Dashboard – Convert faults to work orders



Scrolling the down in the claimed event window exposes the history and conditions leading the the event in order to aid in the analysis by the operator.

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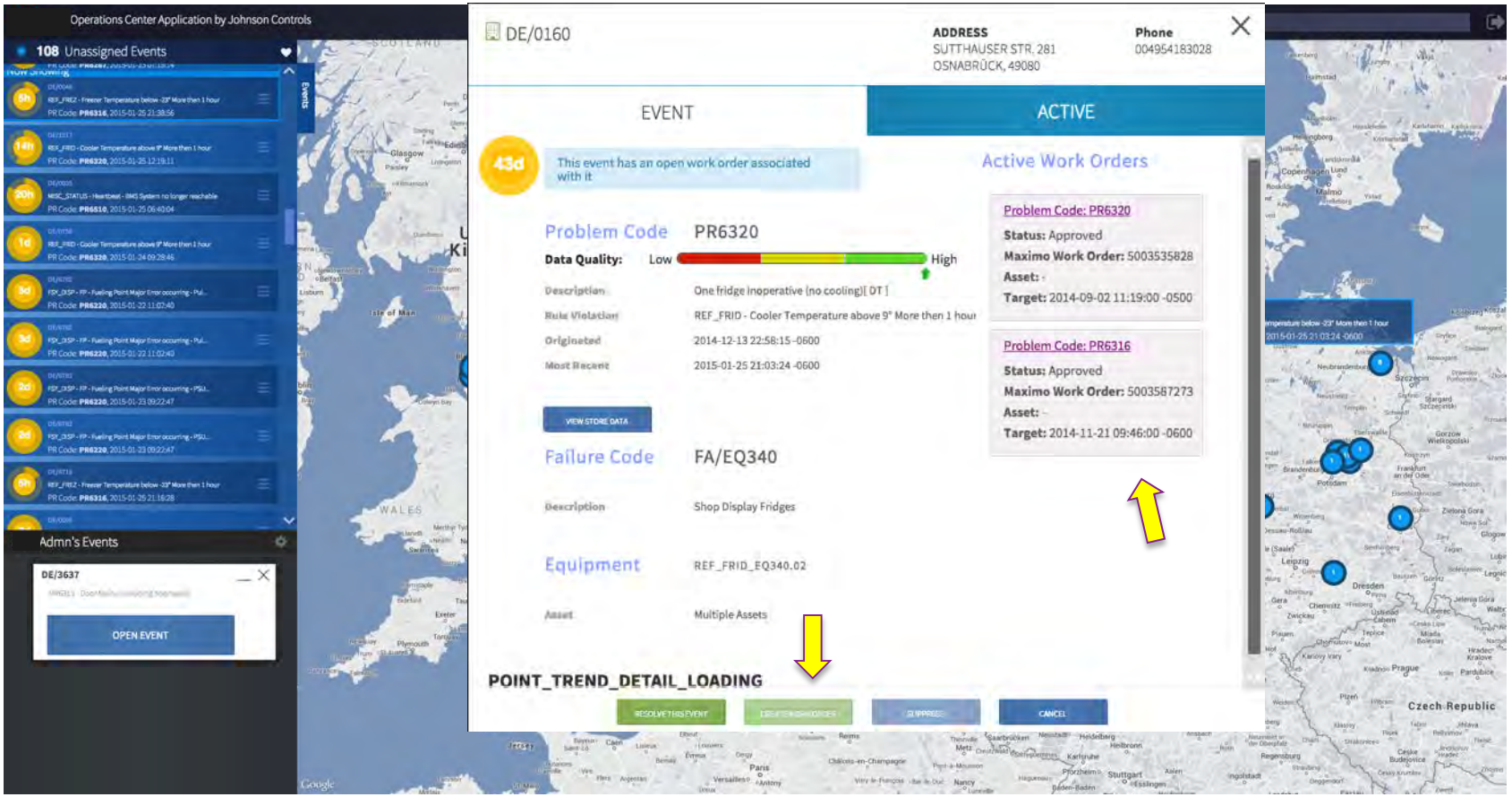
Operations Dashboard – Convert faults to work orders



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Work order Analysis Tool

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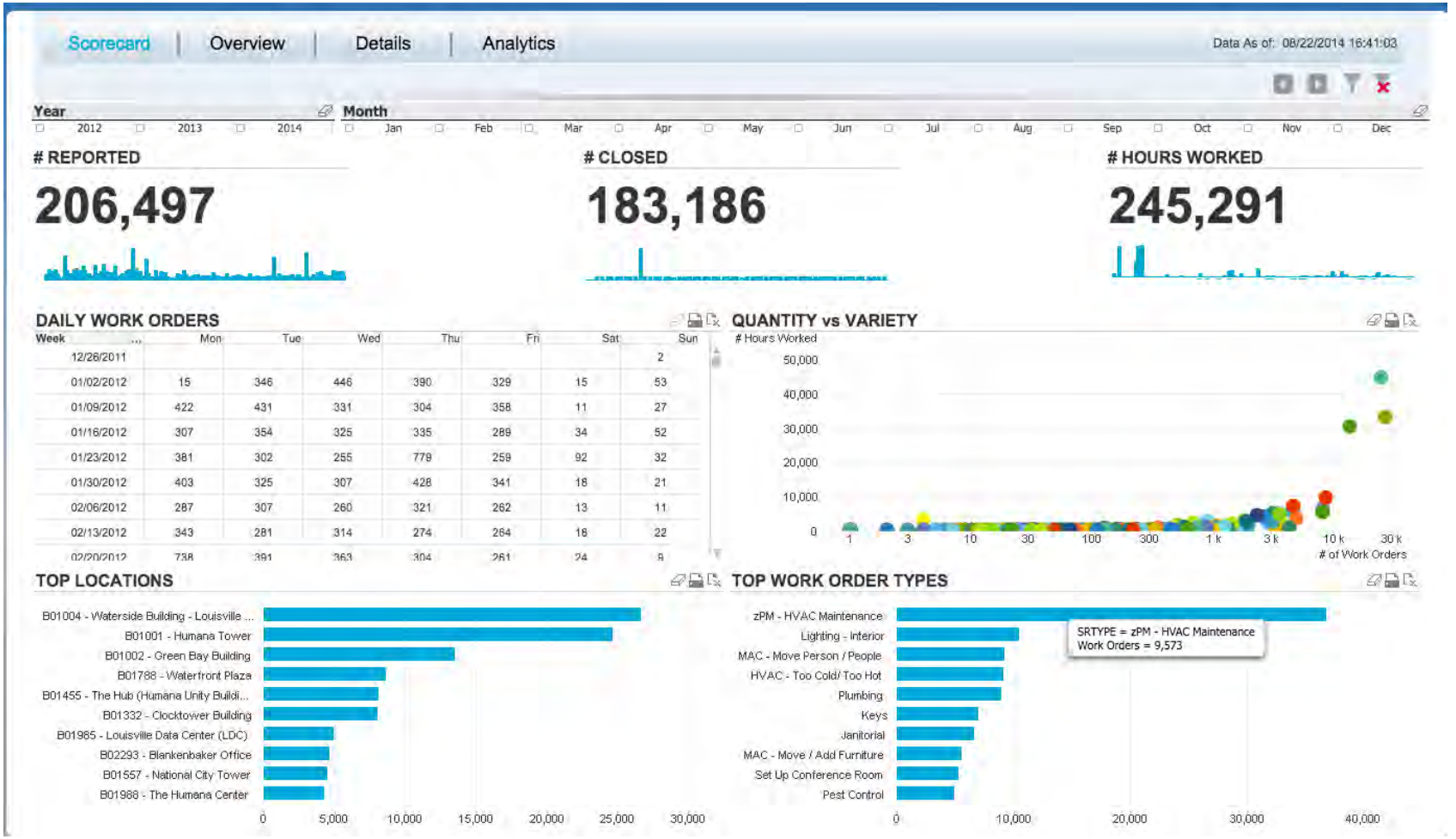
Work Order Analysis Tool – Managing service performance



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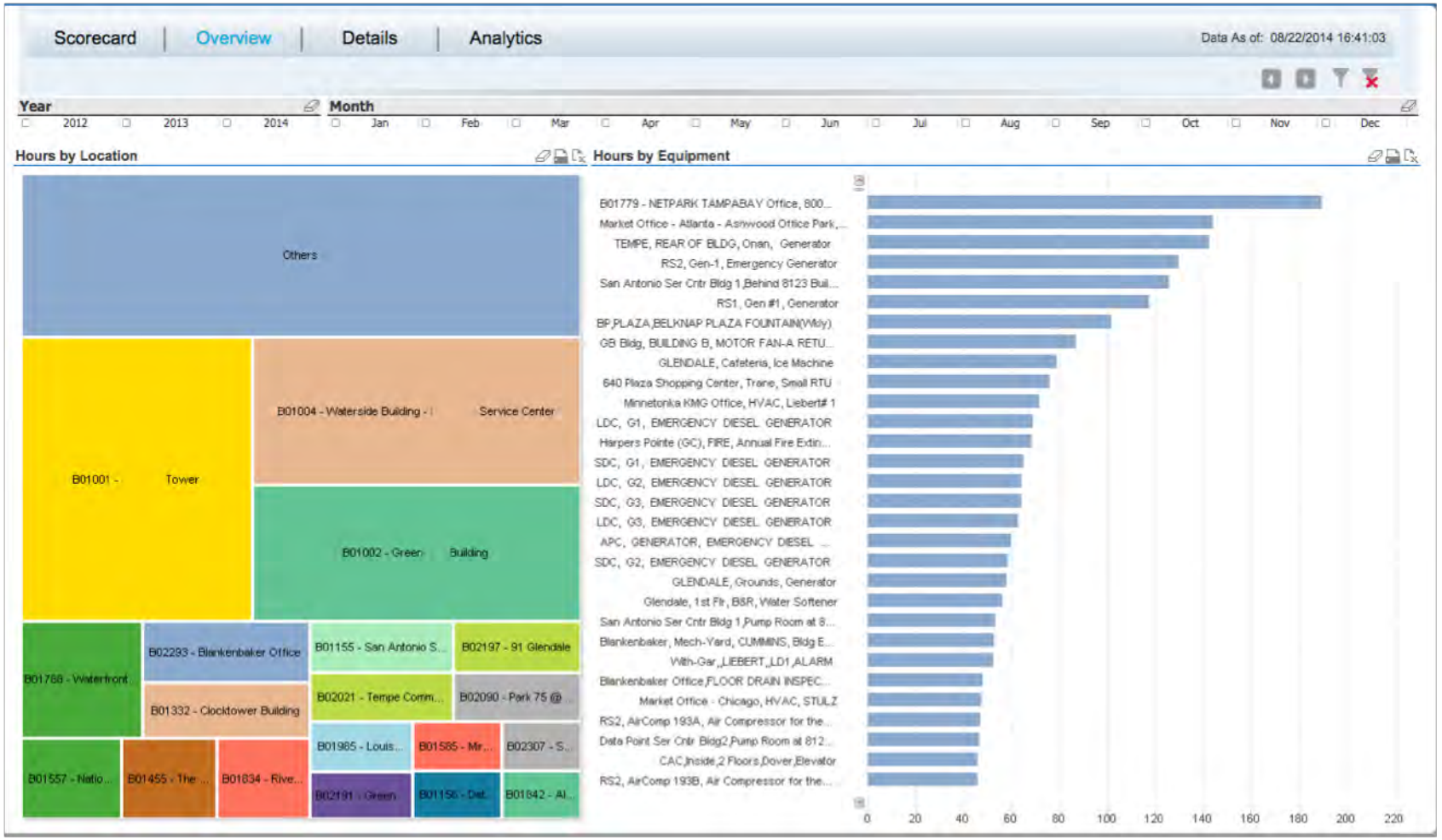
Work Order Analysis Tool – Managing service performance



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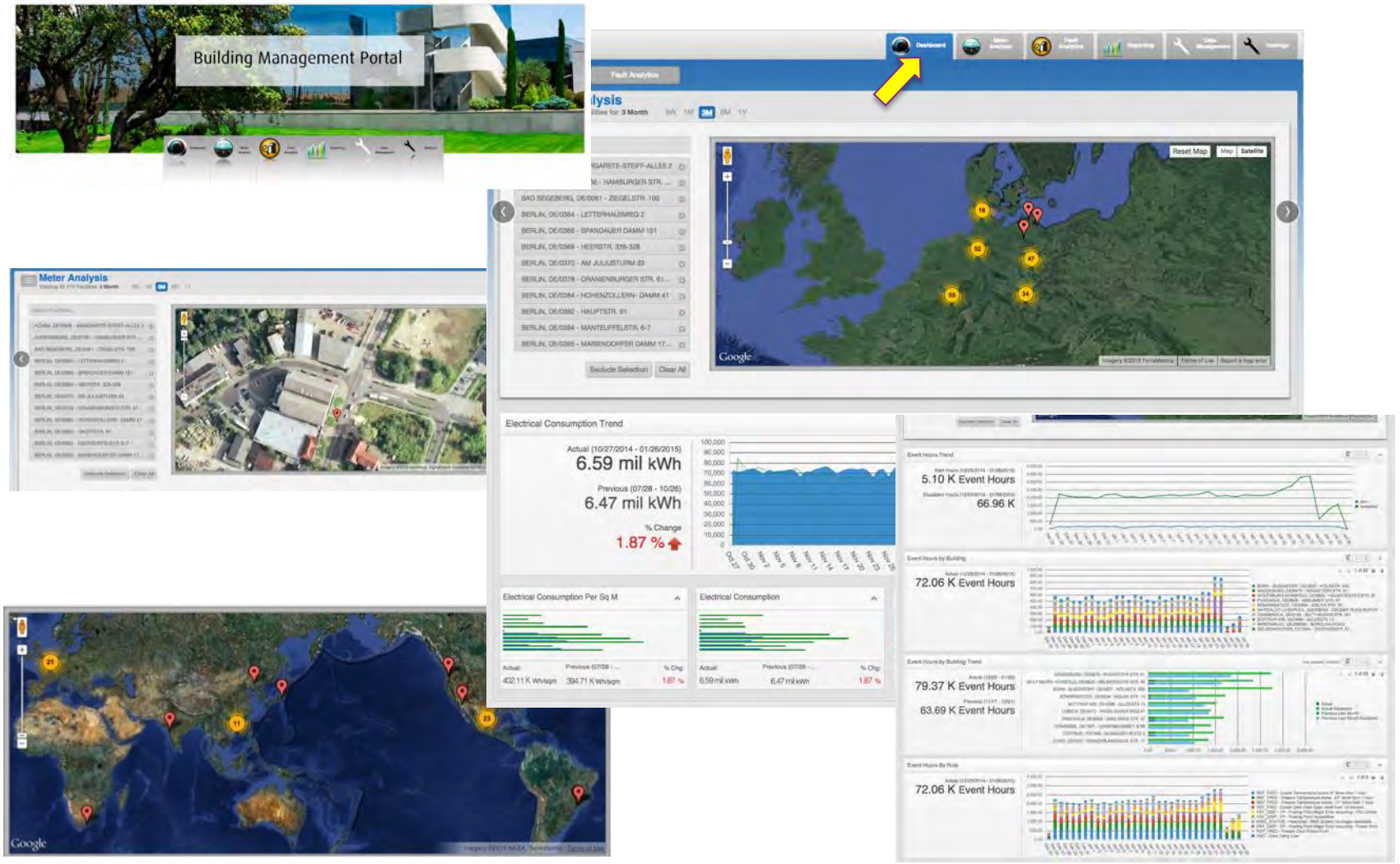
Enterprise Dashboard – Portfolio rollup of key performance indicators



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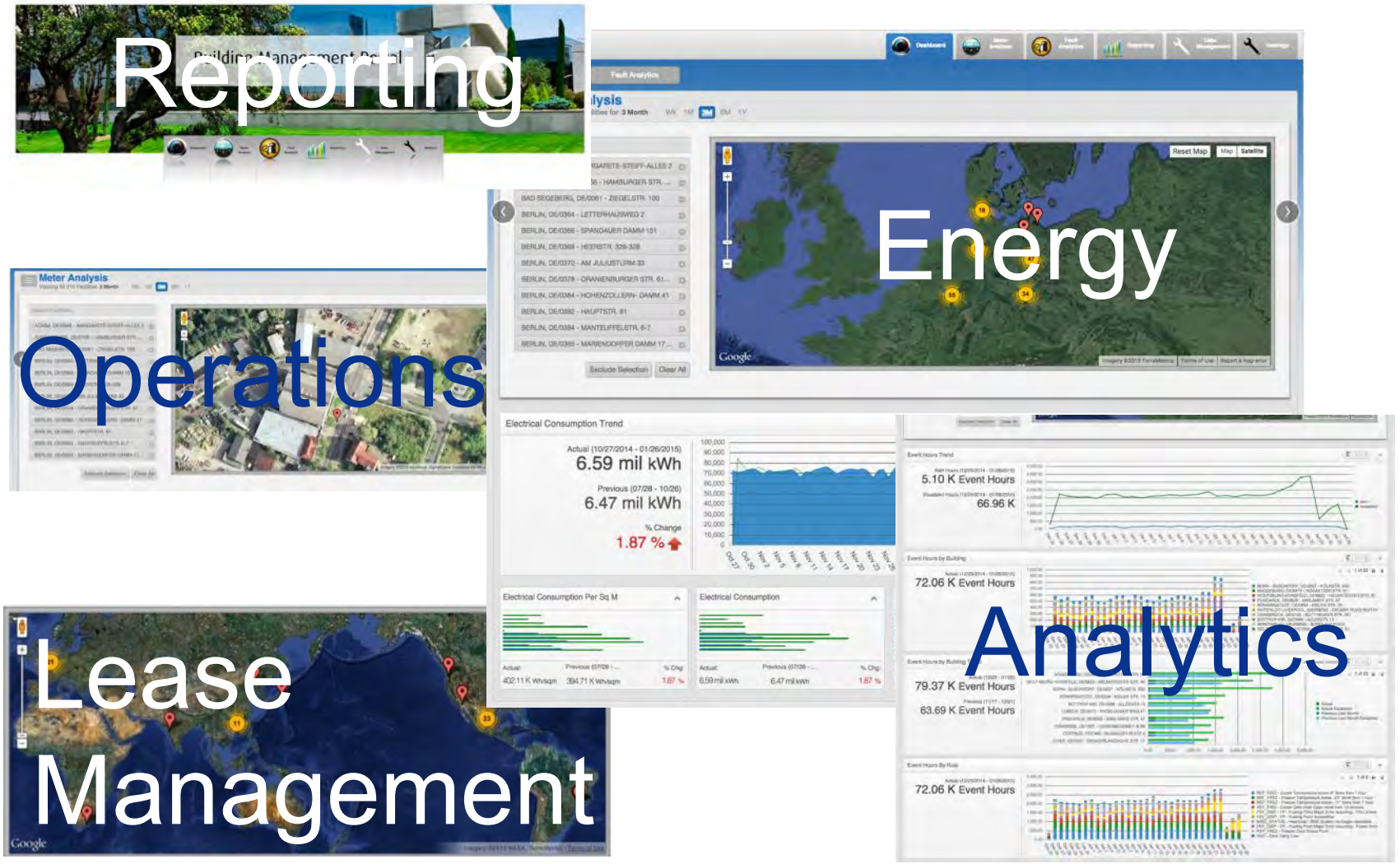
Enterprise Dashboard – Energy, analytics, real estate, operations



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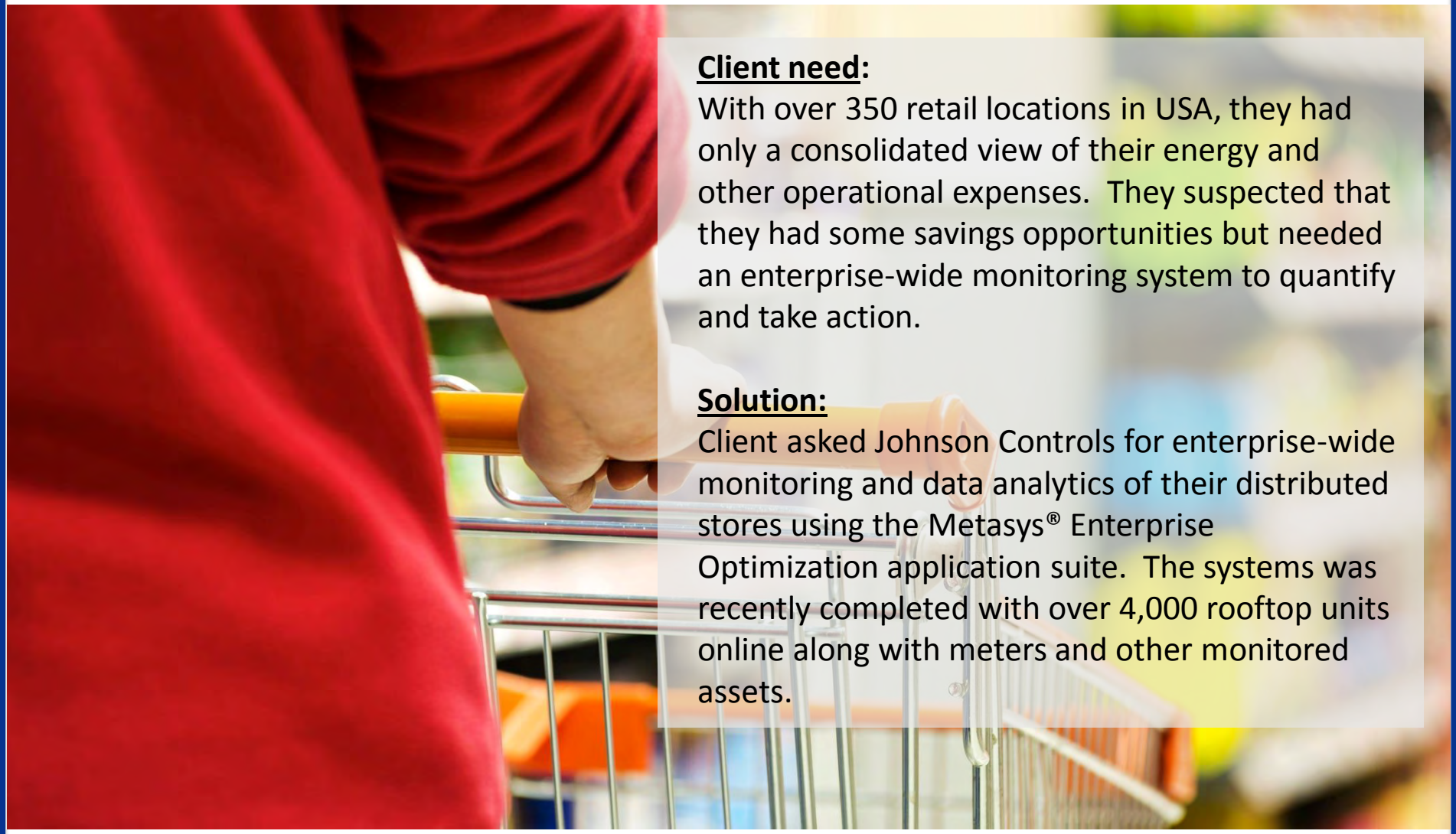
Case Study - Retails



Client need:
With over 350 retail locations in USA, they had only a consolidated view of their energy and other operational expenses. They suspected that they had some savings opportunities but needed an enterprise-wide monitoring system to quantify and take action.

Solution:
Client asked Johnson Controls for enterprise-wide monitoring and data analytics of their distributed stores using the Metasys® Enterprise Optimization application suite. The systems was recently completed with over 4,000 rooftop units online along with meters and other monitored assets.

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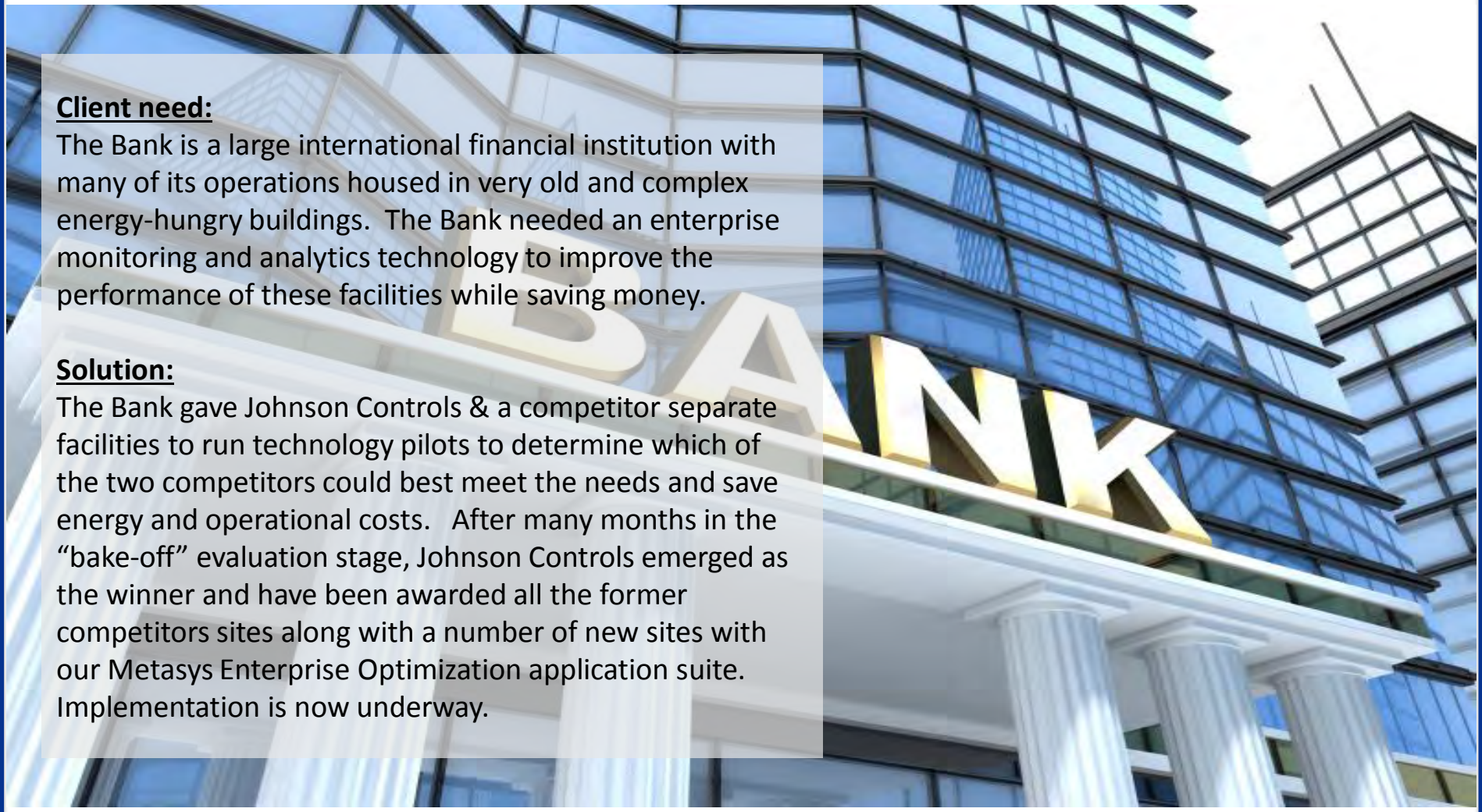
Case Study - Bank



Client need:
The Bank is a large international financial institution with many of its operations housed in very old and complex energy-hungry buildings. The Bank needed an enterprise monitoring and analytics technology to improve the performance of these facilities while saving money.

Solution:
The Bank gave Johnson Controls & a competitor separate facilities to run technology pilots to determine which of the two competitors could best meet the needs and save energy and operational costs. After many months in the "bake-off" evaluation stage, Johnson Controls emerged as the winner and have been awarded all the former competitors sites along with a number of new sites with our Metasys Enterprise Optimization application suite. Implementation is now underway.

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Metasys Enterprise Optimization
Assets • Energy • Operations
Thank You