

Making it Real: The Carnegie Mellon Story

Presented by **David Doll**
Microsoft Alliance Program Manager



A photograph of a modern, multi-story building at Carnegie Mellon University. The building features a dark, textured facade with numerous windows, some of which are set in white frames. The architecture is characterized by its geometric, stepped design and large glass sections. The sky is clear and blue.

Carnegie Mellon University





Carnegie Mellon University

Smart Campus, Smart City

Bertrand Lasternas

Researcher

Center for Building Performance and
Diagnostic, School Of Architecture

Background: Carnegie Mellon University

Founded in 1900 by
Andrew Carnegie

12,991 Students (6223
undergrad)

5000 faculty / staff

CMU annual energy
budget over \$20M

That's over \$1,600 per
year per student!

Goal:

Improve
by 30%



Pittsburgh, PA

Why we didn't save energy?



We had no idea what we are using



We had no idea how important it was



There was no easy way to change outcomes



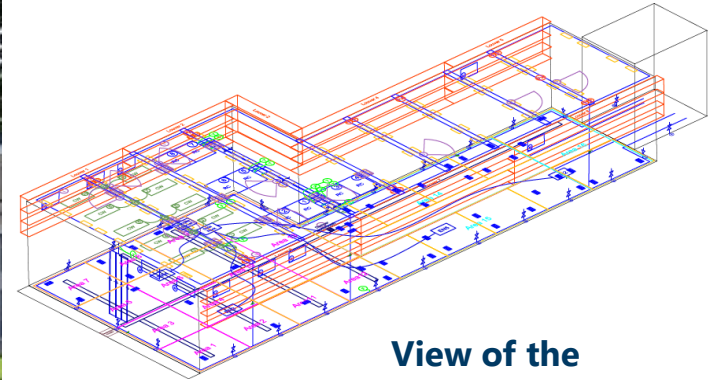
We didn't know what metrics to use

The Intelligent Workplace

The Robert L. Preger Intelligent Workplace, built in 1997, is a 7000 square foot living laboratory of office environments and innovations located on the campus of Carnegie Mellon University.

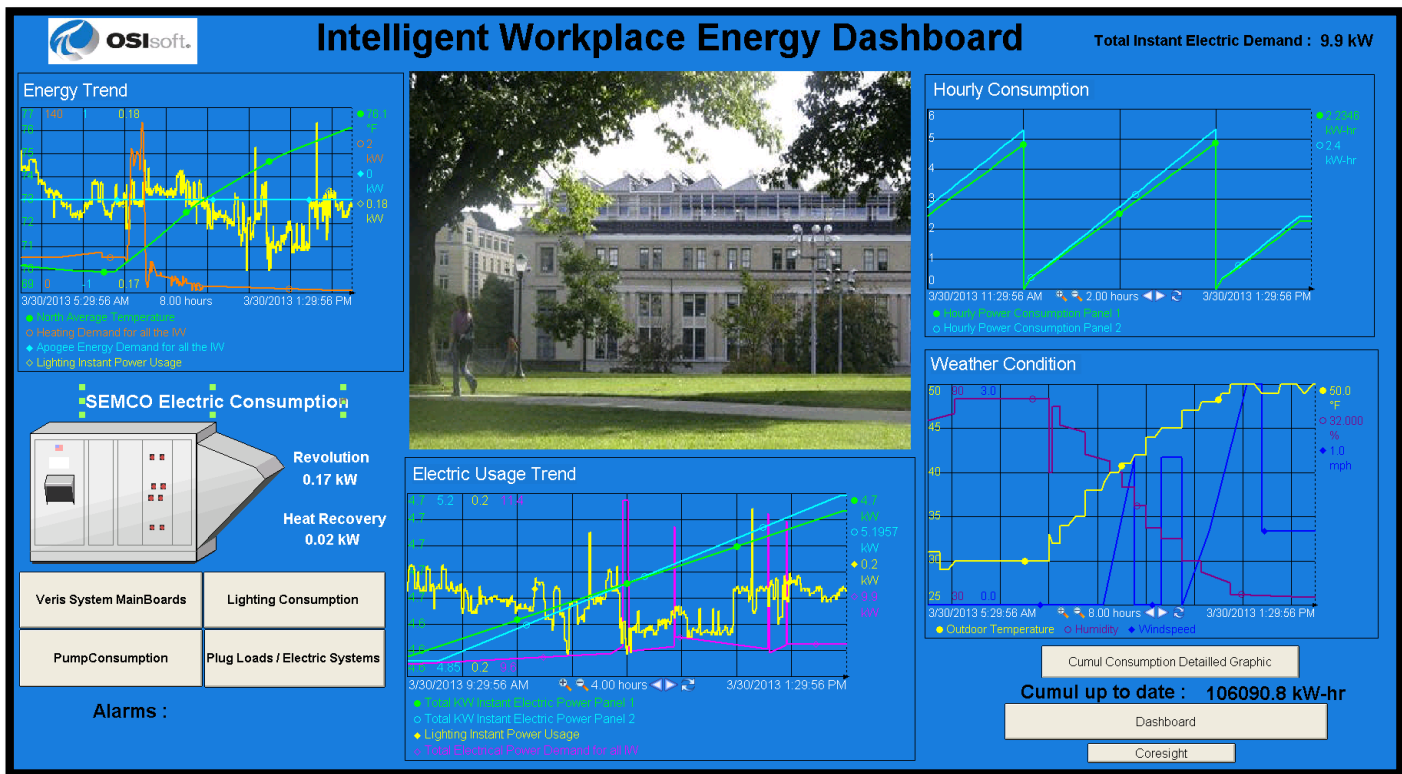
Test and Integration of several systems:

- Heating
- Cooling
- Ventilation (mechanical and natural)
- Lighting, and day-lighting
- Electrical
- Plug load

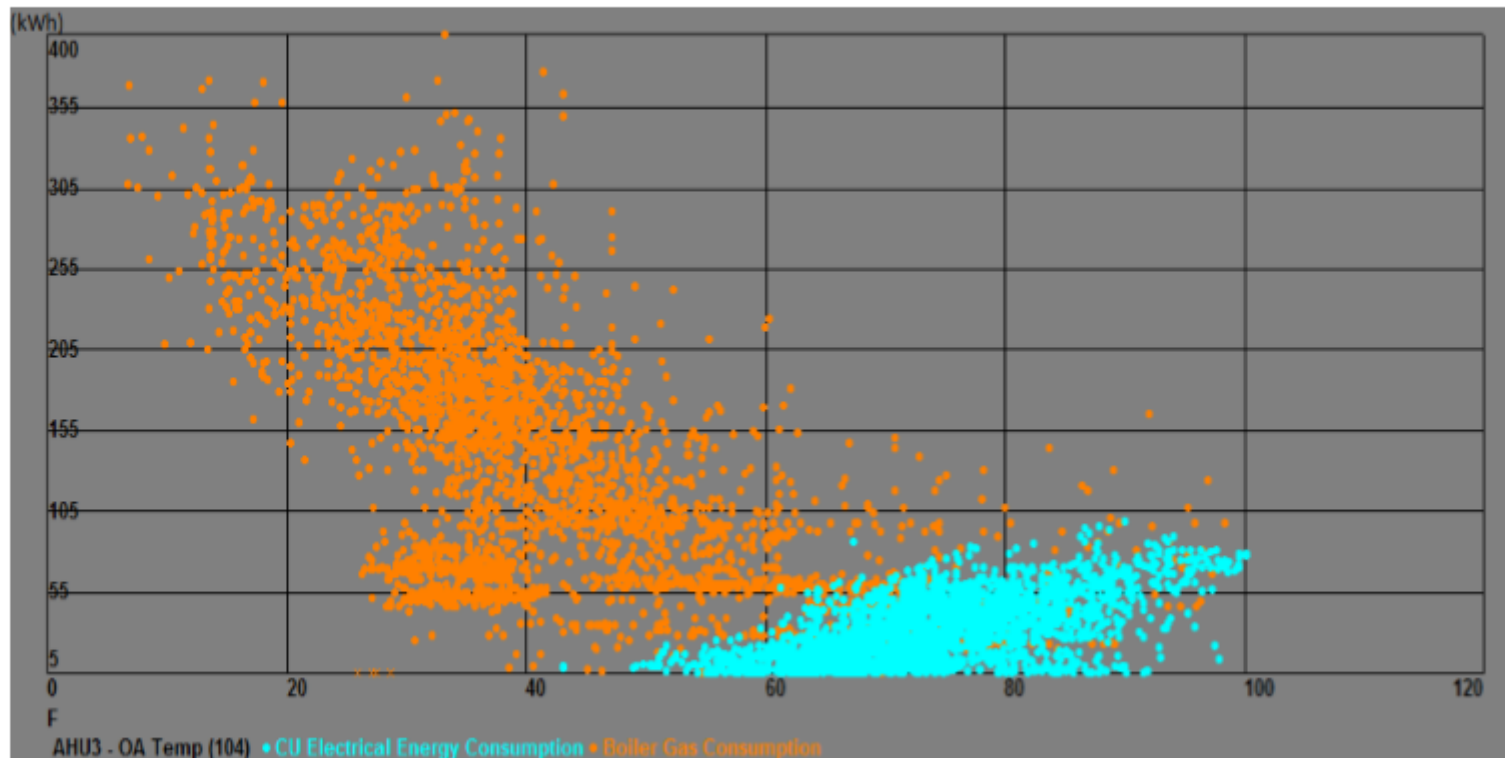


**View of the
sensors/actuators density
1500+**

Facility Manager Interfaces

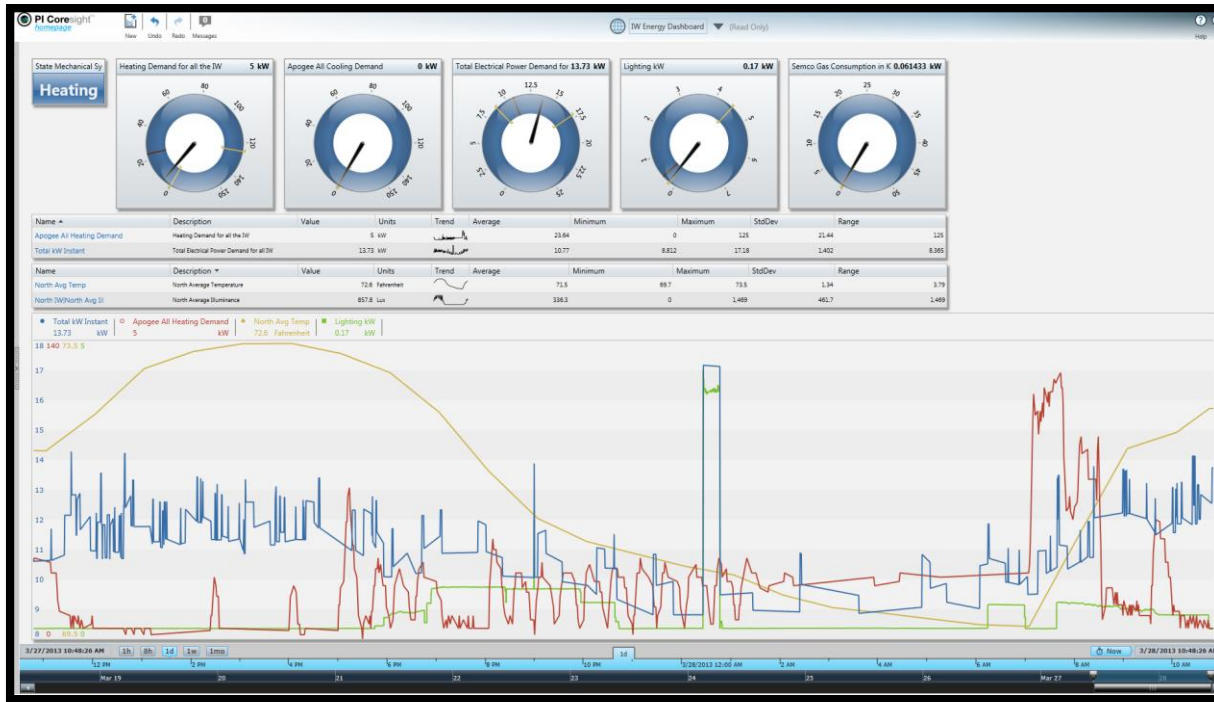


(ID-F) Data Analytics



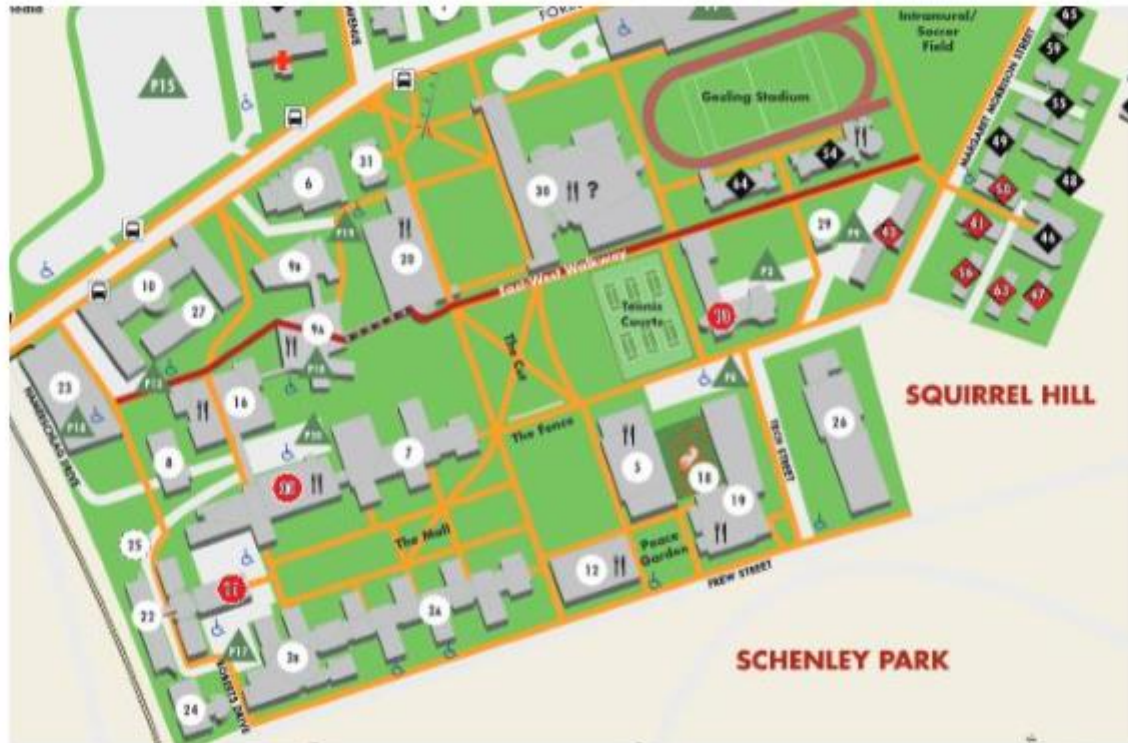
Real Time Measured data for meaningful diagnostics

Public Interface



Real-time Dashboard on Touchscreen Displays

(ID-C) Implementation on Carnegie Mellon Campus



Early stages : 9 Buildings monitored, to be expanded (work with Facility Managers)

What we learned?

Integrate ALL
information

Continuously
monitor and
diagnose
building
performance

Information
needs to be
accessible to
the consumers
(public, faculty,
students)

Building
occupants need
control in order
to change
behaviors

How to do it?

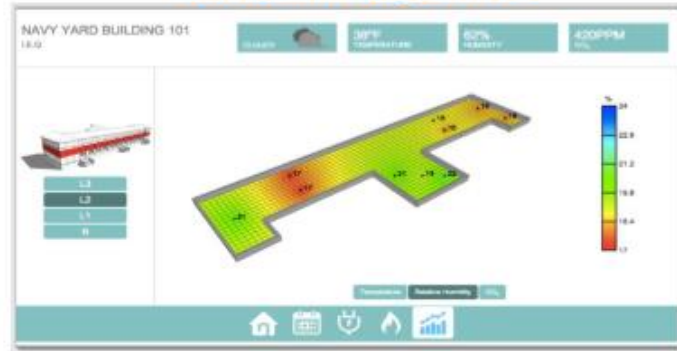
PI System + Excel & Power BI for Office 365

Spreading their knowledge: EEB Hub

Welcome Page



Real-Time IEQ Status



Electrical/Gas Trending



Energy Consumption Maps (8760 hrs/yr)



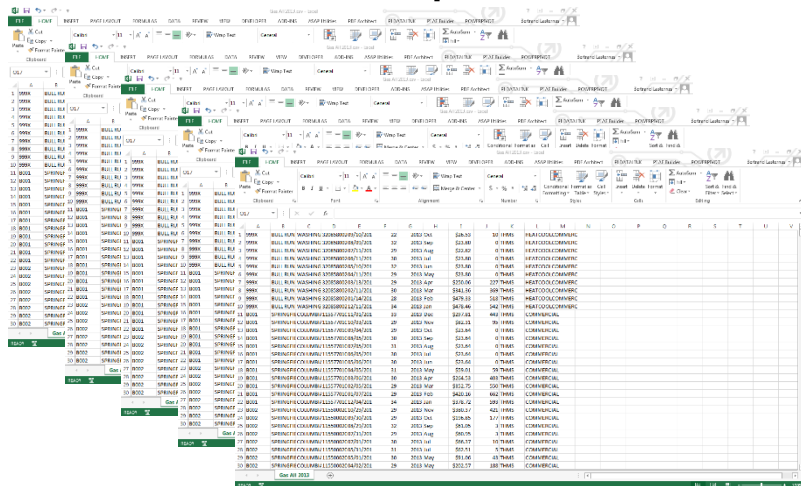


Carnegie Mellon University:
Working with others



Managing a Building Portfolio

- Energy Manager at a Pittsburgh Bank
- Challenge: Monitor and analyze a portfolio of 4000+ buildings from Headquarters to Data Centers, down to ATMs.



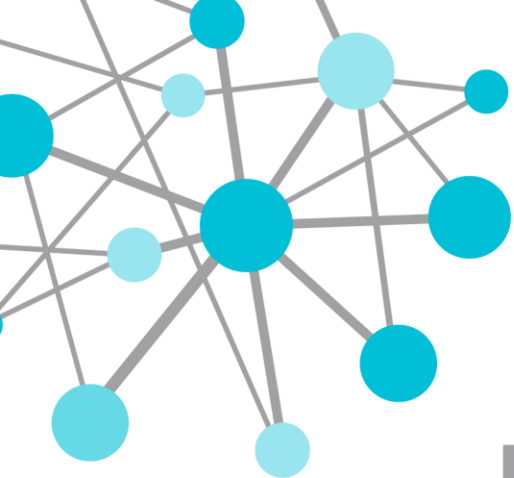
The screenshot shows a complex spreadsheet application with multiple tabs at the top. The main data table has columns for various building attributes and energy data. The table is organized into sections, with some rows highlighted in green. The data includes building codes, addresses, and energy consumption metrics.



Code	Address	City	State	Occupancy	Sq. Ft.	Elect Cost	Elec.	Elec.	Gas	Gas	Gas	Water	Water	Water	
B313	160 BROADWAY ST.	JACKSON	OH		10	11998	10709.77	90240	0.1187	2385.62	2894.94	0.7992	1250.95	40616.4	0.02
B313D1	276 PEARL ST.	JACKSON	OH		10	11998	10709.77	90240	0.1187	2385.62	2894.94	0.7992	1250.95	40616.4	0.02
B369	40 WEST ERIE STREET	PAINESVILLE	OH		8	2640	6799.44	57369	0.1185	1125.33	1116.52	1.0079	821.92	28424	0.02
B404	735 S. MAIN ST.	BOWLING GREEN	OH		7	2200	8154.4	67843	0.1036	703.2	713.79	0.9852	647.37	83866.24	0.02
B429	221 W. MAIN ST.	BRYAN	OH		6	3036	4897.19	43160	0.1135	605.03	699.37	0.8651	999.48	165308	0.02
B433	37 SOUTH MAIN STREET	HUDSON	OH		12	3653	11363.99	91520	0.1242	1519.74	1659.33	0.9159	1586.47	66572	0.02
B494	24 EAST MAIN STREET	NORWALK	OH		6	6945	8348.66	70447	0.1185	2713.42	3197.12	0.8487	1812.1	52000	0.02
B606	401 BAY STREET	POTOSKEY	MI		9	4454	4657.34	38880	0.1198	2085.55	2037.34	1.0256	1187.89	89790	0.01
B611	4900 EAST MONROVIA ROAD	DETROIT	MI		5	4345	12539.02	81600	0.1566	2776.25	2618.26	1.0602	2927.79	8976	0.32
B618	145 SOUTH RIPLEY	ALPENA	MI		1	1459	4393.98	32627	0.1347	1292.24	1105.19	1.1692	223.66	20000	0.01
B619	13391-13401 WEST 9 MILE ROAD	OAK PARK	MI		10	4000	14577.27	103080	0.1414	1792.71	1972.45	0.9089	1140.76	89790	0.01
B621	2991 KNEELAND STREET	LEWISTON	MI		8	3600	6556.12	52188	0.1256	2345.63	2339.13	1.0028	292.08	27141	0.01
B622	12483 STATE STREET	ATLANTA	MI		0	2196	2530.56	22301	0.1135	1730.47	1512.04	1.1445	240	17888	0.02
B625	13230 EAST JEFFERSON	DETROIT	MI		6	3240	6295.32	41054	0.1509	1813.61	1386.38	1.1639	784.61	18700	0.02
B628	320 ASHUM STREET	SAULT STE. MARIE	MI		10	14399	9404.86	82160	0.1145	7334.34	7923.79	0.9256	3138.86	157080	0.01
B629	3398 I-75 BUSINESS SPUR	SAULT SAINT MARIE	MI		3	1326	4718.34	40300	0.1177	1107.69	923.91	1.1989	266.39	6732	0.02
B633	1710 EAST 12 MILE ROAD	ROYAL OAK	MI		8	2585	8253.78	50120	0.1647	802.22	786.92	1.0194	670.24	29020	0.02
B635	4111 WOODWARD AVENUE	DETROIT	MI		7	3700	13290.93	93120	0.1427	2768.34	2612.08	1.0599	1314.15	88264	0.01
B640	28841 JOHN R. ST.	MADSON HEIGHTS	MI		9	4400	10417.13	66480	0.157	2347.51	3231.51	0.8889	638.86	47124	0.01
B657	200 NORTH KALAMAZOO AVENUE	PAN RAV	MI		10	5388	5257.55	52960	0.0993	1399.66	1428.61	0.9797	2778.71	744700	0.01
B677	7030 EAST MICHIGAN AVENUE	SALINE	MI		8	2307	8870.74	63001	0.1408	2427.85	2353.55	1.0312	1004.67	97988	0.01

Unstructured Data Model

Power Pivot



DEMO



Wrap-up



Summary

- CMU wanted to reduce energy cost
- To do that, they needed visibility
- Lessons learned:
 - Integrate ALL information
 - Continuously monitor
 - Make it accessible and visible
 - Empower people with the ability to influence outcome



For More Information

- Microsoft Case Study
 - http://www.microsoft.com/casestudies/Case_Study_Detail.aspx?CaseStudyID=710000003921
- OSIsoft User Conference Presentation
 - <http://www.osisoft.com/templates/item-abstract.aspx?id=11029>



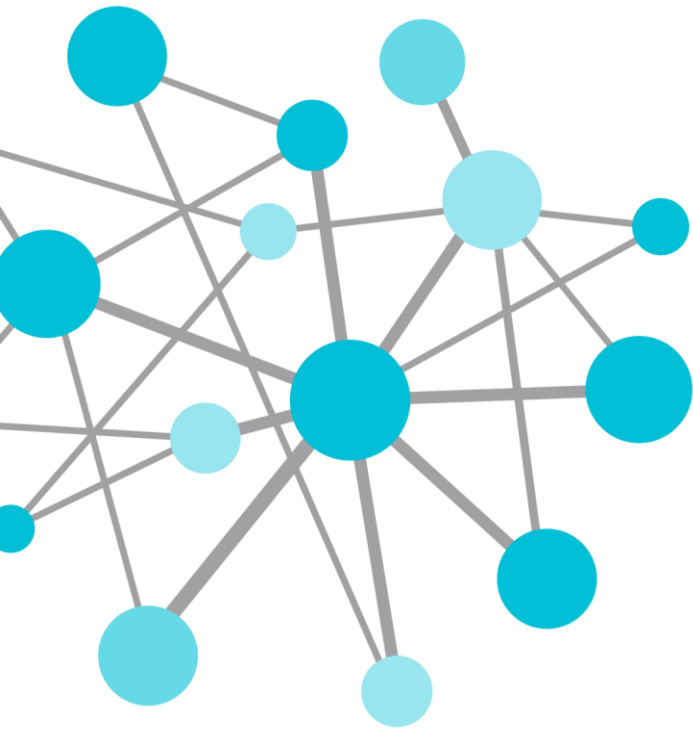
Contact Info

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THANK
YOU

Brought to you by  **OSI**soft.





A little dose of

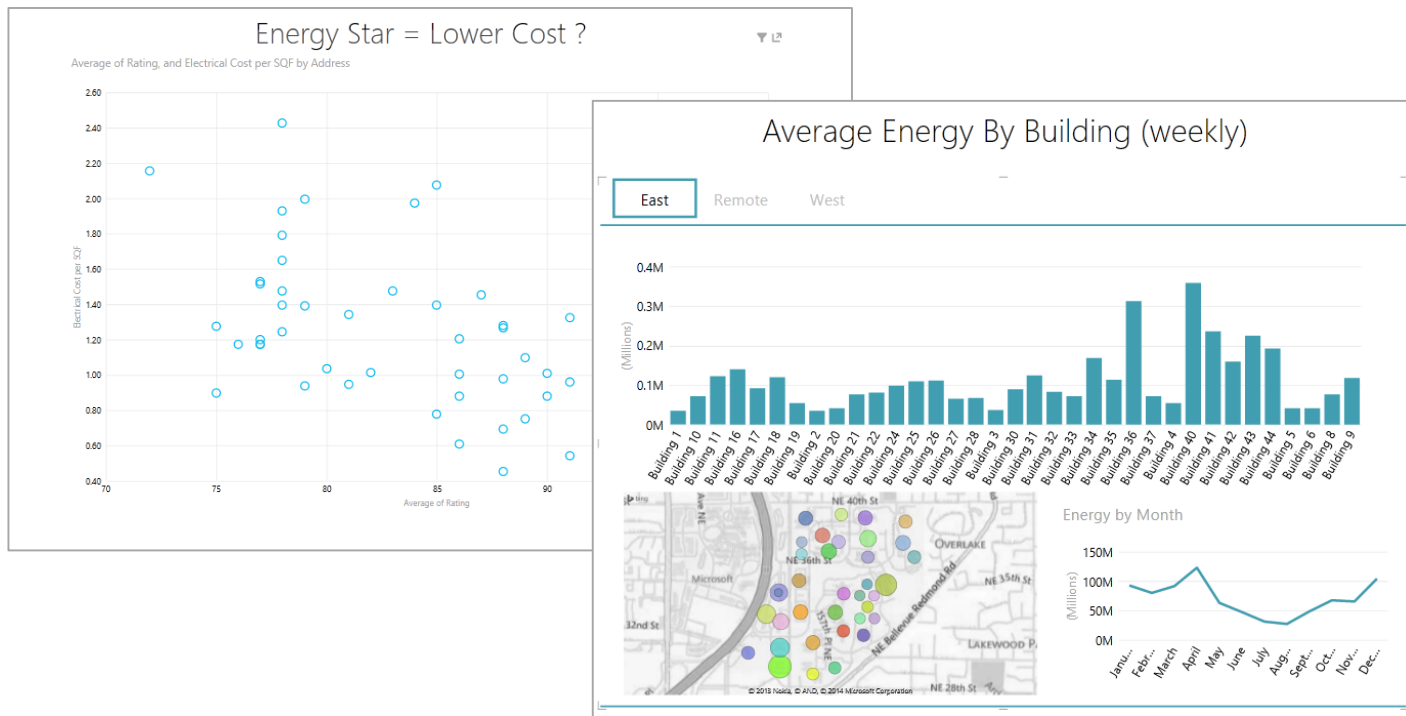


Real-time Analysis

Search
Drag
Drop



High-level Analytics

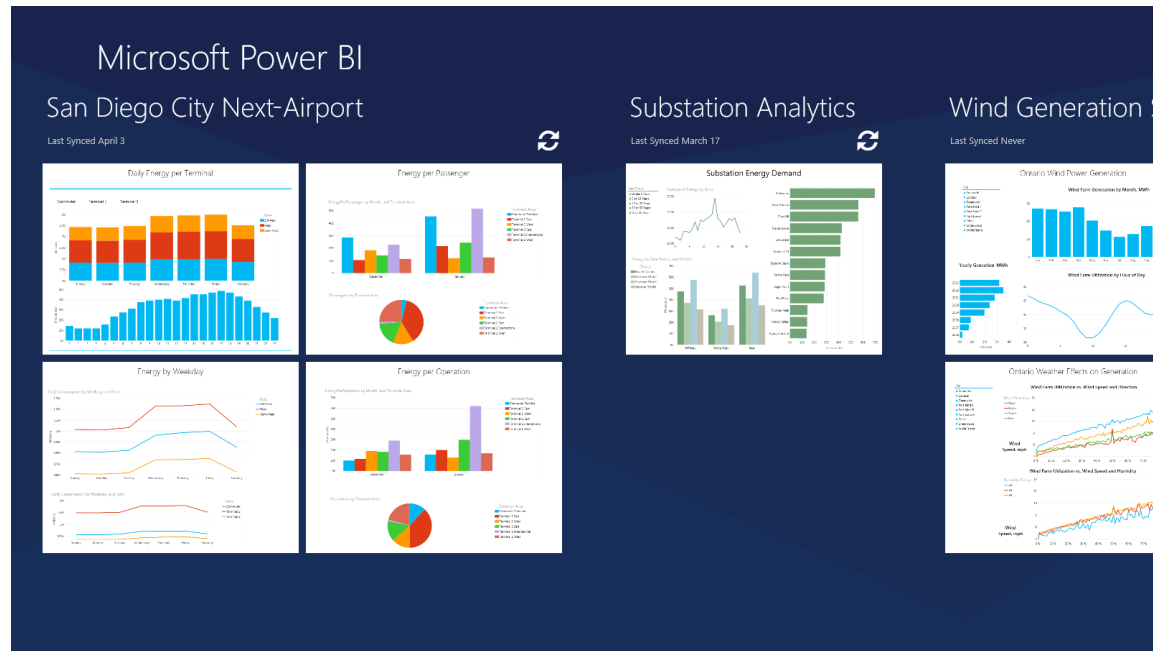


Slice
Filter
Map

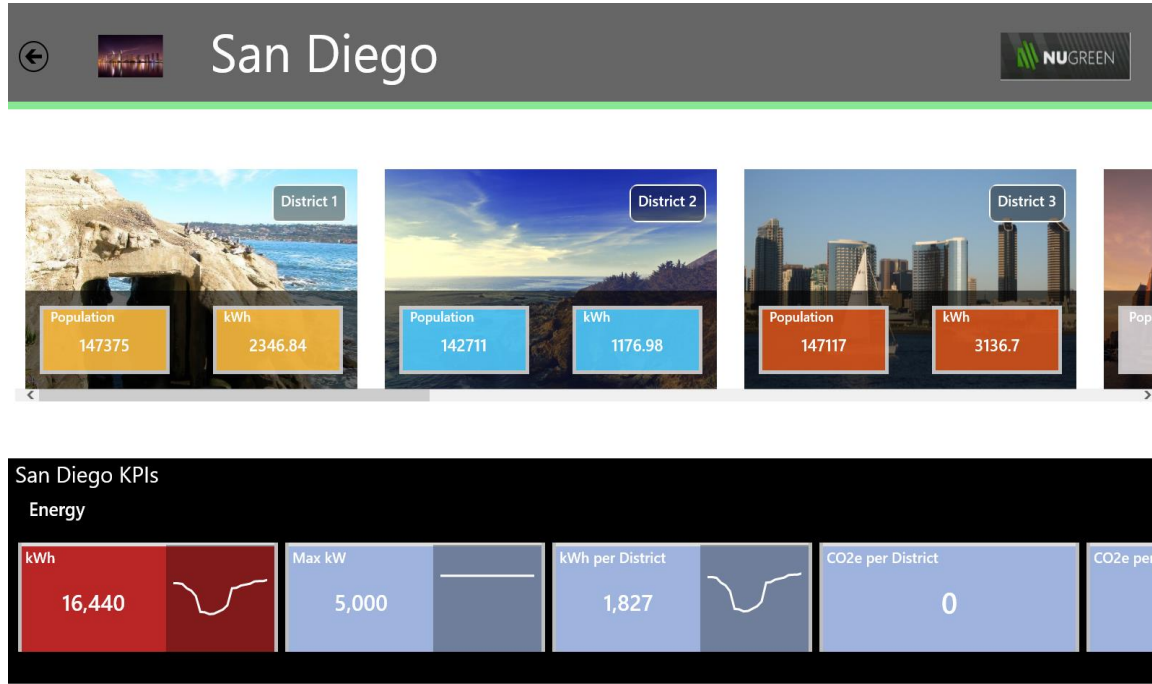


Mobile App

Mobile
Access
Near-zero
training



Custom Win8 Apps



Touch
Navigation
KPI's
Drill-down