SkyFoundry Insider

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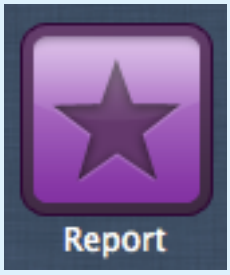
Data Presentation – from automatically generated views to custom reports

SkySpark offers a wide range of tools for visualizing the results of analytics and performing data analysis

SkySpark provides a wide range of automatically generated views that present users with the results of analytics. These views provide valuable insights into issues, faults, deviations from expected operation and opportunities for improved performance and cost savings.

In some cases though, special views are useful to meet specific reporting needs or project requirements.

SkySpark provides a wide range of features to enable you to create custom reports and output data to external programs for additional presentation development. This issue of the Insider will take a look at using SkySpark to create custom views and reports. Lets take a look!

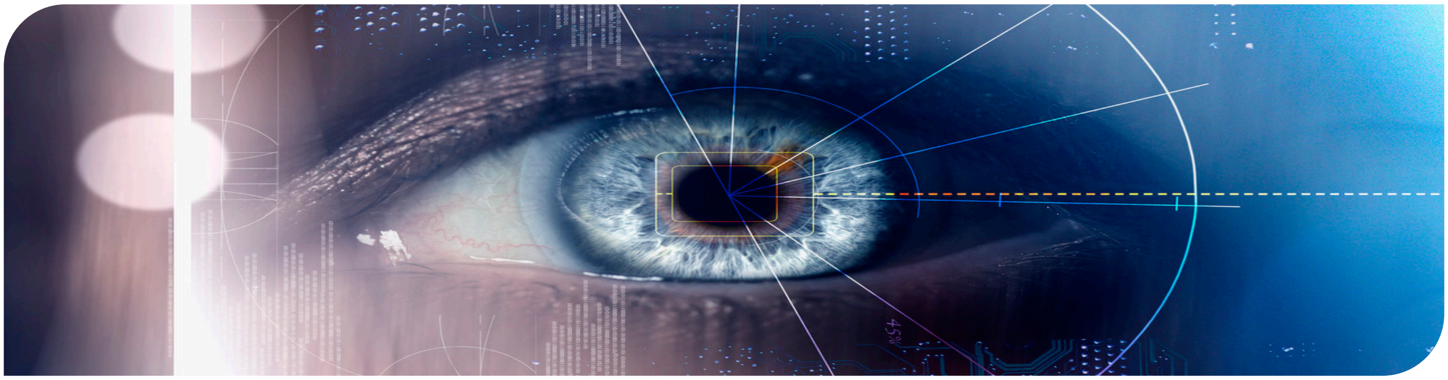


Creating Custom Reports

In addition to the standard views that SkySpark provides for operators via the Site App, Energy App and Historian, custom reports can be created and saved for easy selection with a single click from the **Report App**.

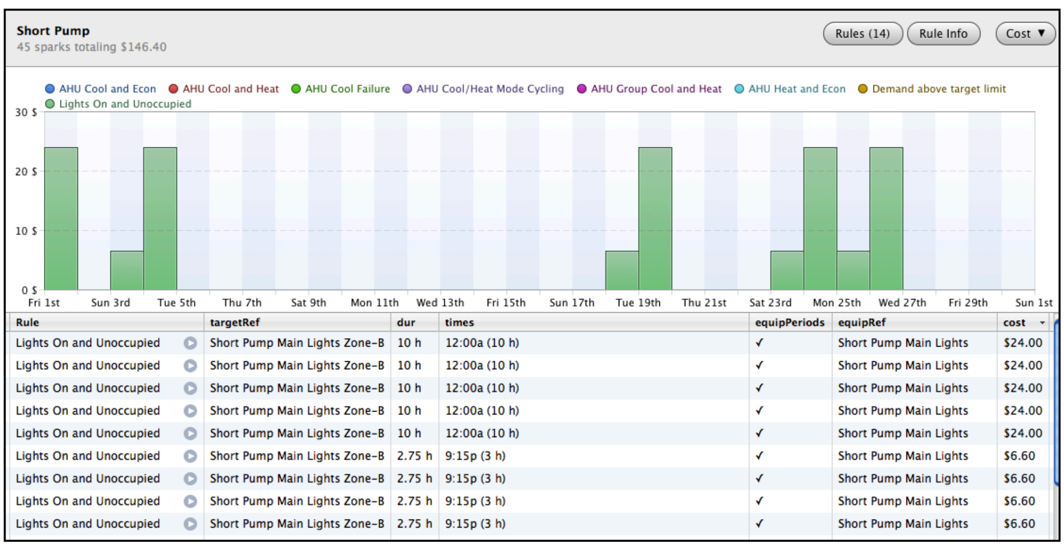
Custom reports can be based on sophisticated queries pulled directly from the database, or can be used to provide quick access to pre-configured views of Sparks, Energy or Historian reports.

Con't on page 3



Share Important Spark Views and Data with SkySpark's New Export Tools

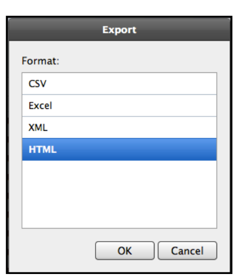
So here's the scenario – you're looking at a group of sparks from your portfolio of buildings. The main lighting circuits in one of your sites have not been operating according to schedule. It's costing real money ($146.40 just in April in this one site). You want to show your boss the results you've found and present them in a language that matters to him -- $$$. You need to get this information front of him now. The option – quickly download the Spark view with all of the associated cost data. Two clicks will take you from this SkySpark view:



Rule	targetRef	dur	times	equipPeriods	equipRef	cost
Lights On and Unoccupied	Short Pump Main Lights Zone-B	10 h	12:00a (10 h)	✓	Short Pump Main Lights	$24.00
Lights On and Unoccupied	Short Pump Main Lights Zone-B	10 h	12:00a (10 h)	✓	Short Pump Main Lights	$24.00
Lights On and Unoccupied	Short Pump Main Lights Zone-B	10 h	12:00a (10 h)	✓	Short Pump Main Lights	$24.00
Lights On and Unoccupied	Short Pump Main Lights Zone-B	10 h	12:00a (10 h)	✓	Short Pump Main Lights	$24.00
Lights On and Unoccupied	Short Pump Main Lights Zone-B	10 h	12:00a (10 h)	✓	Short Pump Main Lights	$24.00
Lights On and Unoccupied	Short Pump Main Lights Zone-B	2.75 h	9:15p (3 h)	✓	Short Pump Main Lights	$6.60
Lights On and Unoccupied	Short Pump Main Lights Zone-B	2.75 h	9:15p (3 h)	✓	Short Pump Main Lights	$6.60
Lights On and Unoccupied	Short Pump Main Lights Zone-B	2.75 h	9:15p (3 h)	✓	Short Pump Main Lights	$6.60
Lights On and Unoccupied	Short Pump Main Lights Zone-B	2.75 h	9:15p (3 h)	✓	Short Pump Main Lights	$6.60

to an HTML page you can email directly to him. First click on the Download Icon in the menu tray:

Then select HTML and click OK.



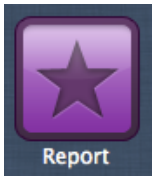
Con't on Page 4

The view to the left is automatically generated for the operator when SkySpark detects an issue or Rule violation - we call them "Sparks".

SkySpark tracks cost, duration and number of occurrences of Sparks and provides operators with automated notifications delivered right to their email.

Creating Custom Reports

Turn any query or view into a report any user can run with a single click



SkySpark's highly efficient query language lets trained users explore their data for an infinite number of relationships. Queries produce results in the form of charts and data grids like the ones below:

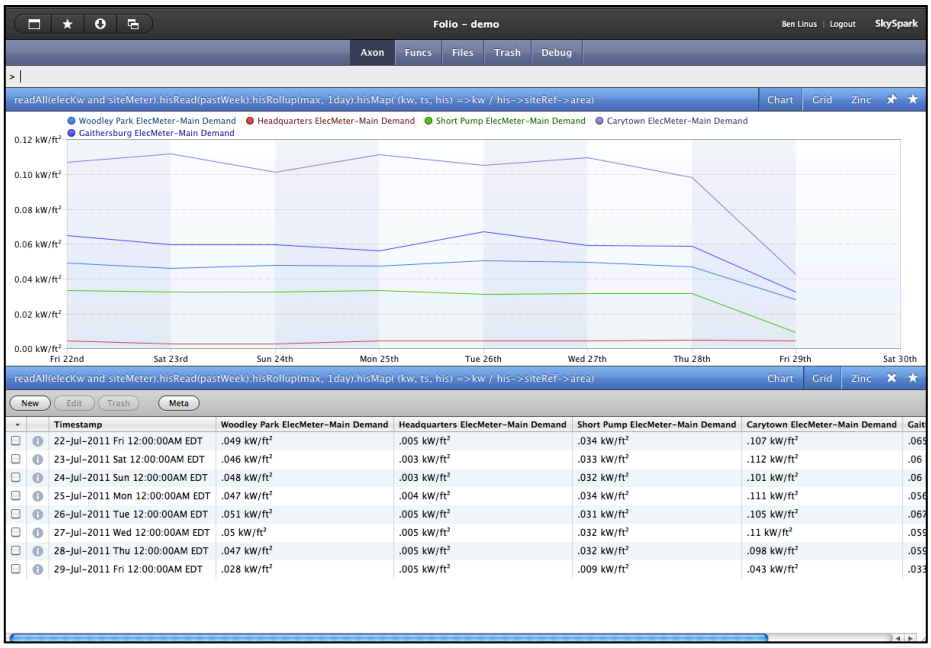
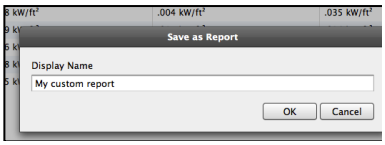


Chart and grid view showing Max/KW per Sq Ft for the past week across a portfolio of 5 sites

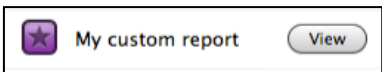
Often we want to provide less experienced users with the ability to run those same queries. It's easy to save any query as a report →

by just clicking on the "favorites" icon (the star):

Next, give the report a name and click OK



Now you have a report that any user can run with a single click from the Report App



The result: Any query, no matter how complex, is now available to any user! And any view in any SkySpark App can be saved for single click operation.

Why Analytics?

It all comes down to saving $$$

Efficient use of energy doesn't mean going without – it means doing more for less cost. Energy efficiency has been proven to be the most cost effective way to create new energy capacity. Reducing usage at the load by 1 unit results in a savings of approximately 10 units of energy at the point of generation due to losses that occur along the distribution chain, so reducing energy waste in your facilities has a huge impact on the grid and the environment as well as your bottom line.

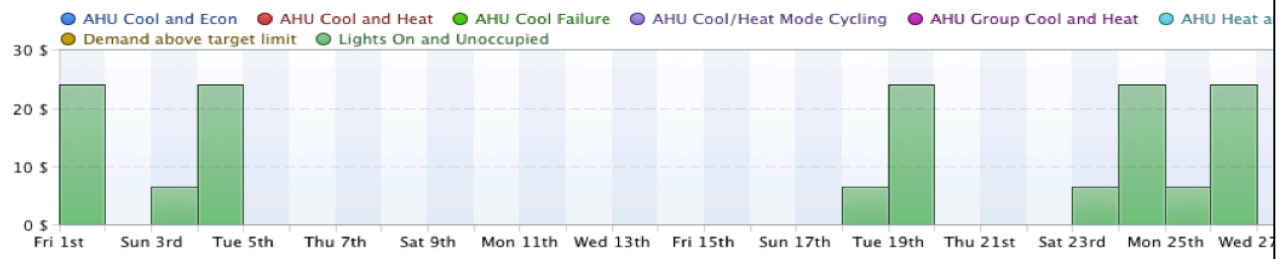
But how do we find the actual waste? Analytics designed to work with energy, building and equipment data is the key. Analytics enables you to gain additional value from the investments you have already made in your smart systems and devices. *It's like mining your data for money.*

Export Tools - Con't from Page 2

Now you have an HTML report showing all the issues, the costs and all of the related Spark data:

Site — demo — Apr-2011

Short Pump



spark	ruleRef	targetRef	date	dur	times	equipPeriods	siteRef	equipRef
✓	AHU Group Cool and Heat	Short Pump RTUs	29-Apr-2011	.5 h	3:15p (15 min), 7:45p (15 min)	✓	Short Pump	
✓	AHU Cool/Heat Mode Cycling	Short Pump RTU-2	29-Apr-2011	.5 h	3:15p (15 min), 7:45p (15 min)	✓	Short Pump	Short Pump RTU-2
✓	AHU Cool and Heat	Short Pump RTU-2	29-Apr-2011	.5 h	3:15p (15 min), 7:45p (15 min)	✓	Short Pump	Short Pump RTU-2
✓	AHU Heat and Econ	Short Pump RTU-2	28-Apr-2011	.25 h	9:00p (15 min)	✓	Short Pump	Short Pump RTU-2
✓	AHU Cool/Heat Mode Cycling	Short Pump RTU-2	28-Apr-2011	.25 h	9:00p (15 min)	✓	Short Pump	Short Pump RTU-2
✓	AHU Group Cool and Heat	Short Pump RTUs	28-Apr-2011	.25 h	9:00p (15 min)	✓	Short Pump	
✓	AHU Cool and Econ	Short Pump RTU-2	28-Apr-2011	.25 h	9:00p (15 min)	✓	Short Pump	Short Pump RTU-2
✓	AHU Cool and Heat	Short Pump RTU-2	28-Apr-2011	.25 h	9:00p (15 min)	✓	Short Pump	Short Pump RTU-2
✓	AHU Cool/Heat Mode Cycling	Short Pump RTU-2	27-Apr-2011	1.75 h	10:30a (15 min), 11:15a (15 min), 12:15p (15 min), ...	✓	Short Pump	Short Pump RTU-2
✓	AHU Group Cool and Heat	Short Pump RTUs	27-Apr-2011	1.75 h	10:30a (15 min), 11:15a (15 min), 12:15p (15 min), ...	✓	Short Pump	
✓	AHU Cool Failure	Short Pump RTU-2	27-Apr-2011	.25 h	8:00p (15 min)	✓	Short Pump	Short Pump RTU-2

Use HTML Exports in Other Applications

And if you want to build a custom report from a series of exported views you can open SkySpark HTML export files with a standard HTML editor to add additional commentary and information.

The download feature works with virtually every visualization app in SkySpark.

But Sometimes You Just Need Data

Its true - sometimes you don't want a graphical view, you want the data. The download app solves that too. Choose to download the data from any SkySpark view in Excel, XML or CSV format for processing in the application of your choice. Here's some of the same data in Excel:

Con't on Page 5

"With SkySpark I have the knowledge and experience of my best engineers watching every detail of my building operations every minute of the day"

New Analytic Functions for Slicing and Dicing Data… mmmm good!

Often when analyzing time-series data, we wish to examine "windows" of time. In essence, a *window* is a timestamp and duration pair. A *slice* is a sub-set of historical data, pulled from a window. SkySpark provides a suite of functions designed to compute different combinations of windows and slices.

- `hisSlidingWindows`
- `hisTransitionWindows`
- `hisSlice`
- `hisFindSlicePeriods`
- `hisMapSlices`

Windows
Windows of time can be created using two different techniques. A *sliding window* is a set of steps across a time range and can be created by the `hisSlidingWindows` function. For example if we wish to generate one-hour windows with 15min steps we can use this expression:

```
hisSlidingWindow(dates, 1hr,
15min)
```

Another technique often used to create windows is to look at the "state transition" of a point - for example, when a point turns on or off. The `hisTransitionWindows` function generates windows based on change-of-state historical data. For example, creating 15min windows of data every time a pump transitions from off to on.

Slices
We often wish to compare patterns of historical data against one or more windows. Let's say we have computed a set of windows of data related to that pump transitioning from on to off. We could use a slice function to compute the change in electrical demand from 5min before the transition to 10min after. The `hisSlice`, `hisFindSlicePeriods` and `hisMapSlices` functions generate slices from windows of data.

These new analytic functions dramatically simplify the development of rules for analyzing periods of data.

Happy slicing!

Exporting Data - Con't from Page 4

B	C	D	E	F	H	J
ruleRef	targetRef	date	dur	times	siteRef	cost
Lights On and Unoccupied	Short Pump Main Lights Zone-B	2011-04-25	2.75h	9:15p (3 h)	Short Pump	6.6$
Lights On and Unoccupied	Short Pump Main Lights Zone-B	2011-04-23	2.75h	9:15p (3 h)	Short Pump	6.6$
Lights On and Unoccupied	Short Pump Main Lights Zone-B	2011-04-18	2.75h	9:15p (3 h)	Short Pump	6.6$
Lights On and Unoccupied	Short Pump Main Lights Zone-B	2011-04-03	2.75h	9:15p (3 h)	Short Pump	6.6$
Lights On and Unoccupied	Short Pump Main Lights Zone-B	2011-04-26	10h	12:00a (10 h)	Short Pump	24$
Lights On and Unoccupied	Short Pump Main Lights Zone-B	2011-04-24	10h	12:00a (10 h)	Short Pump	24$
Lights On and Unoccupied	Short Pump Main Lights Zone-B	2011-04-19	10h	12:00a (10 h)	Short Pump	24$
Lights On and Unoccupied	Short Pump Main Lights Zone-B	2011-04-04	10h	12:00a (10 h)	Short Pump	24$
Lights On and Unoccupied	Short Pump Main Lights Zone-B	2011-04-01	10h	12:00a (10 h)	Short Pump	24$
AHU Group Cool and Heat	Short Pump RTUs	2011-04-29	0.5h	3:15p (15 min), 7:45p (15	Short Pump	
AHU Cool/Heat Mode Cyclir	Short Pump RTU-2	2011-04-29	0.5h	3:15p (15 min), 7:45p (15	Short Pump	
AHU Cool and Heat	Short Pump RTU-2	2011-04-29	0.5h	3:15p (15 min), 7:45p (15	Short Pump	
AHU Heat and Econ	Short Pump RTU-2	2011-04-28	0.25h	9:00p (15 min)	Short Pump	
AHU Cool/Heat Mode Cyclir	Short Pump RTU-2	2011-04-28	0.25h	9:00p (15 min)	Short Pump	
AHU Group Cool and Heat	Short Pump RTUs	2011-04-28	0.25h	9:00p (15 min)	Short Pump	
AHU Cool and Econ	Short Pump RTU-2	2011-04-28	0.25h	9:00p (15 min)	Short Pump	
AHU Cool and Heat	Short Pump RTU-2	2011-04-28	0.25h	9:00p (15 min)	Short Pump	
AHU Cool/Heat Mode Cyclir	Short Pump RTU-2	2011-04-27	1.75h	10:30a (15 min), 11:15a (	Short Pump	

Example of a SkySpark data view directly exported to Excel format

Or get your data in XML format:

```
<grid ver='1.0'>
<cols>
 <spark/>
 <ruleRef/>
 <targetRef/>
 <date/>
 <dur/>
 <times/>
 <equipPeriods/>
 <siteRef/>
 <equipRef/>
 <cost/>
 <viewPointRefs/>
</cols>
<row>
 <spark kind='Marker'/>
 <ruleRef dis='AHU Group Cool and Heat' kind='RecId'
val='15a88b9d-761386b1'/>
 <targetRef dis='Short Pump RTUs' kind='RecId'
val='15a88b9d-d4a2c1bc'/>
 <date kind='Date' val='2011-04-29'/>
 <dur kind='Number' val='0.5h'/>
 <times kind='Str' val='3:15p (15 min), 7:45p (15
min)'/>
 <equipPeriods kind='Marker'/>
 <siteRef dis='Short Pump' kind='RecId'
val='15a88b9d-6de36cac'/>
 <viewPointRefs kind='Str' val='15a88b9d-
48f98b7e,15a88b9d-f27bdc4f,15a88b9d-
c9509b80,15a88b9d-e5aaf948,15a88b9d-
4bd71006,15a88b9d-dac2396b,15a88b9d-
f121dfaa,15a88b9d-66341aa5,15a88b9d-
8e8c0b29,15a88b9d-4e3e6316,'/>
</row>
```

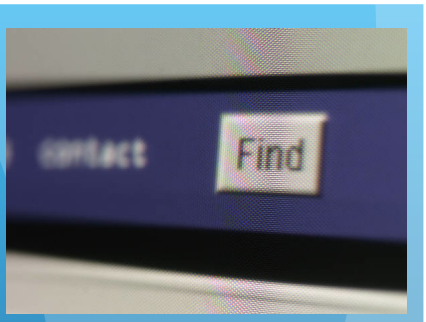
SkySpark not only gives you the benefit of automatically generated views on issues it detects, it give you access to all of your information in standard formats for additional processing. ***It's your data after all!***

SkySpark – Analytics for a World of Smart Devices

The past decade has seen dramatic advances in automation systems and smart devices. From IP connected systems using a variety of standard protocols, to support for web services and xml data schemas, it is now possible to get the data produced by the wide range of systems and devices found in today's buildings and equipment systems.

Access to this data opens up new opportunities for the creation of value-added services to help businesses reduce energy consumption and cost and to identify opportunities to enhance operations through improved control, and replacement of capital equipment.

Access to the data is just the first step in that journey, however. The new challenge is how to manage and derive value from the exploding amount of data available from these smart and connected devices.



The new frontier is to efficiently manage and analyze data to *find what matters*.

Project Haystack Community is Growing Daily – Over 100 Industry Experts are Actively Contributing to Building an Open Source Data Modeling Standard – Join the process!

One of the challenges in managing and analyzing data from equipment systems and smart devices is to be able to interpret its meaning. Today most operational data has poor semantic modeling and requires a manual, labor-intensive process to "map" the data before analytics can begin. Standard naming conventions and taxonomies can dramatically reduce the costs of preparing data for analysis.

Project Haystack is an open source initiative to develop naming conventions and taxonomies for building equipment and operational data. The project defines standardized models for sites, equipment, and points related to energy, HVAC, lighting, and other systems.

Response to the project has been overwhelmingly positive. You can check it out at http://project-haystack.org/. Please consider joining the effort – its open to everyone. The standards process is moving forward every week!

Project Haystack

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