

## KPI

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### Introduction

This is an introduction to the optional KPI extension of InferStack™. You must purchase analytics to use this extension. We will cover how to access it through the graphical interface, and use it to set up and analyze key performance indicators. Reference information is also provided for further study.

### KPI app

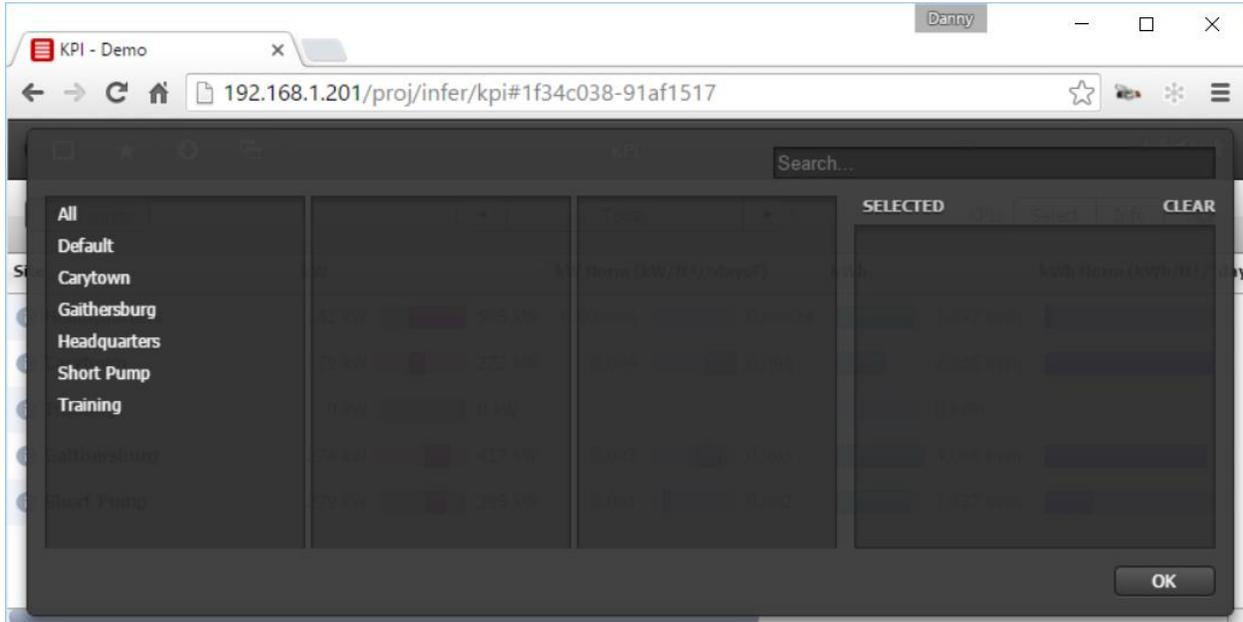
The KPI app allows you to see the Key Performance Indicators that have been previously set up.

Site	kW	kW Norm (kW/R²/°daysF)	kWh	kWh Norm (kWh/R²/°daysF)	kWh Δ Prev Year (kWh/°daysF)	Spark Cost	Sparks Count	ZoneTemp Δ Sp
Headquarters	182 kW	0.000086	3,600 kWh	0.002	-206.252	\$0	1	
Carytown	179 kW	0.004	2,285 kWh	0.05	-88.887	\$0	1	
Training	0 kW	0.006	0 kWh			\$0	0	
Gaithersburg	274 kW	0.003	4,032 kWh	0.05	-201.59	\$0	4	
Short Pump	279 kW	0.001	3,432 kWh	0.01	-168.502	\$0	5	

There is a row for each Site with each KPI in a column. You can click on a column header to sort by that column. In addition, once you have a view that you like, you can Save as Report or Export in the header.

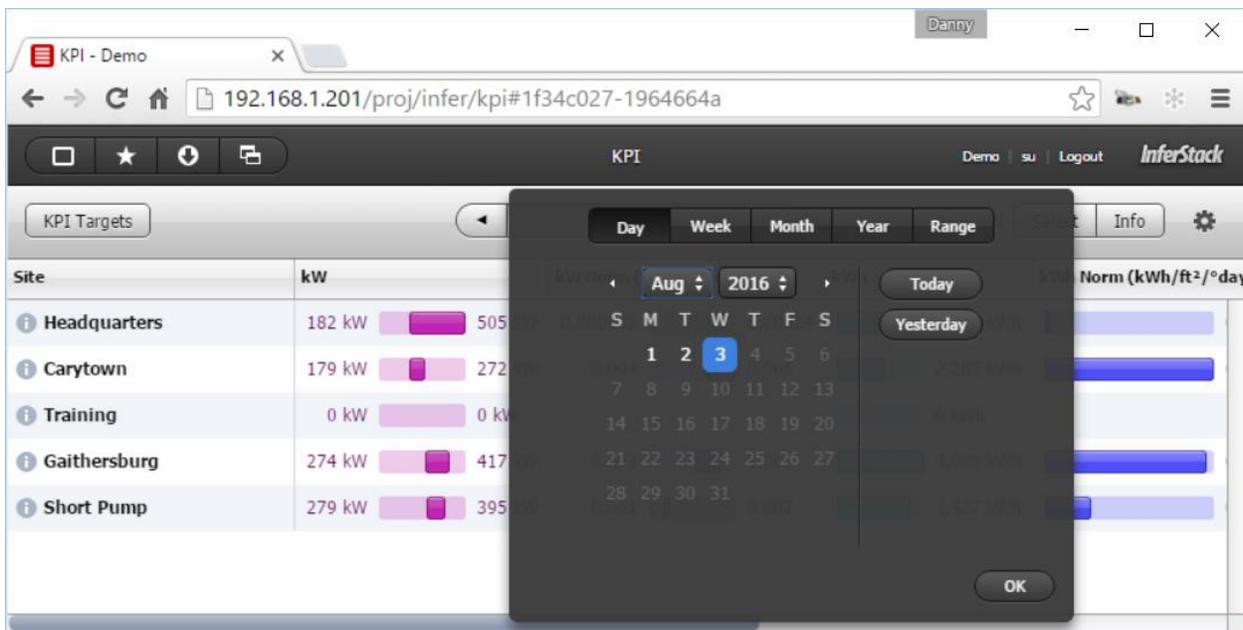
## KPI Targets

You can select the sites to view. Default is All.



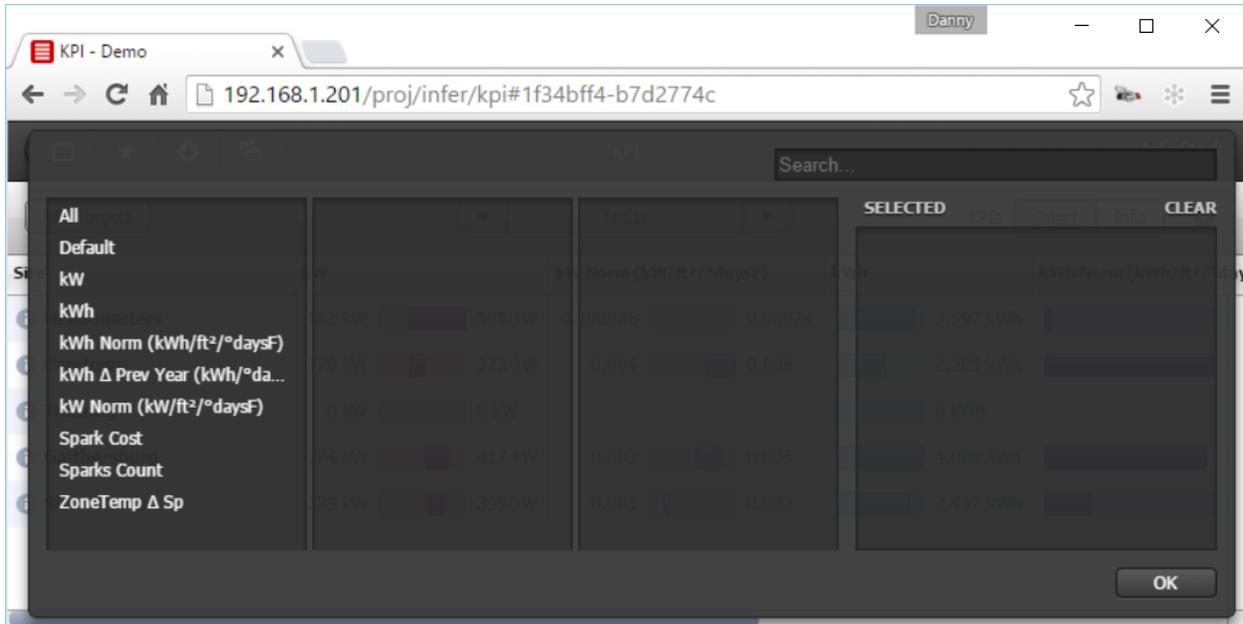
## Date Picker

The default is Today but you can select any time period.



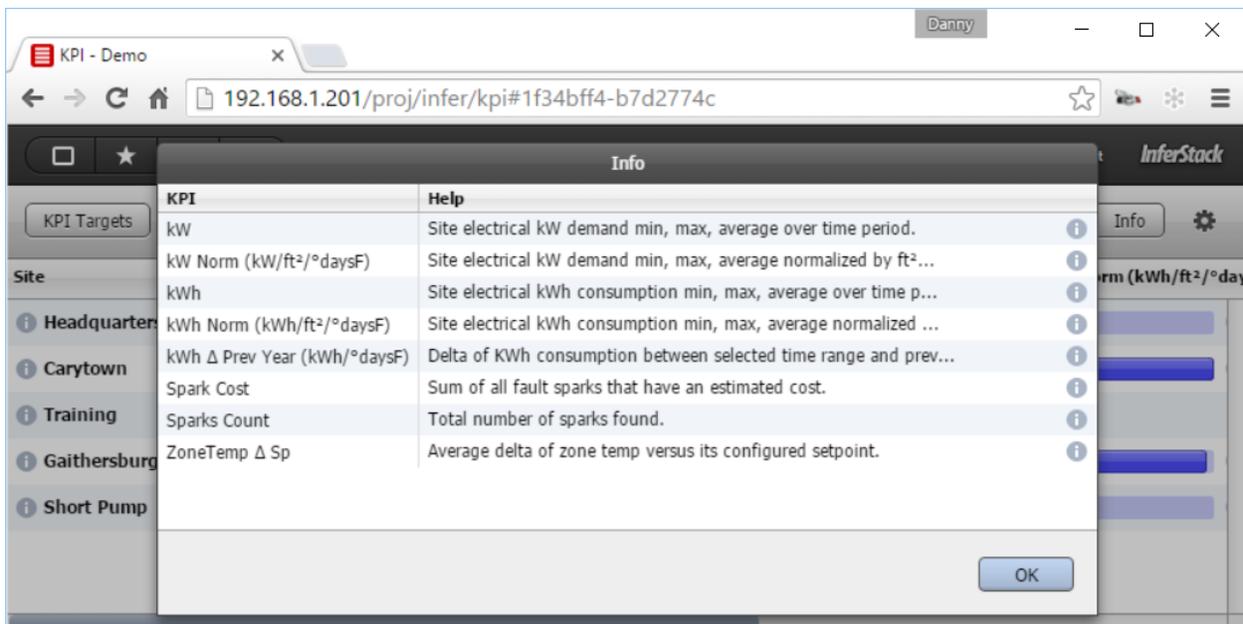
## KPIs Select

You can select the KPIs to view. Default is All.



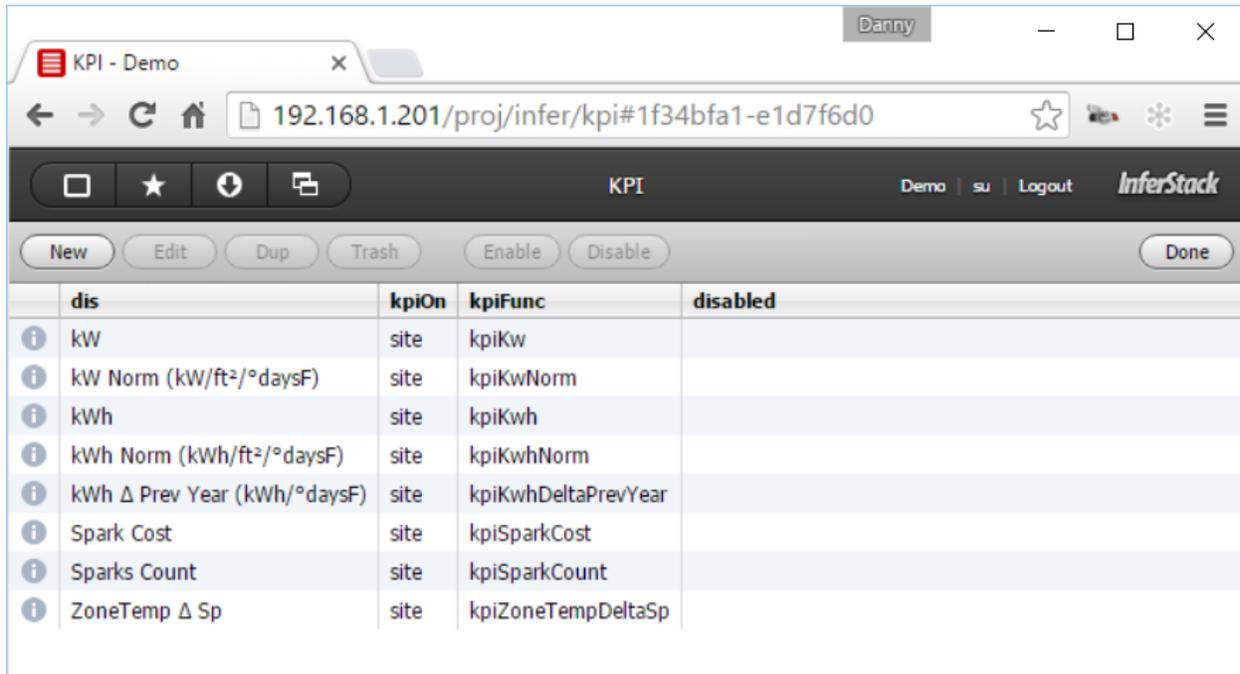
## KPIs Info

This provides information on each KPI that has been set up.



## Show Configuration

This provides access to the KPIs that have been set up. You can create New, Edit, Dup, Trash, Enable or Disable.



	dis	kpiOn	kpiFunc	disabled
i	kW	site	kpiKw	
i	kW Norm (kW/ft <sup>2</sup> /°daysF)	site	kpiKwNorm	
i	kWh	site	kpiKwh	
i	kWh Norm (kWh/ft <sup>2</sup> /°daysF)	site	kpiKwhNorm	
i	kWh Δ Prev Year (kWh/°daysF)	site	kpiKwhDeltaPrevYear	
i	Spark Cost	site	kpiSparkCost	
i	Sparks Count	site	kpiSparkCount	
i	ZoneTemp Δ Sp	site	kpiZoneTempDeltaSp	

## Design

The KPI extension is used to compute key performance indicators using Axon functions.

We use the following terms to discuss the KPI design:

- **KPI Rec:** this is the record in the database that describes the KPI: dis, func, target filter, and help
- **KPI Func:** this is the function that takes a target and a date and range and computes a KPI Result
- **KPI Result:** a Dict that provides the summary information computed for a given target and date range

KPIs are measured on a target over a variable range of time. For example total kWh consumption of a site over a range of time such as yesterday, last month, this year, etc.

The KPI app provides user access to the KPIs.

The screenshot shows a web browser window displaying the InferStack KPI dashboard. The dashboard has a header with 'KPI' and 'Today' navigation. Below the header is a table with the following columns: Site, kW, kW Norm (kW/R<sup>2</sup>/°daysF), kWh, kWh Norm (kWh/R<sup>2</sup>/°daysF), kWh Δ Prev Year (kWh/°daysF), Spark Cost, Sparks Count, and ZoneTemp Δ Sp. The table contains data for four sites: Test, Carytown, BACnet, and Haystack. Each row has colored bars representing the values for kW, kW Norm, kWh, kWh Norm, and kWh Δ Prev Year. Spark Cost and Sparks Count are shown as numerical values with corresponding colored bars.

Site	kW	kW Norm (kW/R <sup>2</sup> /°daysF)	kWh	kWh Norm (kWh/R <sup>2</sup> /°daysF)	kWh Δ Prev Year (kWh/°daysF)	Spark Cost	Sparks Count	ZoneTemp Δ Sp
Test						\$0	0	
Carytown	257 kW	0.002	2,498 kWh	0.003	-87.946	\$13.95	1	
BACnet						\$0	0	
Haystack						\$0	0	

## KPIs versus Sparks

The KPI feature works very much like the [sparkExt](#) and follows many of the same conventions. But it is useful to compare sparks versus KPIs.

To compare KPI terms against the Spark terms:

```
KPI Rec      <-> Rule Rec
KPI Func     <-> Rule Func
KPI Result   <-> Spark
```

Some of the similarities:

- Both use a level of indirection for the kpi/rule rec and the computation function
- Both have the concept of "rule/kpi ready" functions
- Both have notion of targets specified with a filter
- Both model results as Dicts

The major differences between KPIs and Sparks:

- Sparks are considered exceptional, but we expect KPIs are always available for any date range
- We assume KPIs can be computed fast "on-demand" for the user interface, sparks are often much more complicated computations requiring a cache engine
- KPIs are simple sum or min/max, Sparks are timelines of an exceptional condition

## KPI Results

Results are represented as a [dict](#) with an arbitrary set of tags (name/value pairs). All results have the following tags:

- `kpi`: marker tag
- `kpiRef`: Ref for the generating KPI rec
- `targetRef`: Ref for the target the KPI ran against
- any other tags generated by the KPI function

The system supports specific kinds of KPIs which have expected tags:

- **sum**: used to express some totalized variable with the `sum` tag. Examples include total cost, energy usage, runtime hours, etc.
- **spread**: a spread KPI is used to indicate the range of some control variable expressed with the `min` and `max` tags. Examples include kW min/max, temperature min/max, etc.

- **delta**: a delta KPI is used to indicate a difference between two variables with the `delta` tag. The center point of a delta KPI is zero. Examples include delta of energy versus baseline or sensor versus its setpoint.

## KPI Rec

A KPI rec is defined with the following tags:

- `kpi`: marker tag
- `dis`: display name
- `help`: documentation for end users
- `kpiOn`: filter which specifies targets of KPI
- `kpiFunc`: Axon expression which evaluates to function which computes the KPI
- `disabled`: marker tag to temporarily disable the KPI from running

All KPIs are configured *on* some target filter. Note: today the UI only provides tools for working with `site` targets.

Each KPI defines a `kpiFunc` tag which can be any Axon expression which evaluates to a function which takes two parameters: (target, dates). The function must return a Dict with the proper tags based on its type (sum or min/max). If no data is available to compute the KPI then the function should return null.

## KPI Example

Let's walk through a complete example. Let's start with the function we call `kpiSiteKwh`:

```
(site, dates) => do
  pt: read(energy and equipRef->siteMeter and siteRef==site->id)
  his: hisRead(pt, dates)
  {sum: his.foldCol("v0", sum)}
end
```

The function above is given a site record and a date range. It resolves the main site meter's consumption point, reads the historical data, and then sums it up.

We can configure that function as a KPI rec as follows:

```
kpi
kpiOn: "site"
kpiFunc: "kpiSiteKwh"
dis: "Site KWH"
help: "Total electrical consumption for date range"
```

## KPI Ready Funcs

Some functions are defined explicitly to be used with KPIs. We call these functions *KPI ready*. To make a function KPI ready should define the following tags:

- `kpiOn`: suitable default for KPI's `kpiOn` tag
- `dis`: suitable default for the KPI's `dis` tag
- `help`: suitable default for the KPI's `help` tag

Tools used to configure KPIs will query the project's function library for KPI ready functions for easy configuration.

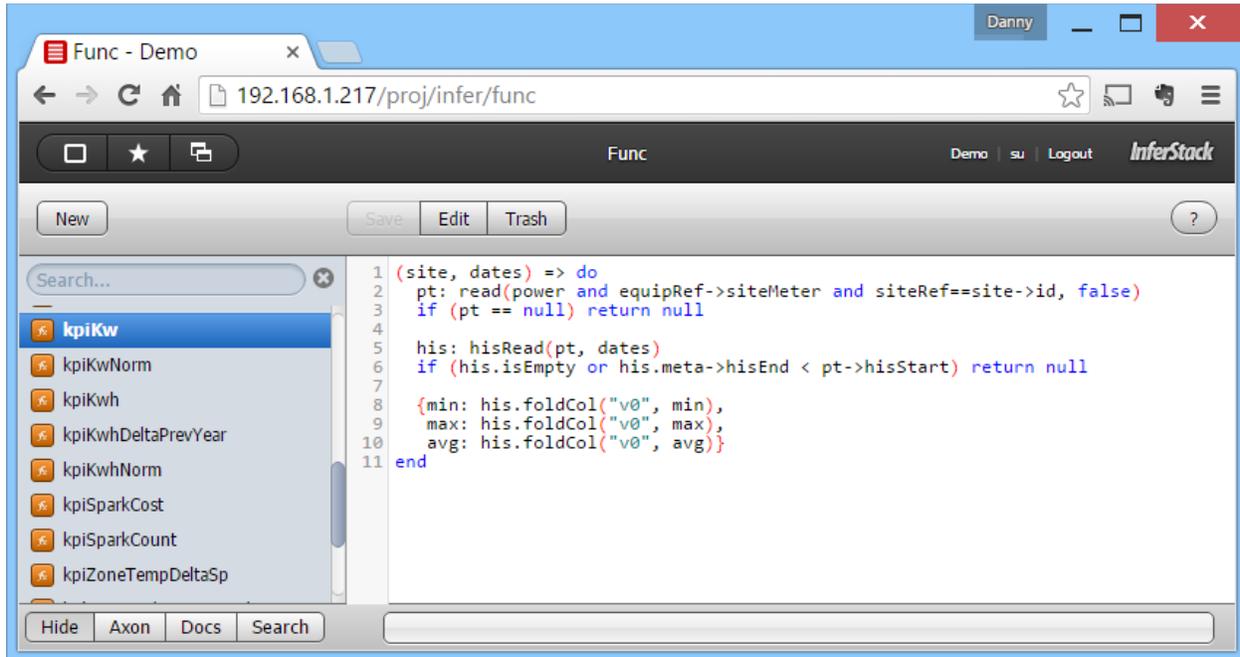
## KPI Functions in the Demo Database

The demo database has 8 KPIs defined:

- kW - Site electrical kW demand min, max, average over time period.
- kW Norm - Site electrical kW demand min, max, average normalized by ft<sup>2</sup> and degree day.
- kWh - Site electrical kWh consumption min, max, average over time period.
- kWh Norm - Site electrical kWh consumption min, max, average normalized by ft<sup>2</sup> and degree day.
- kWh Delta Prev Year - Delta of kWh consumption between selected time range and previous year normalized by degree day.
- Spark Cost - Sum of all fault sparks that have an estimated cost.
- Sparks Count - Total number of sparks found.
- ZoneTemp Delta Sp - Average delta of zone temp versus its configured setpoint.

dis	kpiOn	kpiFunc	disabled
<i>i</i> kW	site	kpiKw	
<i>i</i> kW Norm (kW/ft <sup>2</sup> /°daysF)	site	kpiKwNorm	
<i>i</i> kWh	site	kpiKwh	
<i>i</i> kWh Norm (kWh/ft <sup>2</sup> /°daysF)	site	kpiKwhNorm	
<i>i</i> kWh Δ Prev Year (kWh/°daysF)	site	kpiKwhDeltaPrevYear	
<i>i</i> Spark Cost	site	kpiSparkCost	
<i>i</i> Sparks Count	site	kpiSparkCount	
<i>i</i> ZoneTemp Δ Sp	site	kpiZoneTempDeltaSp	

You can review many of the KPI functions in the demo using the Func app.



## Querying

The `kpi` function is used to query for KPIs along the three dimensions of targets, KPIs, and dates. Some simple examples:

```
// query all KPIs for all sites for yesterday
readAll(site).kpi(yesterday)
```

```
// query only KPIs tagged with energy
readAll(site).sparks(2011-10, readAll(kpi and energy))
```

## Reference

There are a number of references available on your device or server.

Online docs are available at <http://licensing.intellastar.com/doc/> .