Translating Data Into Insight To Enable ISO 50001 Energy Management Standard Certification

19 August 2015

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Schneider Electric

Agenda

> ISO 50001 in perspective
> Energy Planning
> Establish Energy Baseline
> Establish Energy Performance Index
> Complete The Lifecycle
> StruxureWare Power Management Software

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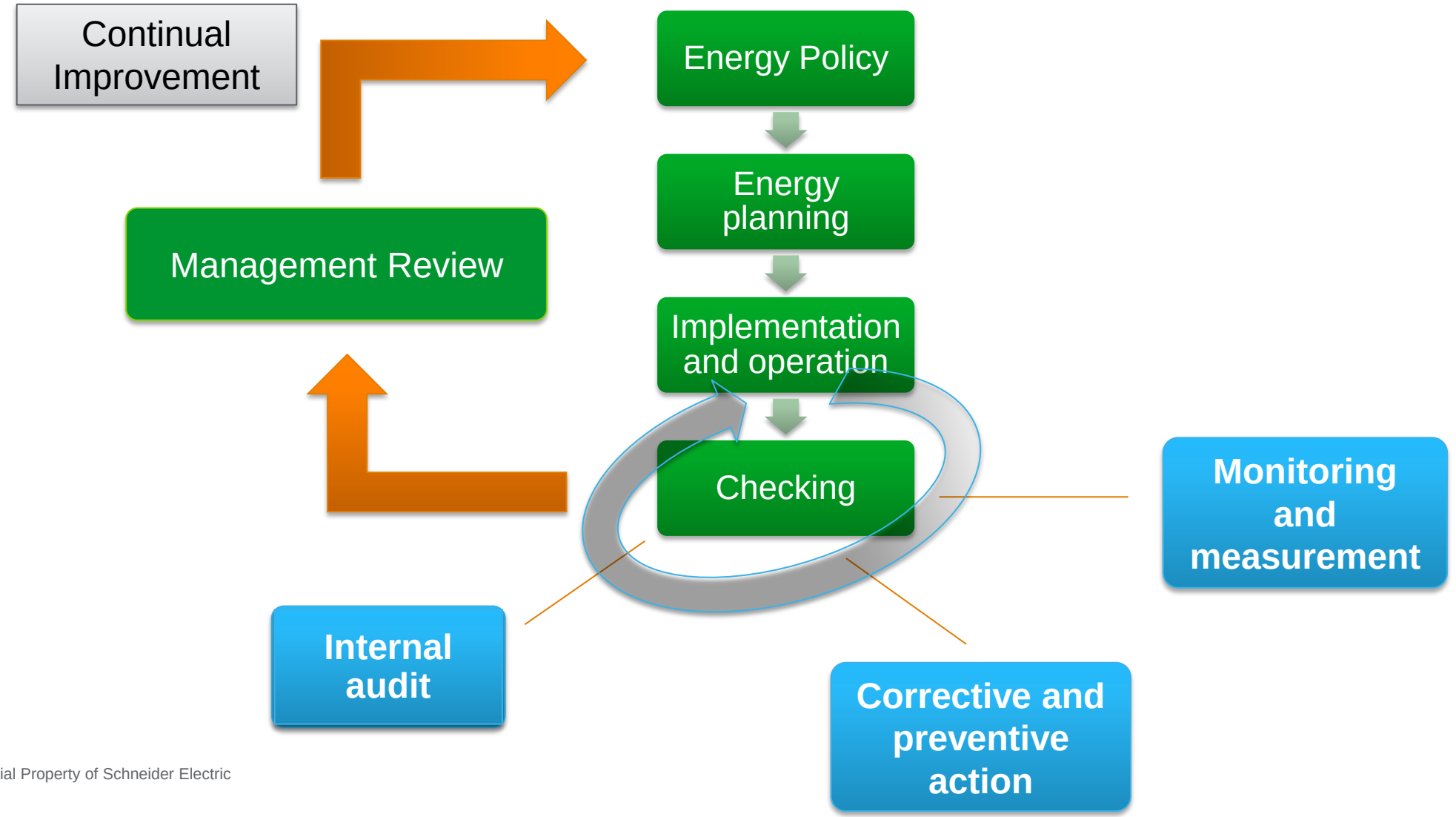
ISO 50001 in perspective



ISO 50001 is the international version of the EN 16001 Energy management standard

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Plan-Do-Check-Act (PDCA) Cycle



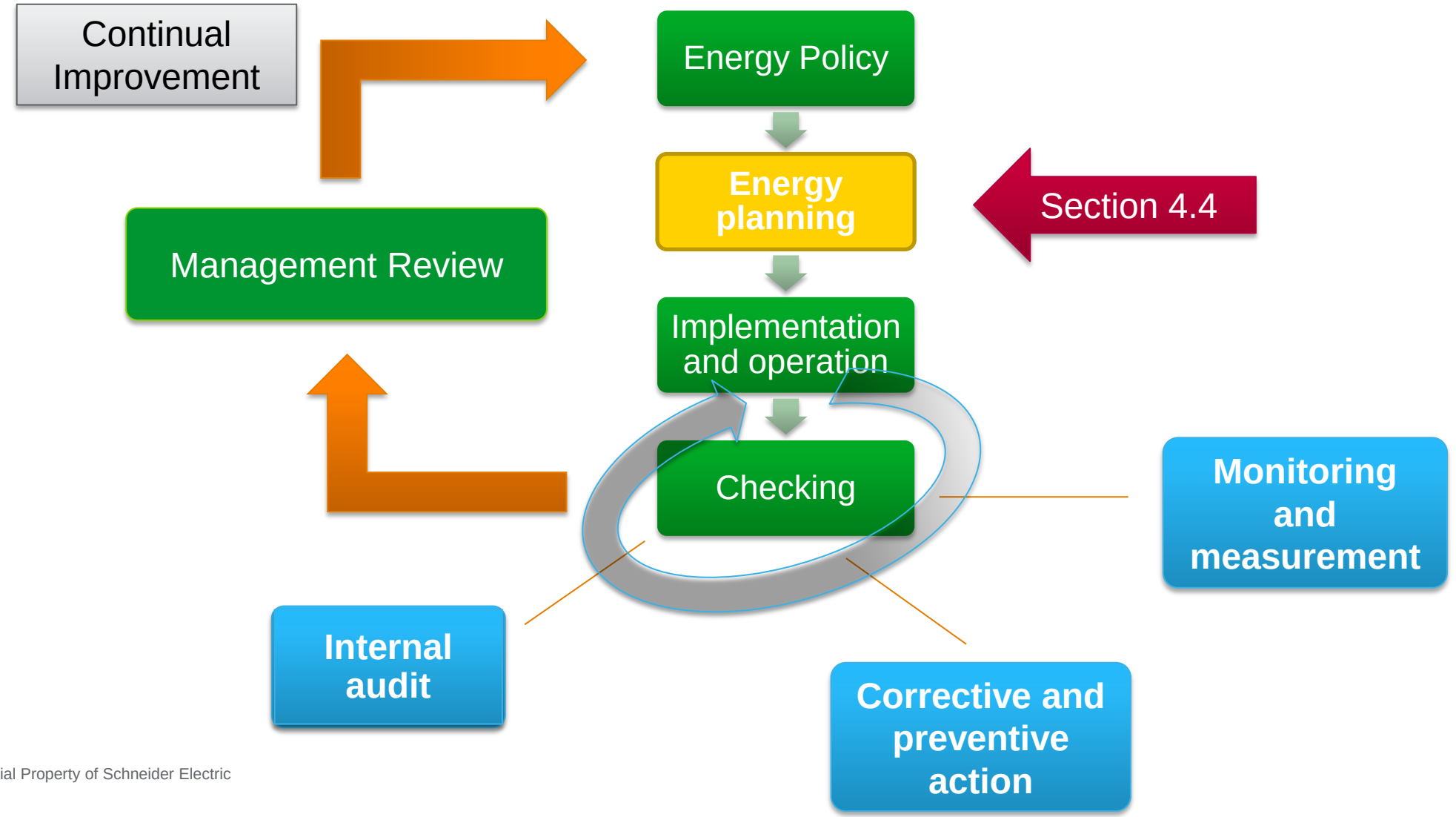
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ISO 50001 Main Requirements

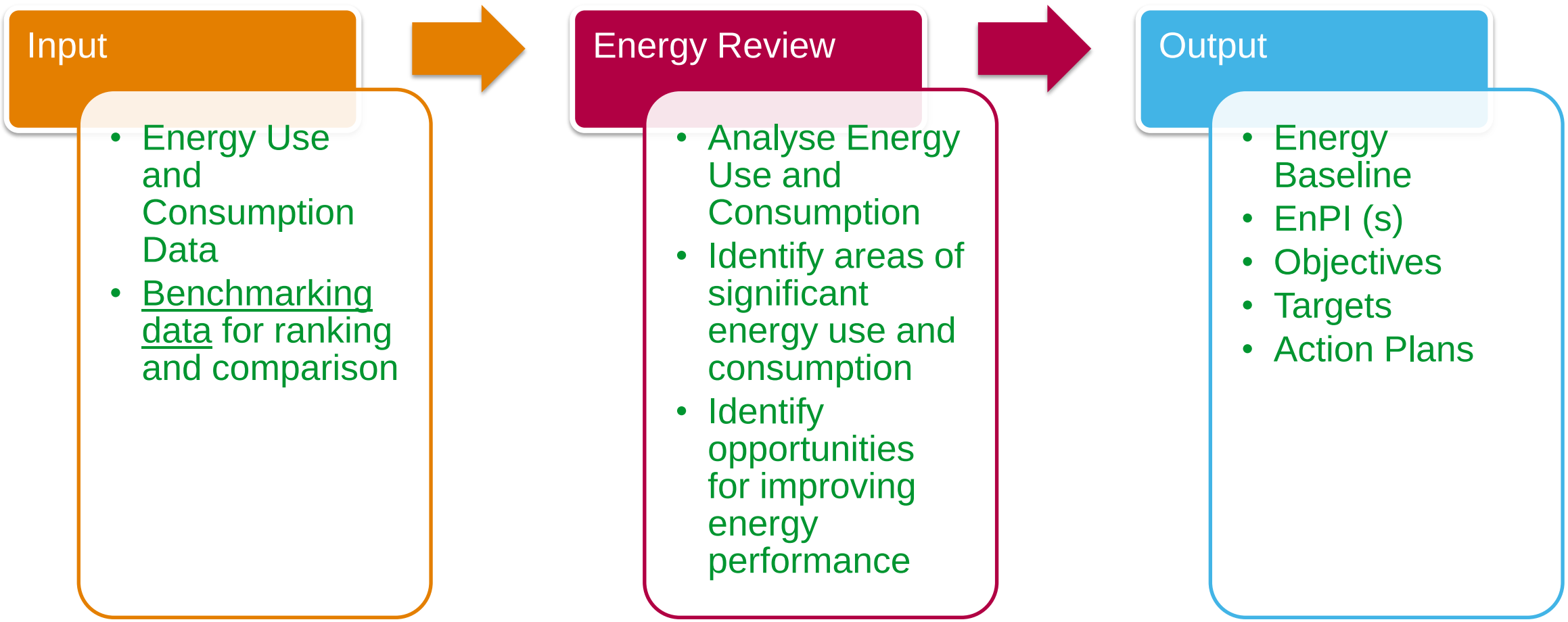


- **Continuous Improvement**
- **Usage Tracking**
- **Energy Review**
- Recommendations for Improvement
- Action Plans for Improvement
- Periodic Maintenance
- Documentation of Operational Procedures
- Communication Protocol
- Training Program

ISO 50001 - Energy Planning

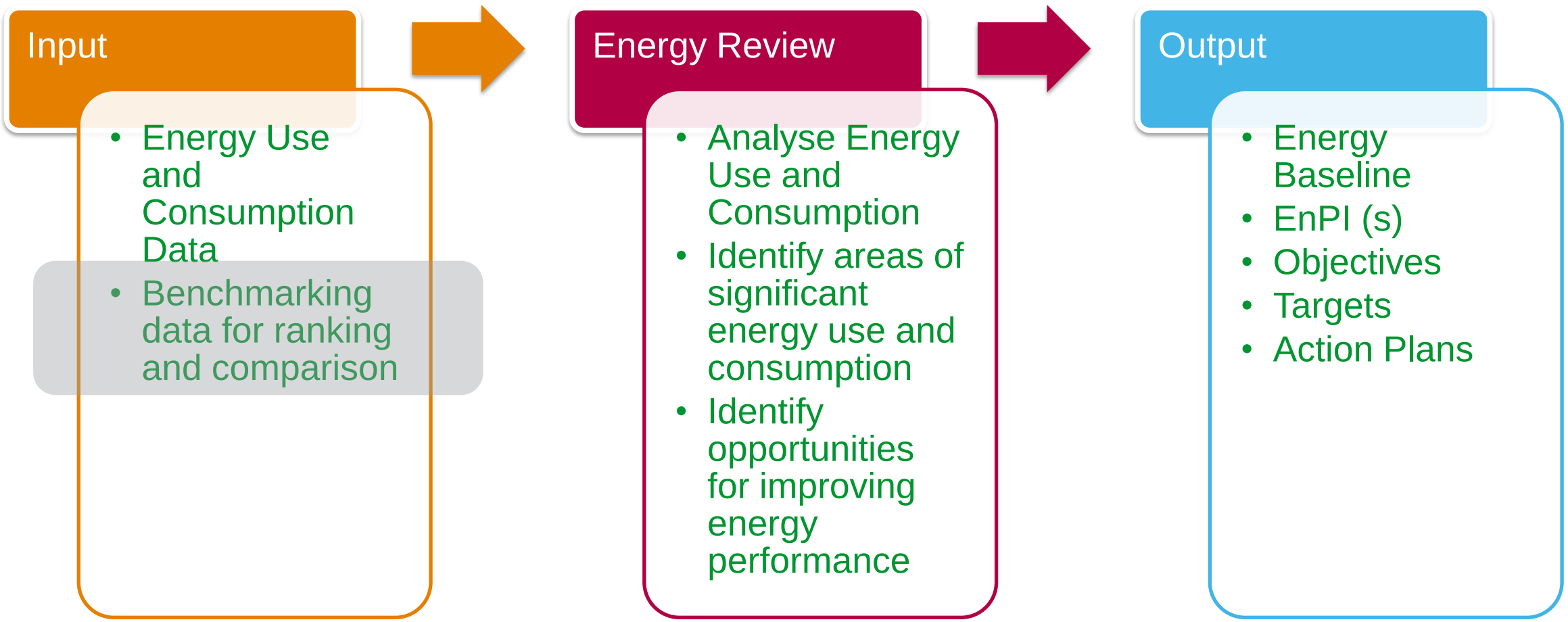


Energy Planning Process



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Energy Planning Process

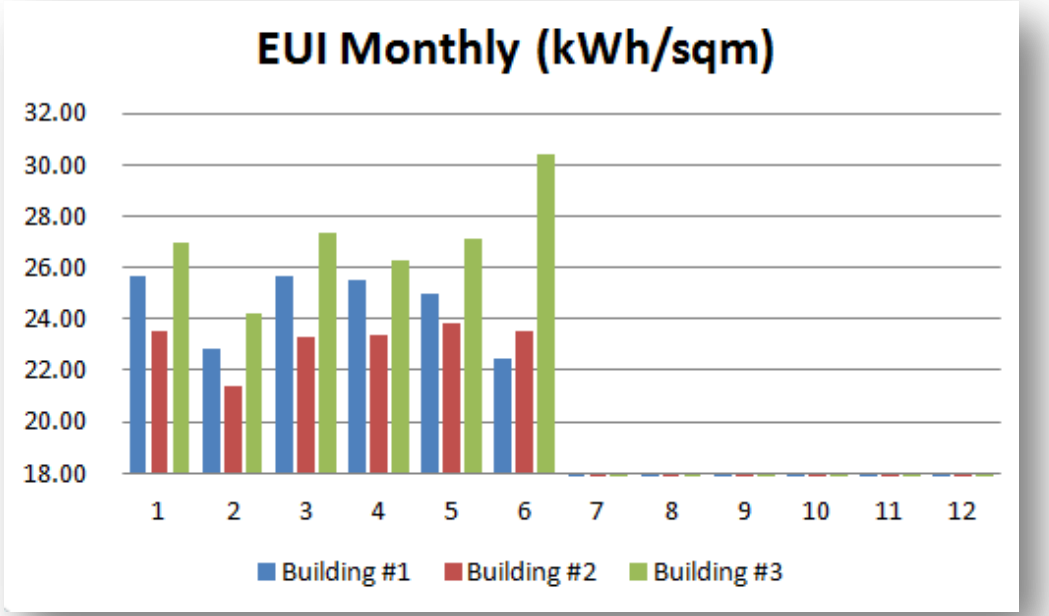


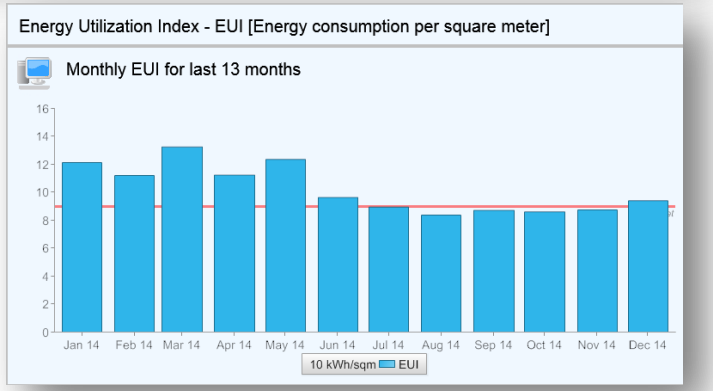
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Benchmarking Through Normalisation

> Normalise energy data to relevant KPI (ie energy per square meter, energy per person, energy per production output)
  > Static scalar to facilitate fairer comparisons

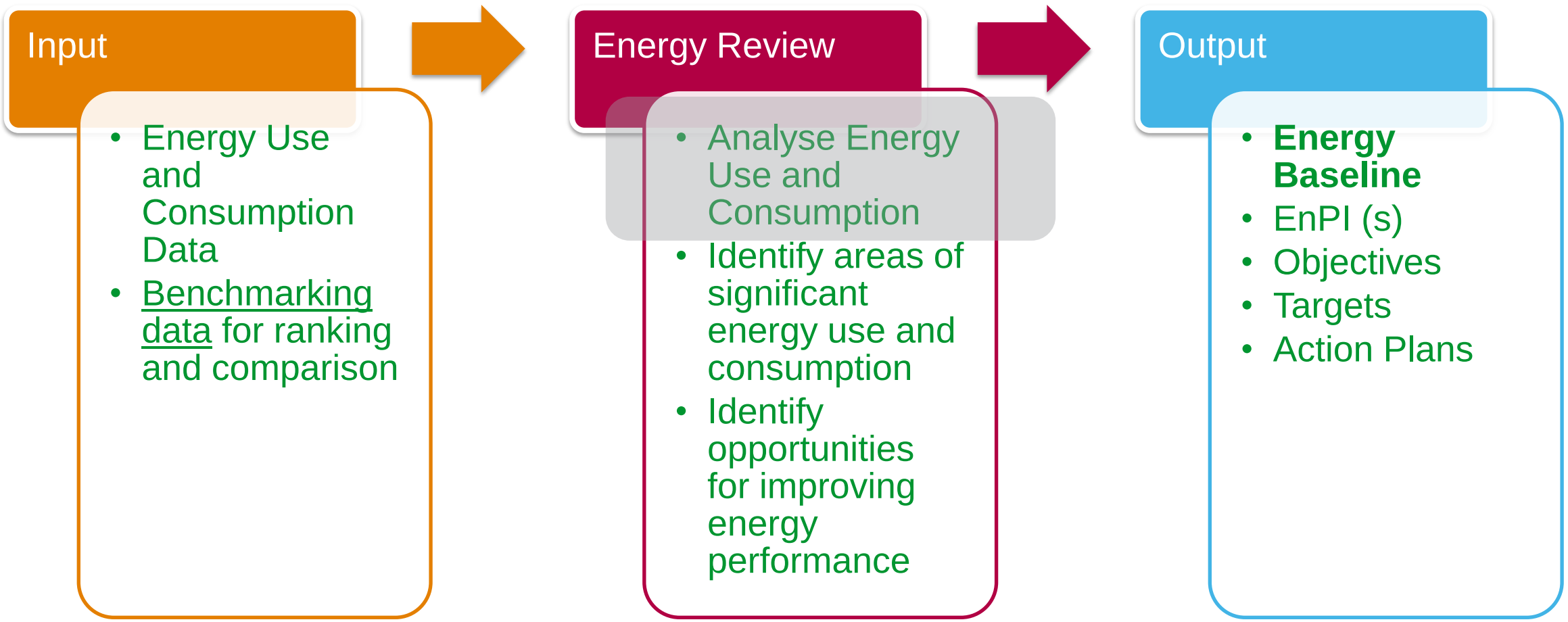
> To identify areas of significant energy use and consumption





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Energy Planning Process



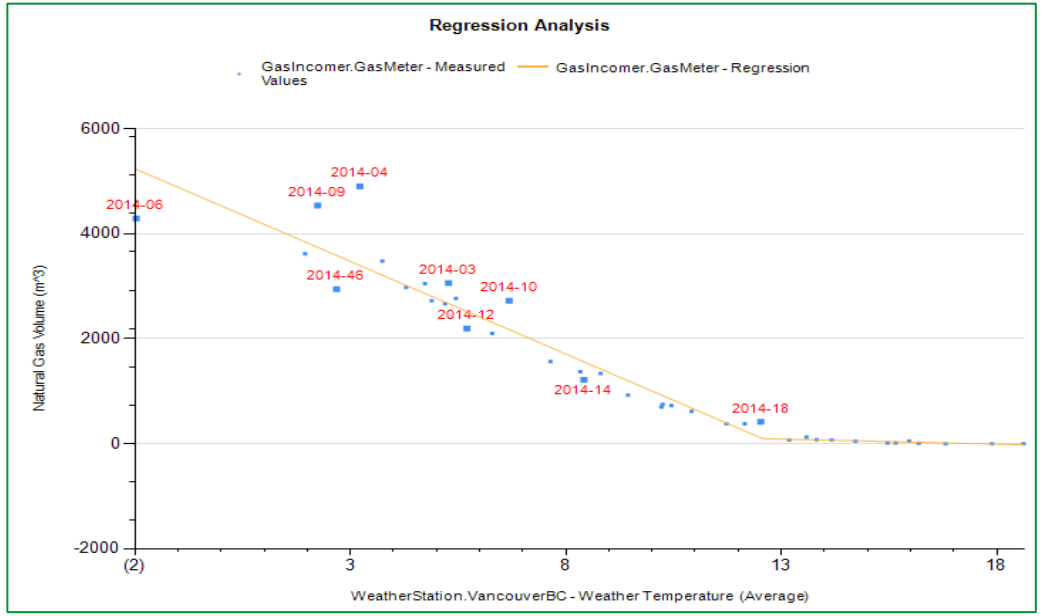
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Analyse Energy Use Through Regression Analysis

> Correlate data to key parameters (temperature data, production, working hours) through regression analysis

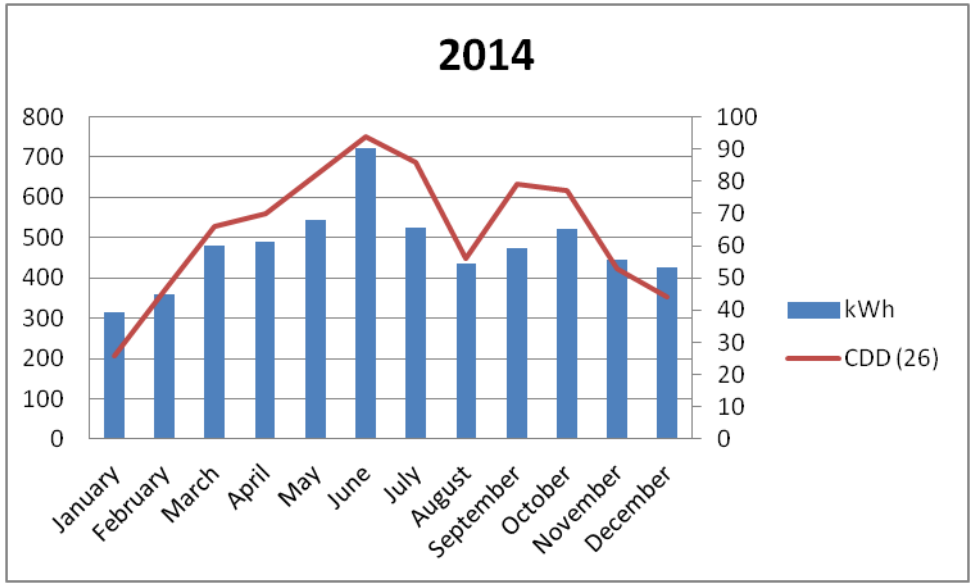
> Linerar regression is normally used, for one dimension analysis compare to others which is more complex

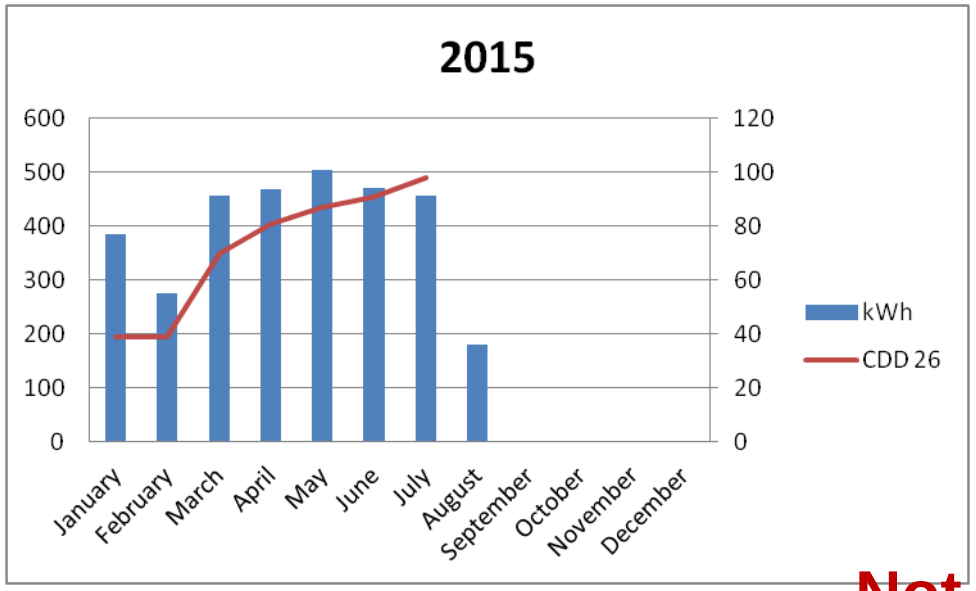
> **To establish Energy Baseline through mathematical model**



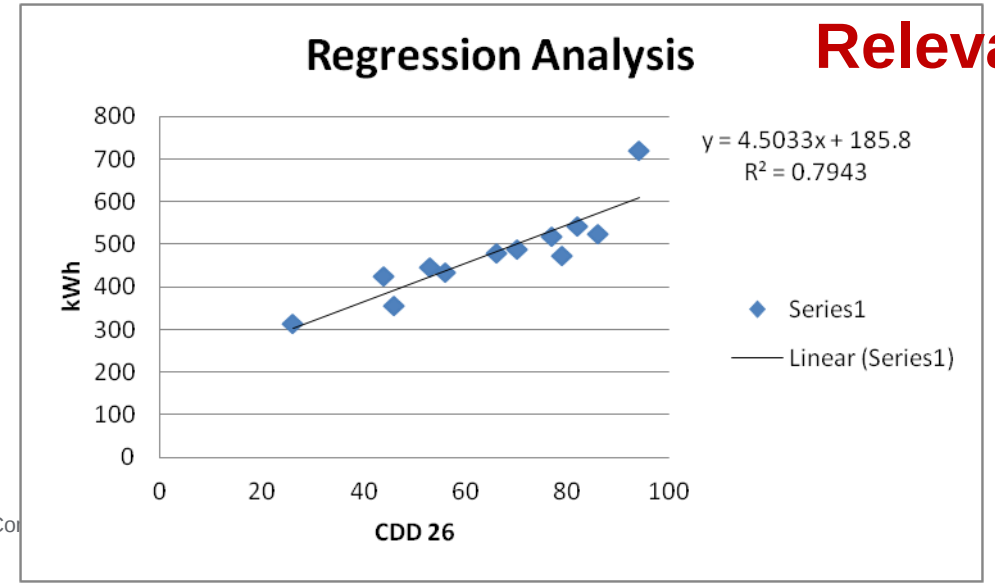
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What do these charts tell you?

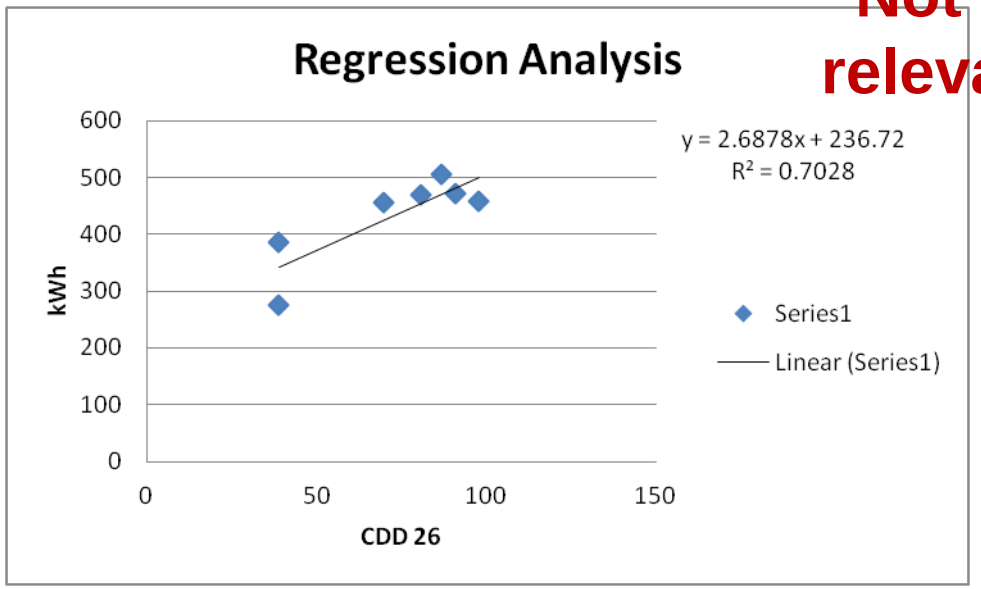




Relevant!



Not so relevant!



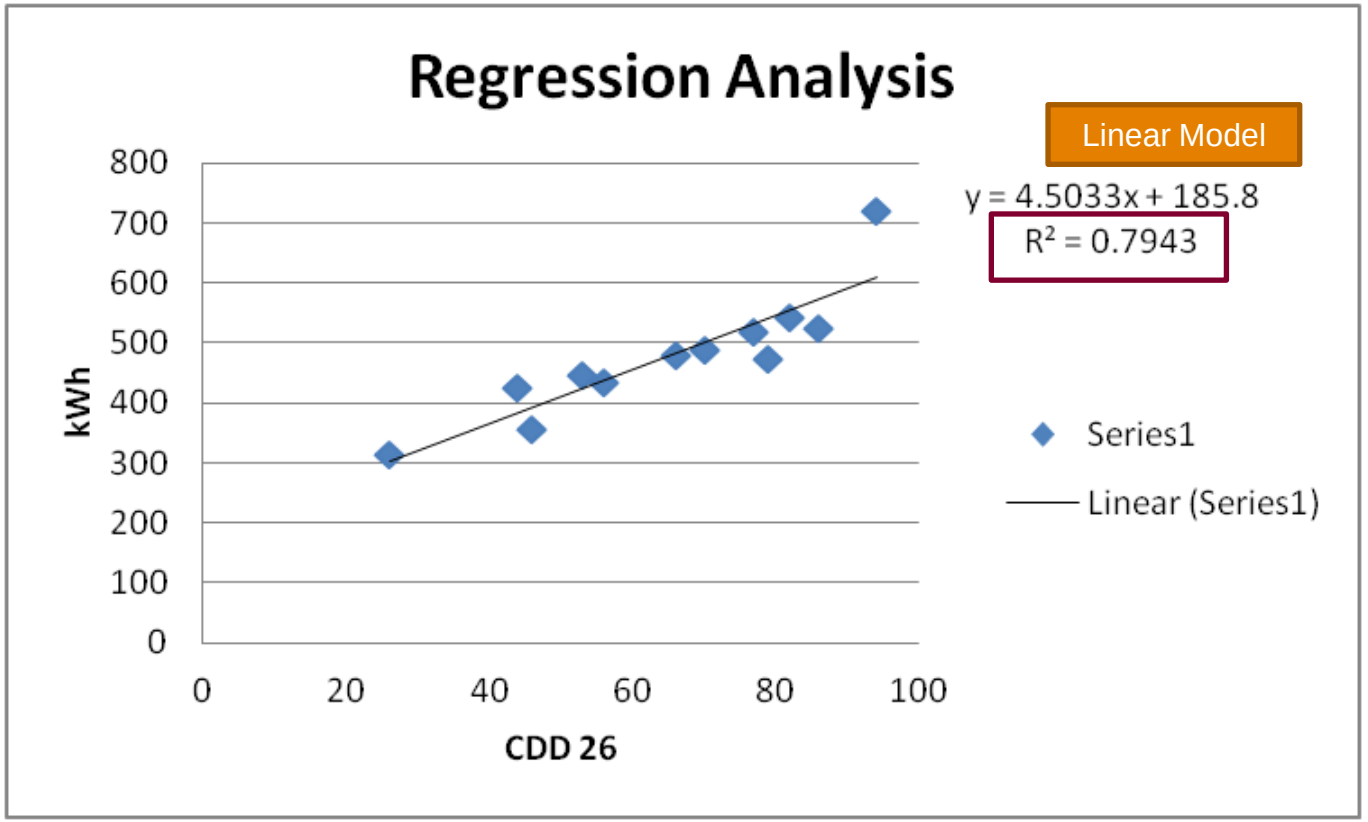
Analysing Uncertainty

R^2 is the most common evaluation index which represents the fraction of variation in data explained in the model.

R^2 greater than about 0.75 is commonly acceptable.

There are further more advanced methods to analyse the data statistically.

> Could not cover in this session…



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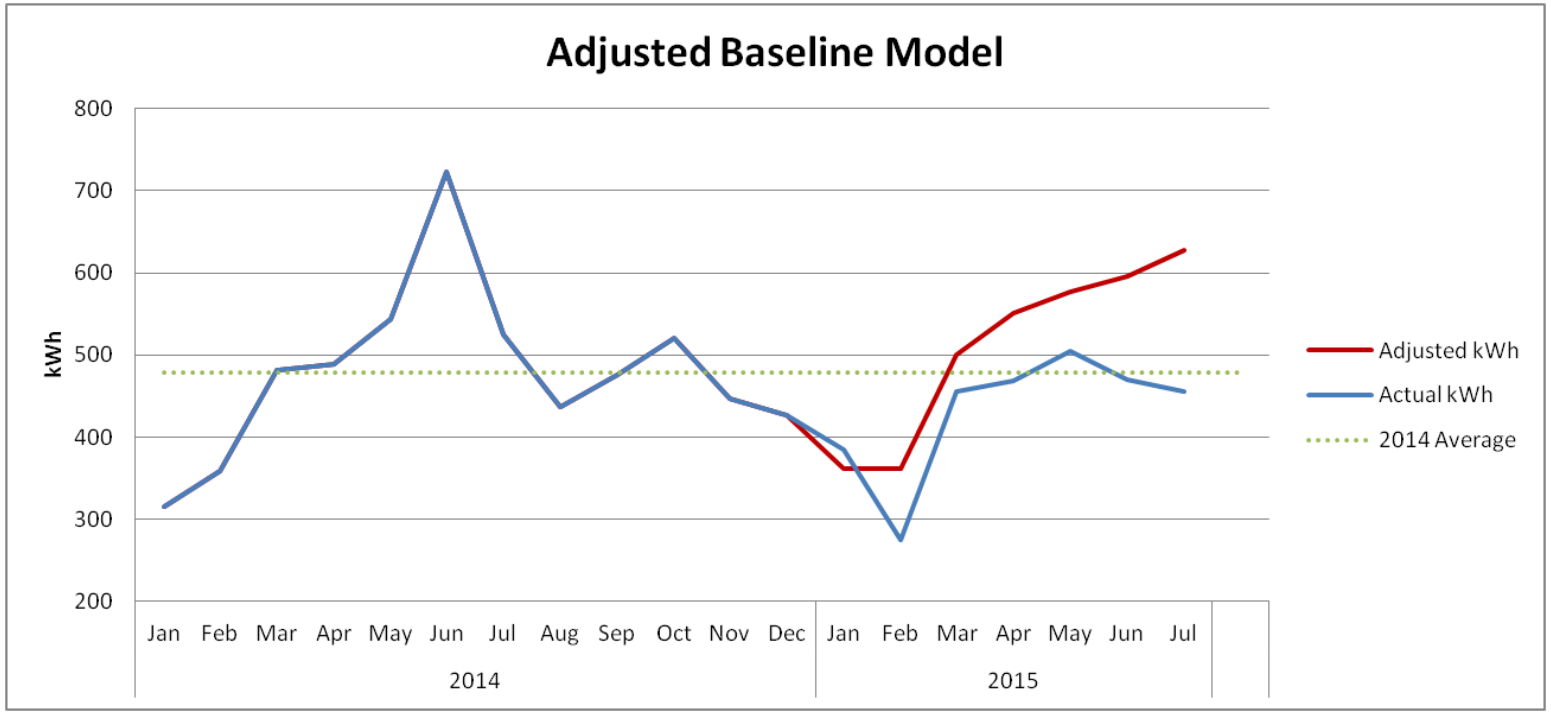
Adjustments using baseline model

Continue from the previous example, the baseline model is generated using linear regression:

Baseline = 4.5X + 185.8

> X is CDD26

With CDD26 in 2015.



The actual savings is those area between the red and blue line

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Energy Planning Process

Input

- Energy Use and Consumption Data
- Benchmarking data for ranking and comparison

Energy Review

- Analyse Energy Use and Consumption – Correlation study
- Identify areas of significant energy use and consumption
- Identify opportunities for improving energy performance

Output

- Energy Baseline
- **EnPI (s)**
- Objectives
- Targets
- Action Plans

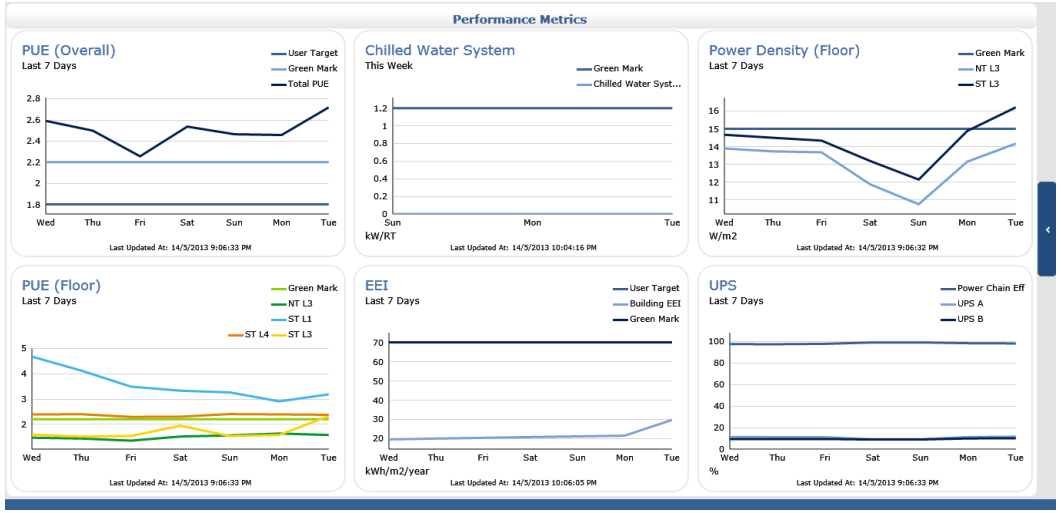
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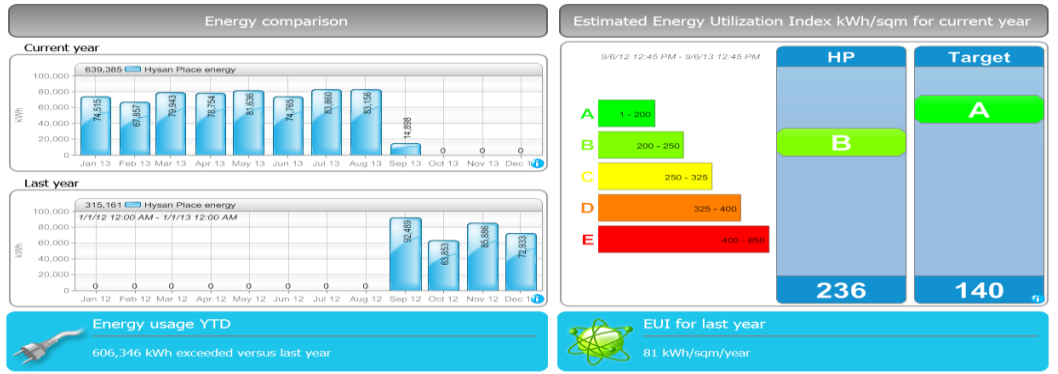
Establish Energy Performance Indicators

> To enable continuous monitoring and measuring energy performance

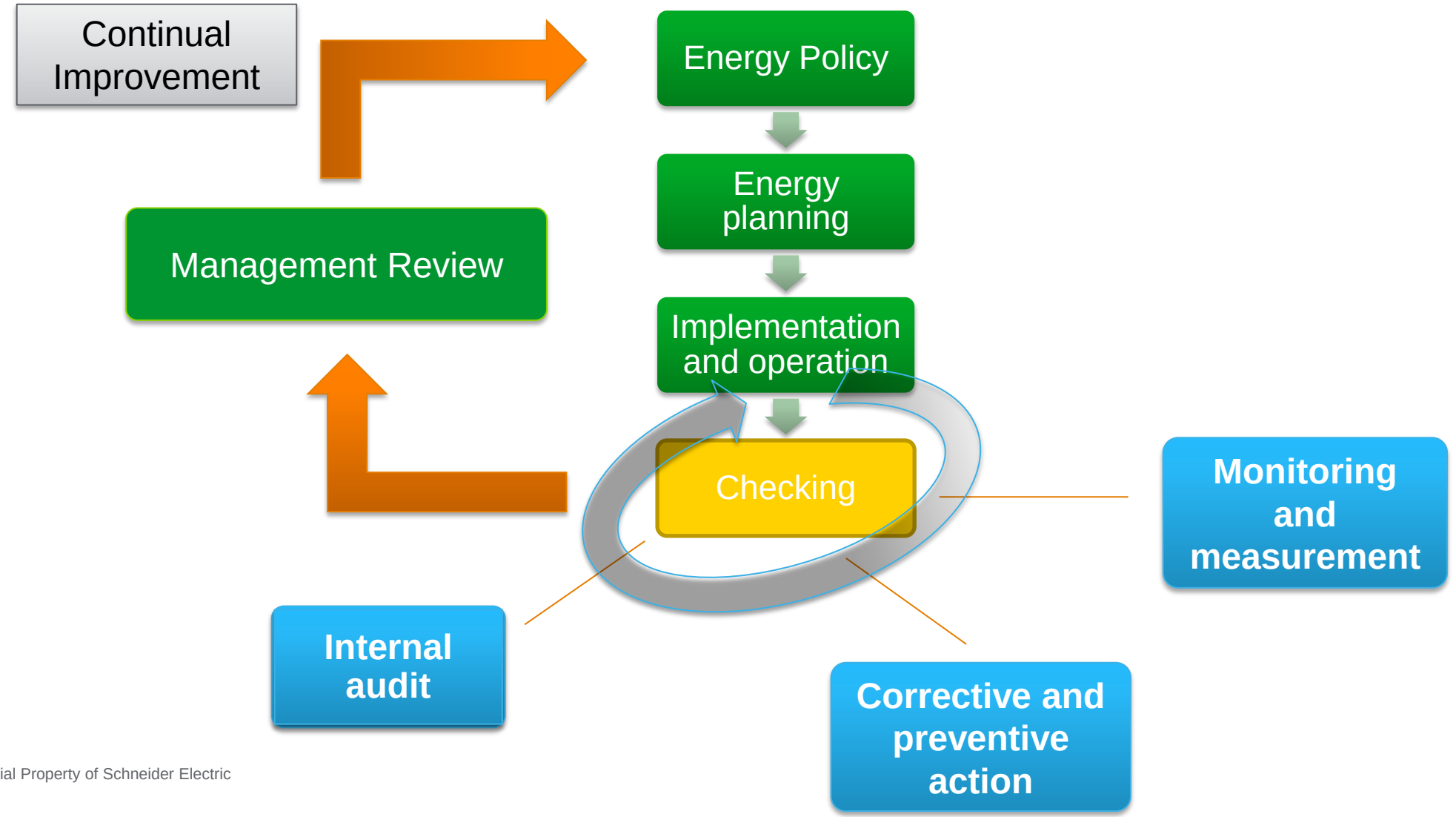
> Commonly found EnPI are such as
  > Energy Utilisation Index (EUI) (kWh/sqm/year),
  > Chiller System Efficiency (kW/RT),
  > Power Usage Effectiveness (PUE) for Data Centre
  > Production Usage Effectiveness (kWh/production output)
  > Power Density (W/sqm)

> Find the right indicator that relates to the operation and business needs





ISO 50001: Checking



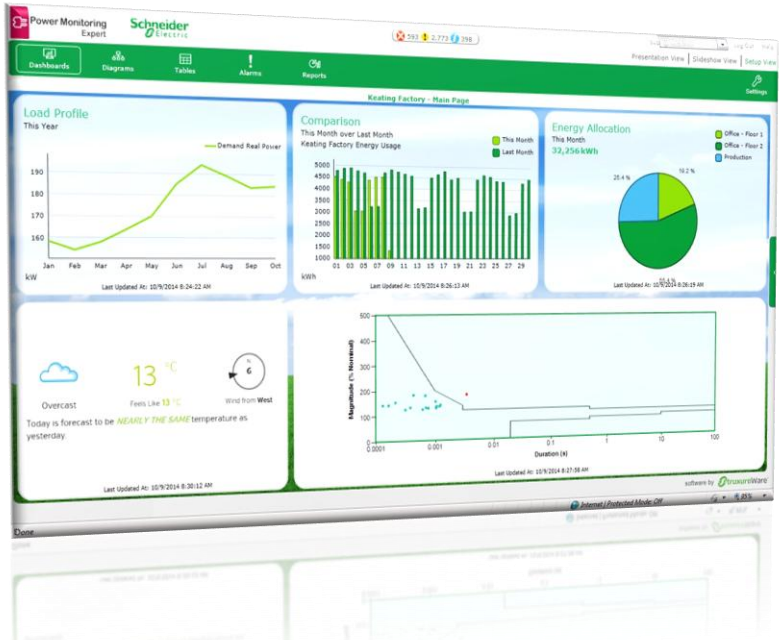
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Cyclic Checking

> Cyclic checking process enables constant evaluation of the implementation and operation through
  > monitoring, measurement and analysis
  > internal audit of EnMS
  > corrective and preventive action

> EnMS implementation to generate periodic report for analysis purpose, continuously monitoring and measuring identified EnPI for next stage Management Review.

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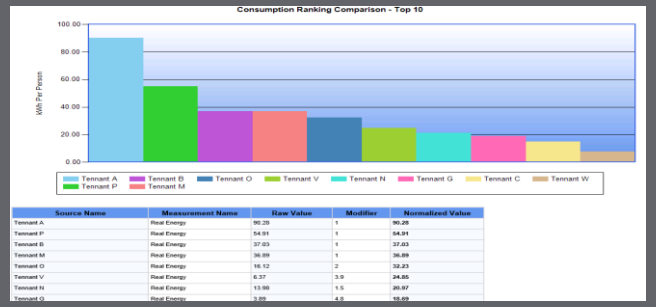


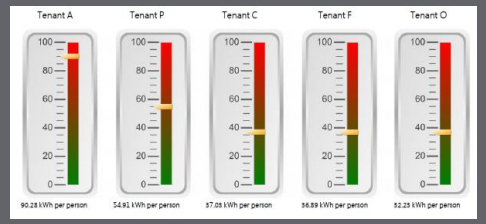
Power Monitoring Expert

StruxureWare Power Management Software

An Energy Management System (EnMS) that enable power reliability, energy visibility and sustainability

Energy Awareness Module





Consumption Ranking



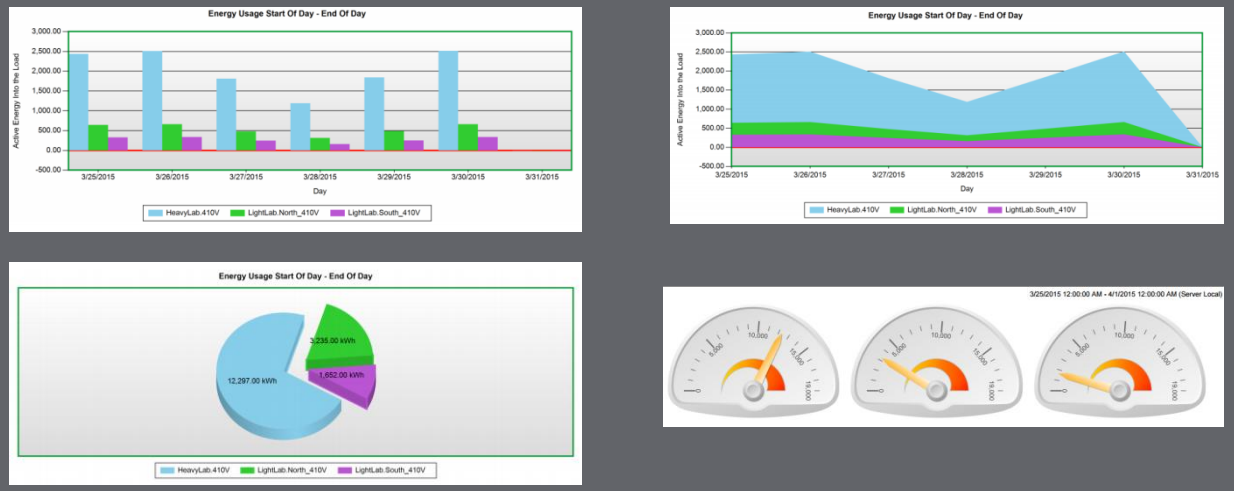
Energy comparison

> Consumption Ranking Report
  > Compare energy sources and rank against each other
    > Buildings, floors, dorm rooms, industrial assets
    > Normalize data to relevant KPI (ie. energy per person)
    > quickly build energy awareness through relative visualization
    > Create competitive environment with dynamic rankings
    > Normalize consumption data by a static scalar to facilitate fairer comparisons

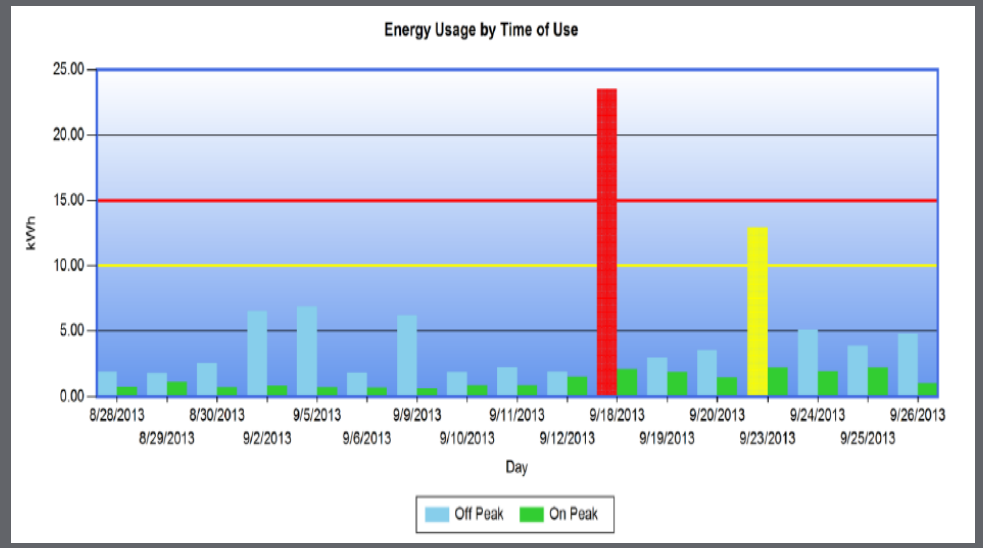
> Energy Comparison Report
  > Compare buildings/floors/areas

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Energy Awareness Module (cont.)



Energy Usage



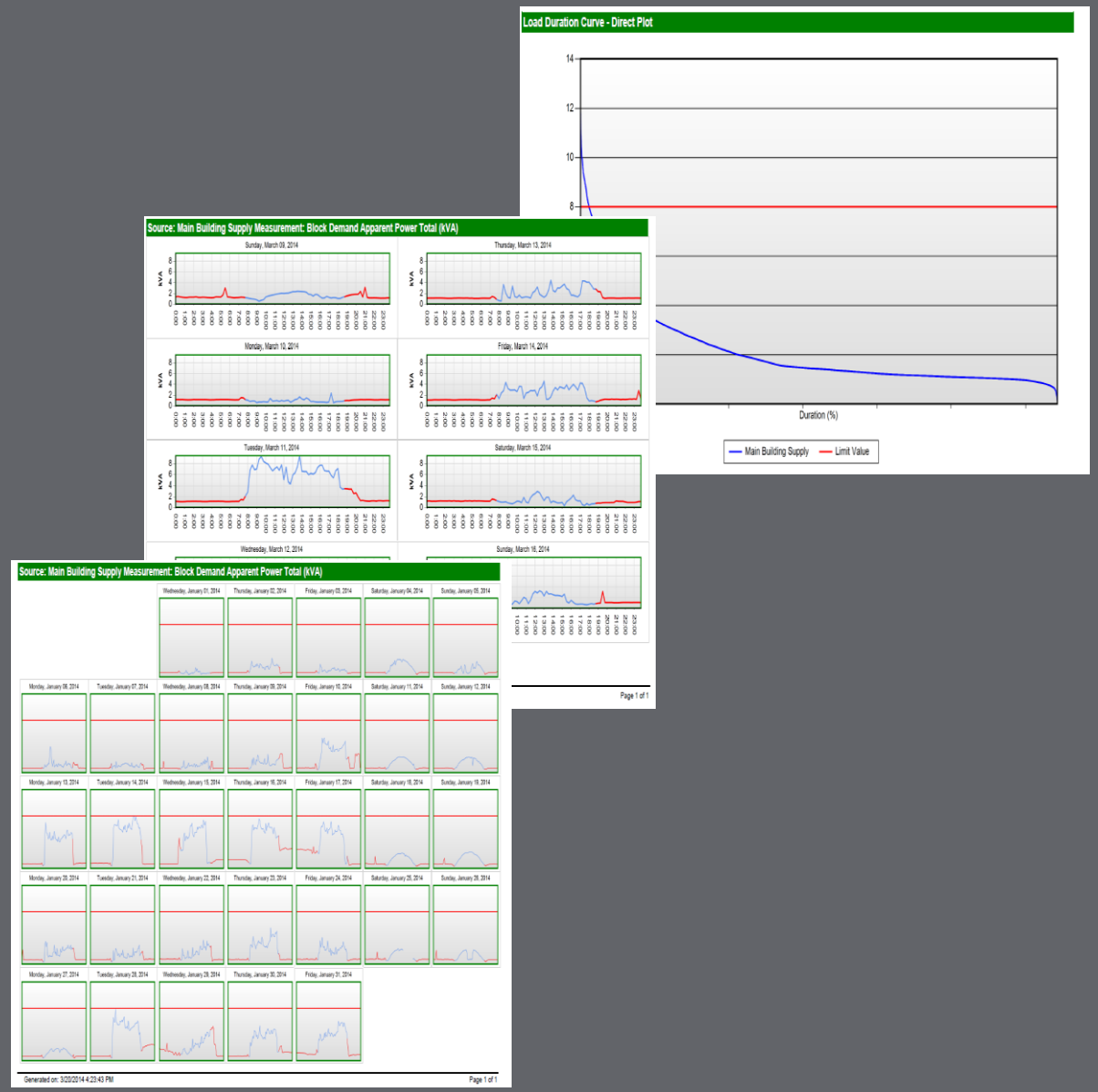
Usage by Time of Use

> Energy Usage Report
  > Displays energy usage data in a variety of display formats

> Energy By TOU Report
  > Time Of Use analysis to identify abnormal consumption
  > View any usage broken down into time of use schedule periods
  > Bars automatically change colour to highlight exceeding defined limits

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Energy Analysis Module



> Duration Curve

- > A duration curve shows the cumulative frequency distribution of a measurement.
- > Identify Short duration conditions that can be expensive
- > Not only energy or consumption, analyze any logged measurement.
- > Typical application is Load duration curve for reducing peak demand.

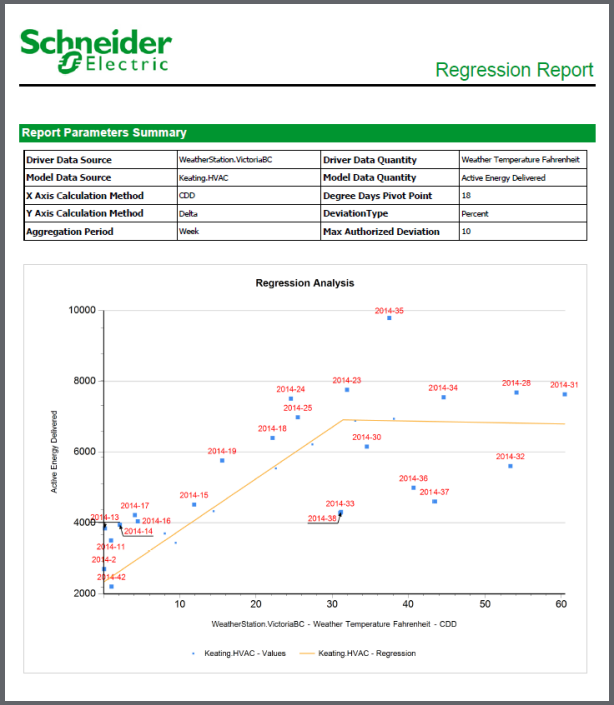
> Calendar Load Profile

- > Compare week to week profiles
- > Analyze out of hours usage
- > Identify usage patterns and load profiles

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Energy Analysis Module (Cont.)

> Energy Regression Analysis
  > Regression analysis to determine correlation of energy consumption to temperature or other external drivers
  > Support of CDD and HDD
  > Compare models before and after Energy Conservation upgrades to determine or validate savings



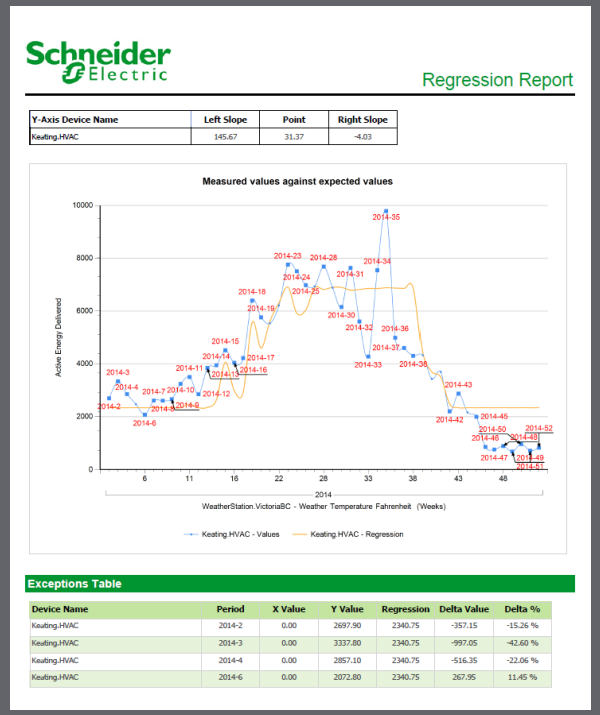
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Regression Report

Report Parameters Summary

Driver Data Source	WeatherStation.VictoriaBC	Driver Data Quantity	Weather Temperature Fahrenheit
Model Data Source	Keating.HVAC	Model Data Quantity	Active Energy Delivered
X Axis Calculation Method	CDD	Degree Days Pivot Point	18
Y Axis Calculation Method	Delta	DeviationType	Percent
Aggregation Period	Week	Max Authorized Deviation	10

Energy Regression Analysis



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Regression Report

Y-Axis Device Name	Left Slope	Point	Right Slope
Keating.HVAC	145.67	31.37	-4.03

Exceptions Table

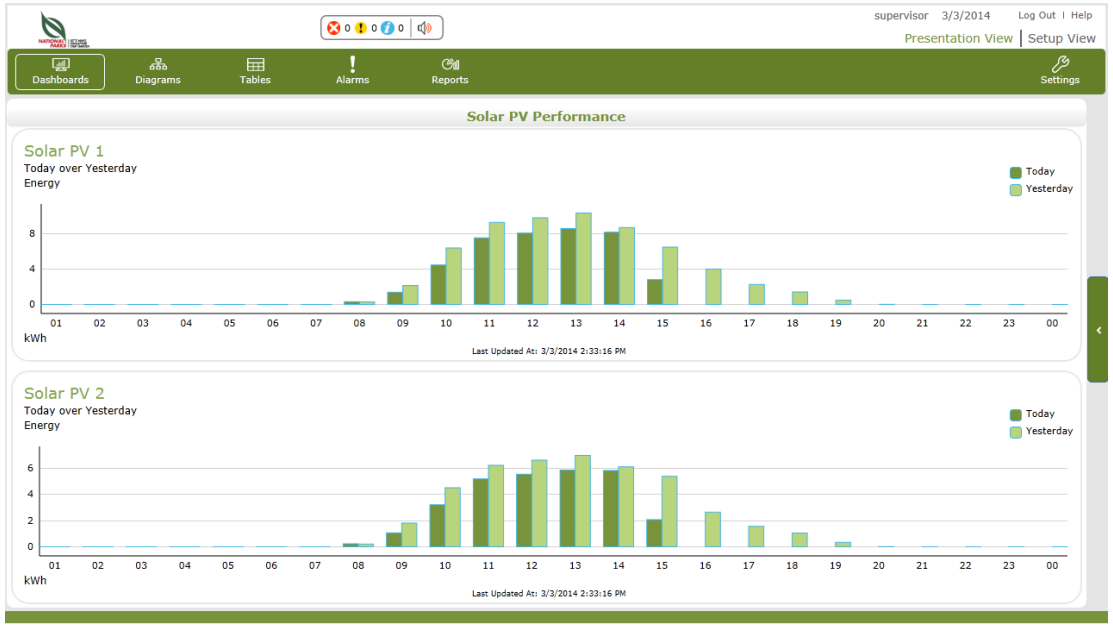
Device Name	Period	X Value	Y Value	Regression	Delta Value	Delta %
Keating.HVAC	2014-2	0.00	2697.90	2340.75	-357.15	-15.26 %
Keating.HVAC	2014-3	0.00	3337.80	2340.75	-997.05	-42.60 %
Keating.HVAC	2014-4	0.00	2857.10	2340.75	-516.35	-22.06 %
Keating.HVAC	2014-6	0.00	2072.80	2340.75	267.95	11.45 %

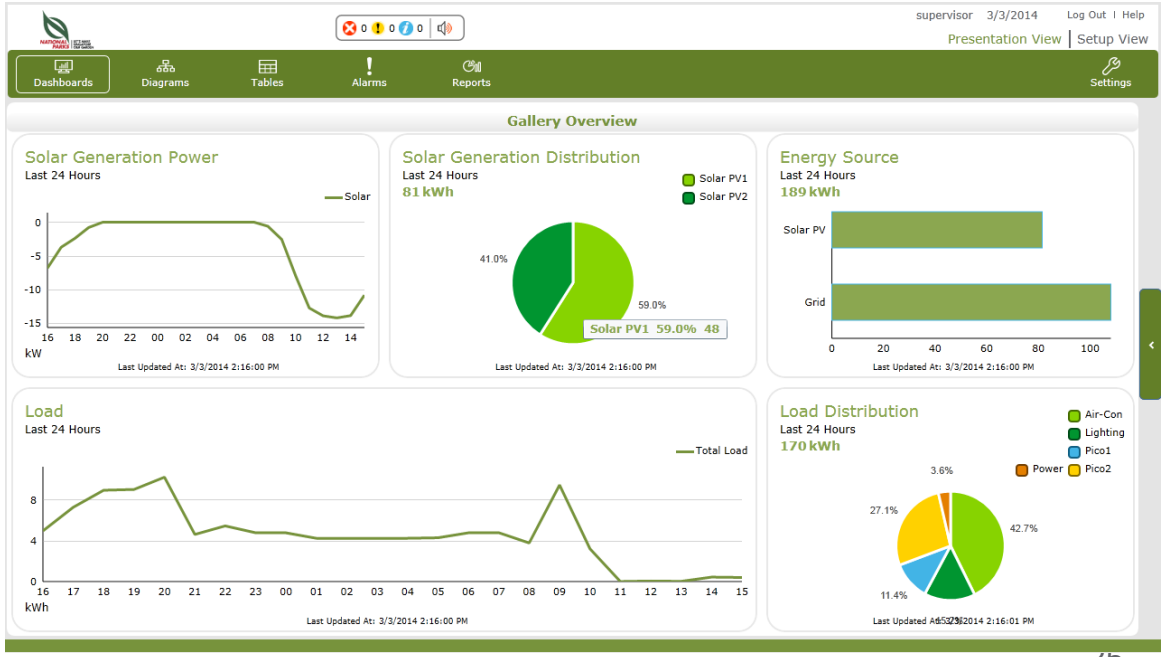
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Dashboard

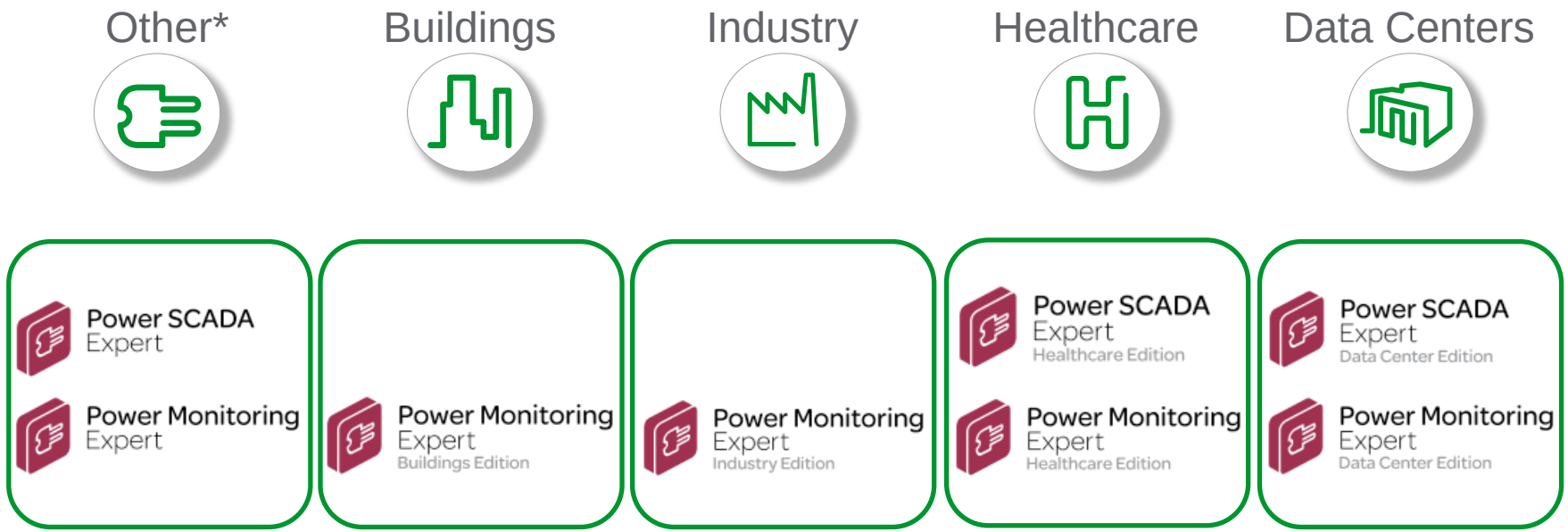
Real time monitoring on key EnPI







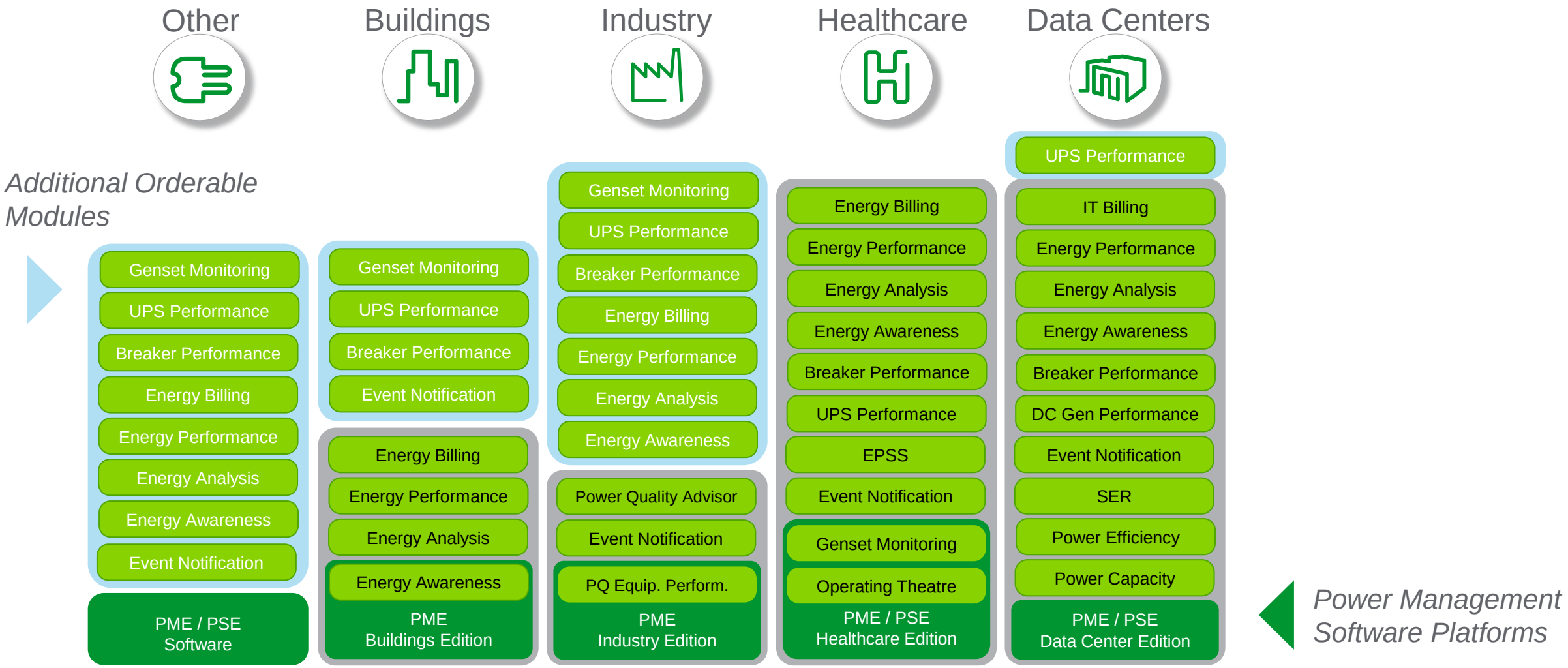
Meet the Family



* Others segment as segment editions such as Infrastructure (airport), Oil & Gas, utilities

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Power Management Software Range Structure



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PME is ISO50001 Compliant Certified!

>Certification was performed within the framework of an on-site audit.

>Power Monitoring Expert verifiably supports compliance with the requirements of the following chapters of the standard ISO 50001:

- > 4.4.3 a), b) Energy review
- > 4.4.4 Energy baseline
- > 4.4.5 Energy performance indicators
- > 4.6.1 Monitoring, measurement and analysis
- > 4.7.2 c) Input to management review



CERTIFICATE

Certificate-ID: C-08-2014-21226200

Certificate for: Audited energy data management system

Certificate holder: Schneider Electric
Schneider Electric SA
35 rue Joseph Monier
92500 Rueil Malmaison
France

Test report: B-08-2014-21225600

Products:
StruxureWare Power Monitoring Expert
StruxureWare Power Monitoring Expert for Healthcare
StruxureWare Power Monitoring Expert for Data Centers

Basis of certification: Audited energy data management system in accordance with the catalogue of requirements Version 2.2 (as of 02/2014)

Scope of certification: Document and system review of functionalities for use with energy management systems in accordance with ISO 50001 and energy audits in accordance with EN 16247-1

It is herewith confirmed that the functionalities and characteristics of the energy data management system StruxureWare Power Monitoring Expert described in the results report B-08-2014-21225600 as well as in the appendix to the certificate, have been verified within the framework of a document and system review. The energy data management system StruxureWare Power Monitoring Expert verifiably supports compliance with the requirements of the chapters of the standards ISO 50001 and EN 16247-1 as listed in the appendix to the certificate.
This certificate is valid until 30 September 2015.

Dated in Cologne, 1 September 2014

Norbert Heidelmann
TÜV Rheinland Group
Energy Services

Peter Maczey
TÜV Rheinland Group
Product Manager/Auditor ISO 50001

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Key Takeaway…

> Understanding ISO50001 framework.

> EnMS enable key process for ISO50001 through establishing Energy Baseline and Energy Performance Index (in Energy Planning), continuously monitoring key energy use and consumption for periodic measurement review needs (Checking and Continual Improvement).

> Energy Baseline Model can be built through Regression Analysis.

> PME is ISO50001 compliant certified.

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