

SmartWatt *Utility* Management

An analytics driven perspective that promotes cost savings & visibility

SmartWatt **Plugitin**



Smart Utility Management through advanced analytics is a solution that can improve utility performance and can be customized for other benefits...



Companies having high utility cost will get benefitted in terms of positive impact on the performance, costs, risks, employees tenants and customers

01



Using advanced analytics on the data captured by the innumerable devices, derive desired output based on client needs and display these in interactive dashboards

02



The system can be customized to track compliance to environmental targets, energy and water utilization targets, carbon accreditation targets, etc.

03

...as well as addressing senior management concerns in utility consumption and in identifying cost-effective conservation methods



Asset Management

- UMS enables the overlay of process/load utility performance with corrective and preventive maintenance
- This will ensure assets utility consumption is continuously optimized, thus reducing utility consumption and increasing the longevity of the assets. Thus asset longevity is enhanced



Loss Minimization

- Performance indicators will reveal if consumption patterns change against well set dynamic internal and external benchmarks that account for occupancy, ambient temperatures and other relevant factors.
- This minimizes avoidable losses attributed to faulty equipment or bad-usage or even leaks and automation



Bill Management

- Detailed interval data from metering
 - Proper meter placement and
 - Meter data analytics
-can significantly improve commercial buildings (and sites such as malls, hotels, airports, compounds) ability to measure the utility consumption of commercial tenants and bill them accordingly;
-This will initiate a process of recovery of more utility costs paid by commercial site owners to utility companies.



Identification of initiatives

- Utility Management Systems (UMS) will provide high quality load profiles enabling the identification of the most significant utility consuming processes and loads..
- This will allow for the development of well-informed implementation plans for these measures with accurate evaluation of payback periods against level of capex required for these interventions.

The power grid is changing essentially towards digitization and the use of analytics to harness the end users to support the grid in the face of the evolving national energy and sustainability targets

Advanced Analytics is Gaining Steam



There's a shift of focus from the grid operator to demand side in the P&U sector. This has led to the penetration of Demand Side Management programs at an accelerated pace

Alternate Energy Enters the Mix



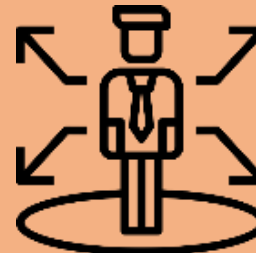
Solar penetration in the grid mix is increasing. Most of the countries has taken very ambitious targets to increase the mix of renewables in the grid. This will require a higher grid flexibility

Increased Sustainability Focus



Increased energy, environmental, climate change regulations are driving decision in the P&U sectors. Business continuity and resilience is being discussed with a greater importance

Consumers Want more Visibility



Users are looking to gain enhanced control and transparency of the energy use and consumption. Using Smart Devices (Smart Plugs) the user can now manage the demand at a given time. Users are looking to be empowered with decision making capabilities to enhance their energy use efficiency


Digitizing the grid is facilitating use of IoT to capture & analyze high resolution data distributed across the grid rendering it a digital transformation national initiative

IOT sensors can capture enormous amount of data which through analytics can derive insights and recommend action plans

There are myriad sets of data that can be captured easily using IOT sensors. Some of these are ...



Power quality, can be used to trigger alarms, develop operating plans

Air quality, can be used to estimate wellness 



Vibration sensing, can be used for asset health monitoring



Energy consumption and use, can be used to calculate energy performance



RE power generation and load management to reduce curtailment



Ambient conditions like RH, Temp, etc. which can enhance HVAC controls



Fire, heat and smoke detectors, can be used to raise security/ safety alarms



Motion, occupancy sensors to calculate the footfall



Health data, travel data and various other parameters can be captured

Bring IOT to the Power Sector in Abu Dhabi

If we choose to ignore this opportunity of IOT



Facility managers will walk **150 million miles average in a year**, which means resource cost will increase

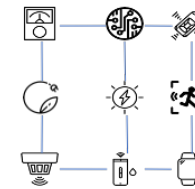


With effective controls **a 99.9% efficient asset will still loose 540 minutes of operating time**



Being blind sighted on consumption patterns and energy utilizations facilities **will loose 30% of their energy**

A platform can be developed to capture operational data & make prescription for efficient operation



The platform, we will be correlating data received from these sensors to enable enhanced control of the operations and optimize their asset utilization and energy consumption

Facilities can save up to 20% of their energy use through this platform

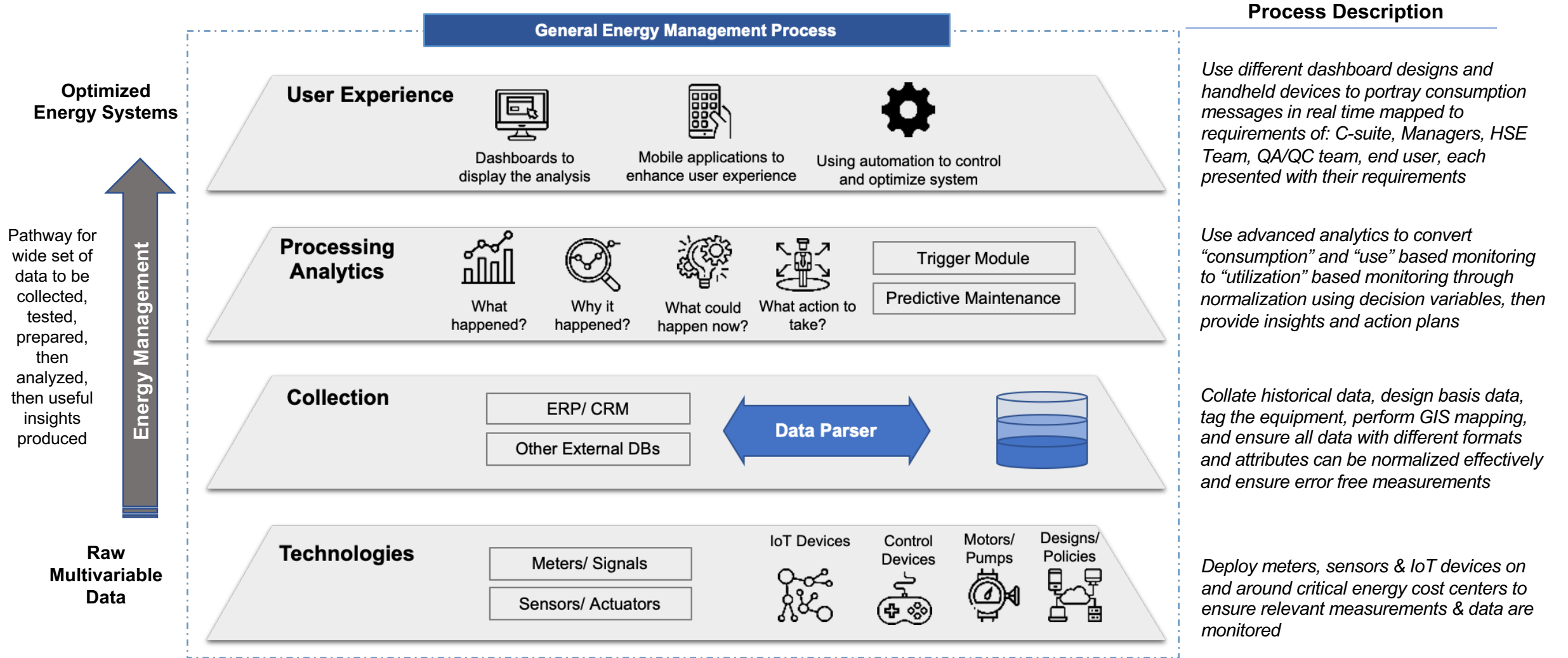


The asset downtime can be reduced, maintenance cost of assets minimized through enhanced monitoring and control

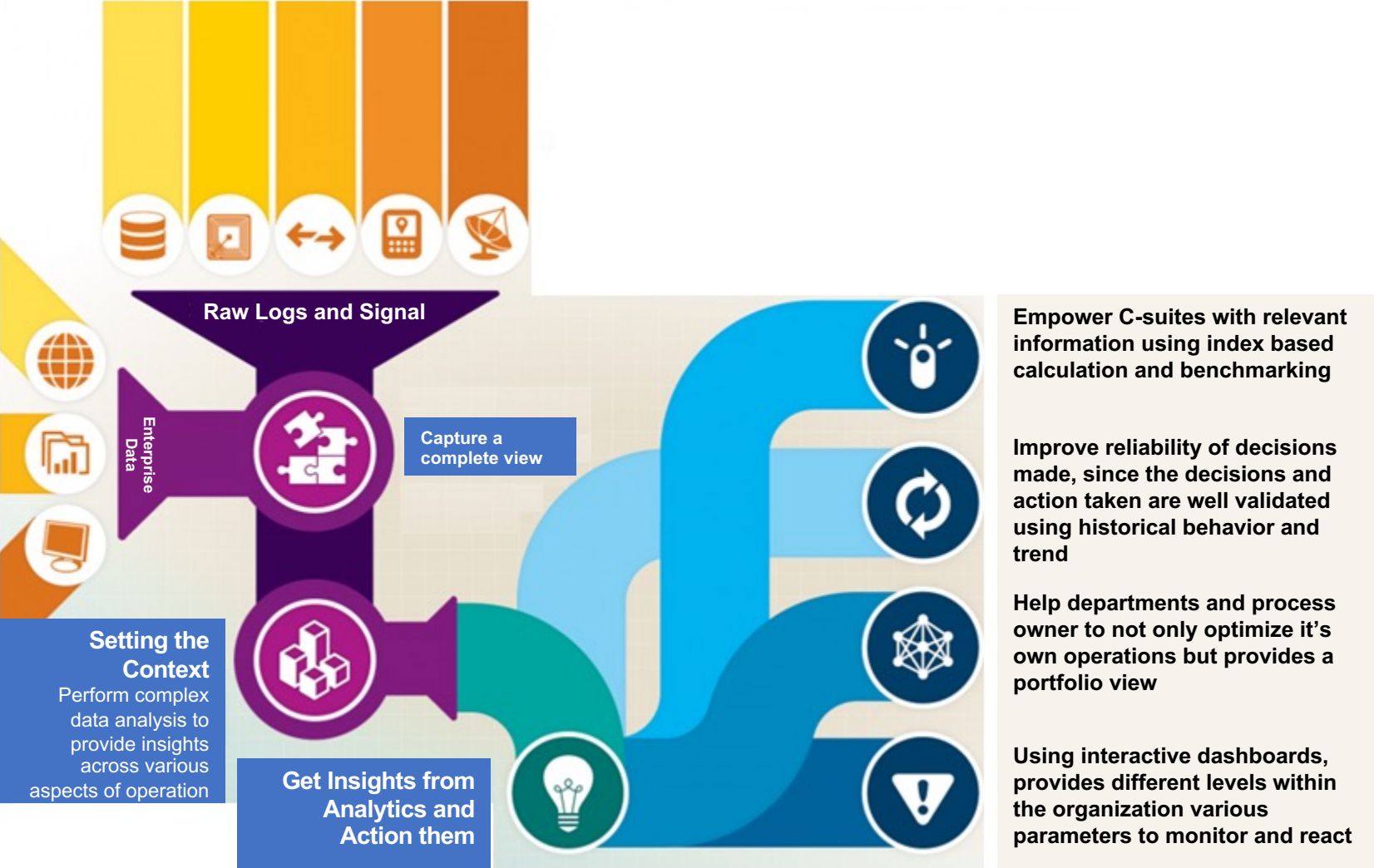
Significant reduction of manhours (~100 p.a.) for operational staff, maintenance staff without compromising productivity



Energy management is using advanced analytics to correlate high resolution energy consumption to a wide set of functional data allowing for incremental optimization energy systems in near real time



IoT devices collect raw logs of data at optimized locations which then gets compiled with other data systems and the analytics-based decision making starts to provide tailored made outputs

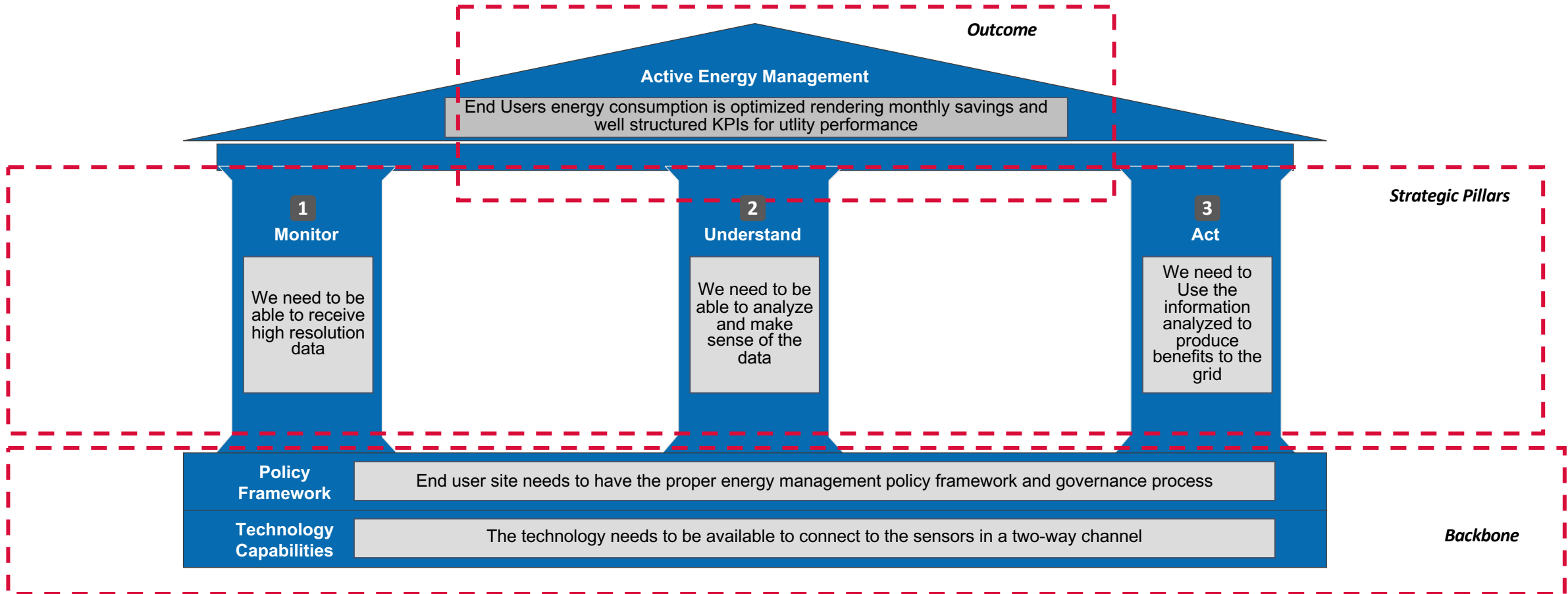


Energy Management Framework

- Being able to pinpoint which systems and equipment have irregularities — to identify and prioritize carbon-saving opportunities allows you to make smarter operating decisions.
- With technology driven solutions and data driven decision making, our solution will help you to completely understand why and how issues are happening and how to remedy these situations.

Active energy management is divided into monitoring the data, understanding it and then acting dynamically on the analytics to bring benefits to end-users/clients or to the grid as a whole

Methodology for Active Energy Management



The monitoring pillar is based on synchronized data collection system capturing varied list of data points with multidimensional integrated attributes including zonal location as well as time indications



Location

Understanding where the equipment is, and what's around it.



Zones

Group equipment into categories based on space use and time of use



Designs

Import CAD and PDF drawings



IoT & Live Data

Connect to BMS, Security and IoT type systems to provide real time awareness



Interventions | Actions

A predetermined list of abatement/ interventions



Notes

Domain expert notes, special configuration notes, etc.



Metered Data

Every bit of data from metered devices should be captured



Schematic

Parent and Child relationship, cable numbers and specifics

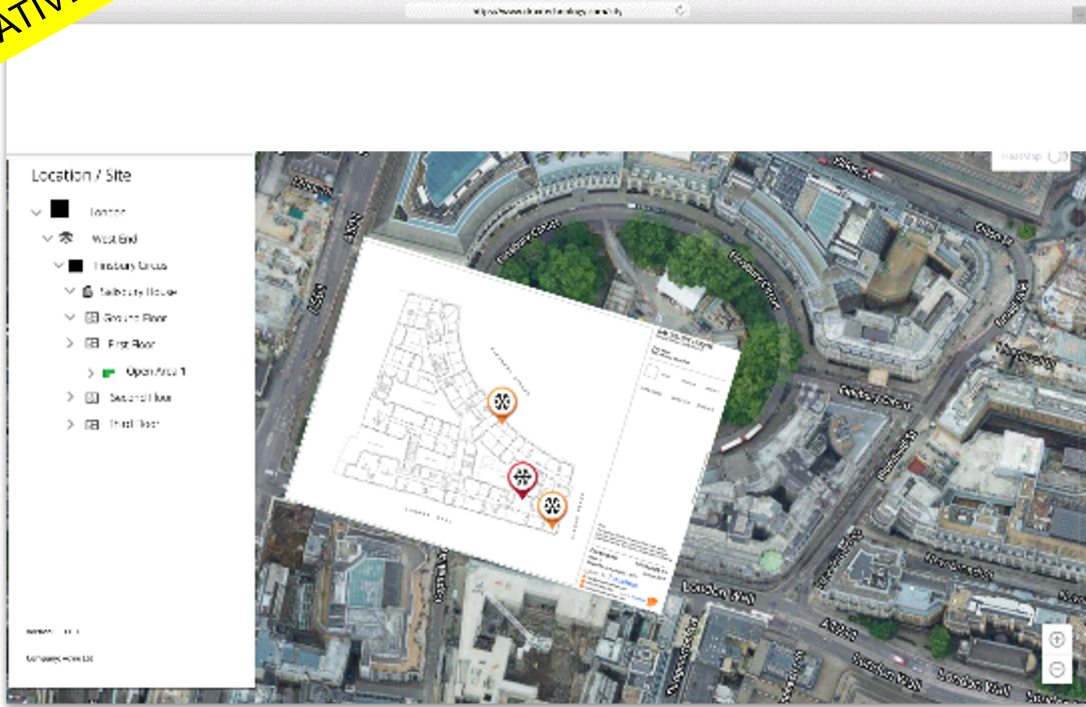


Time of Events

Understanding when something happens or when it will.

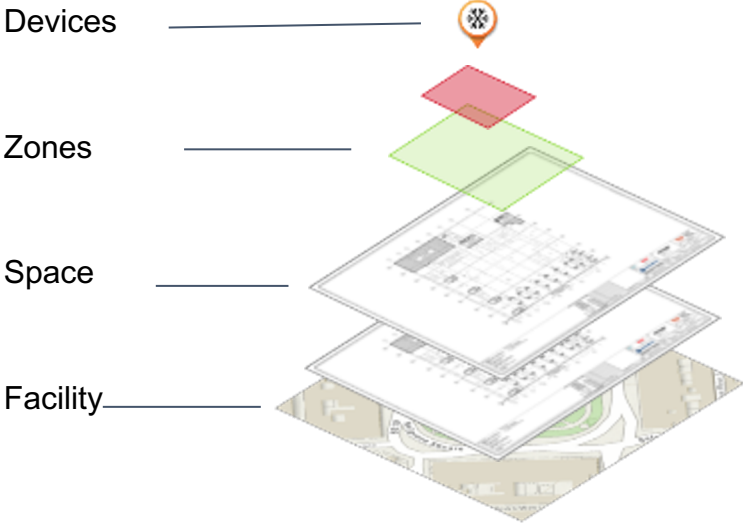
Data is captured at the highest resolution (i.e. equipment level) and simultaneously linked to systems, sub systems at corresponding zones and space describing relations of sub systems and equipment

ILLUSTRATIVE DASHBOARD

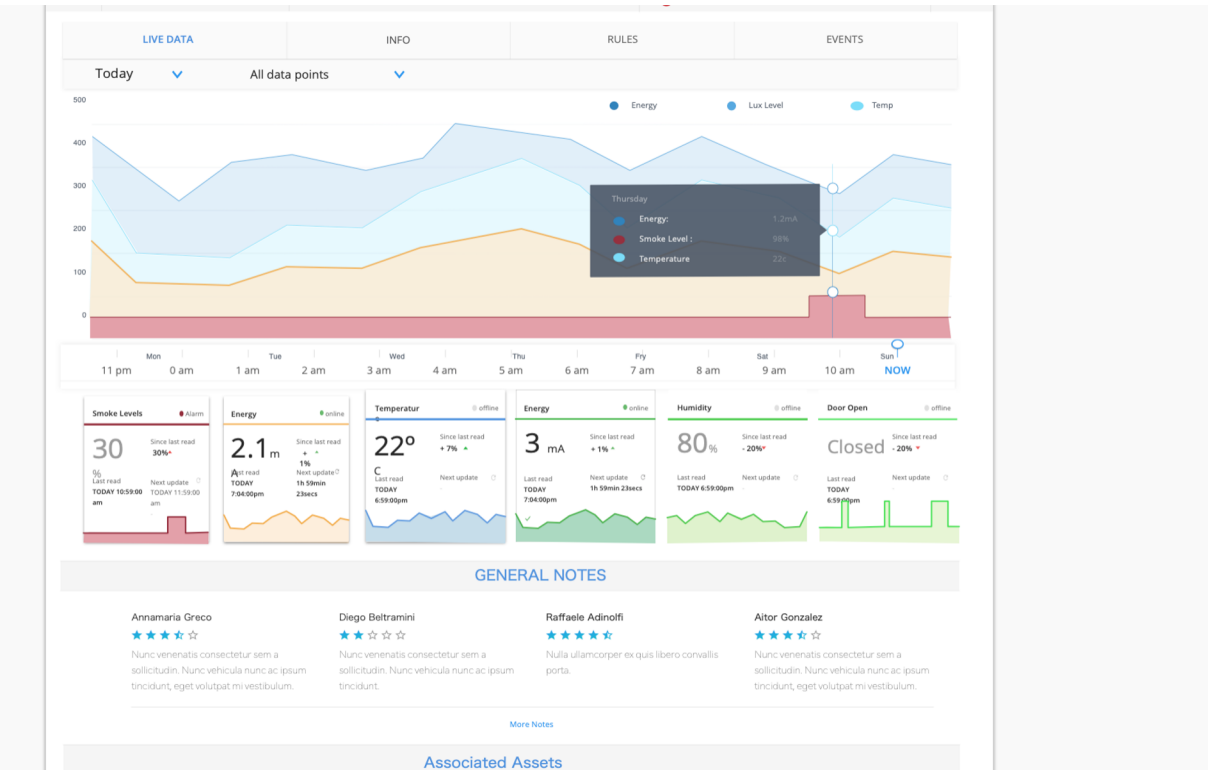
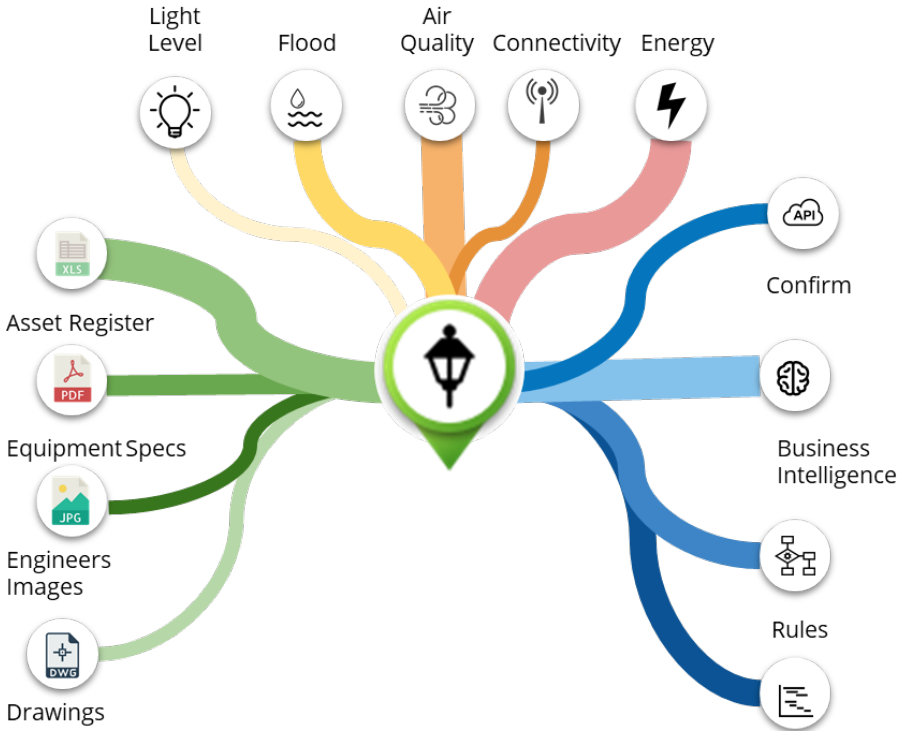


From Macro to Micro

Based on the analytics modules, the action plans suggested will be at a micro level – from Space to Devices.



Data captured representing a myriad set of sensors for each asset is analyzed to derive insights including performance scoring, shifting from consumption to utilization-based monitoring

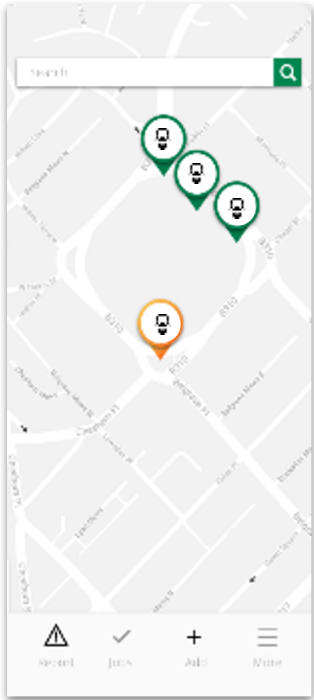


- For every asset, zone, area, space and site capture a large set of data and process this data in a real time to derive insights, suggest actions to optimize consumption and finally improve operational efficiency

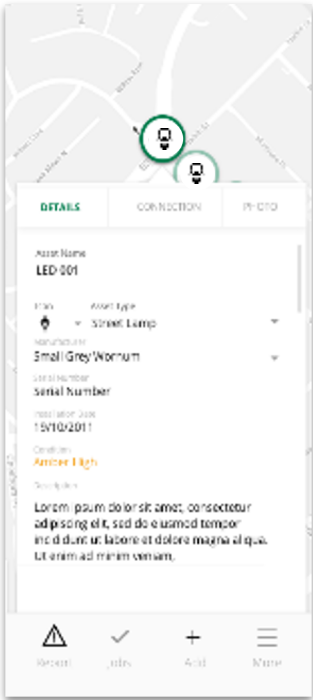
- Understand your asset performance based on a variety of metrics based on sensor data, including: Energy Utilization Index, Mean time to repair (MTTR), mean time between failure (MTBF), energy savings vs potential, and forecasted equipment reserves vs budgeted, etc.

The energy management services offered to clients of the platform will include the ability to provide enhanced user experience through hand-held devices and thereby digitally empowering users

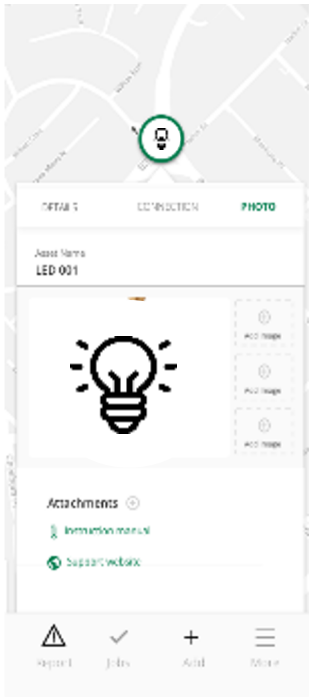
- The action plans derived from the analytics engines are not only displayed in a dashboard or presented in a report, these actions are also submitted to operators through their hand-held devices



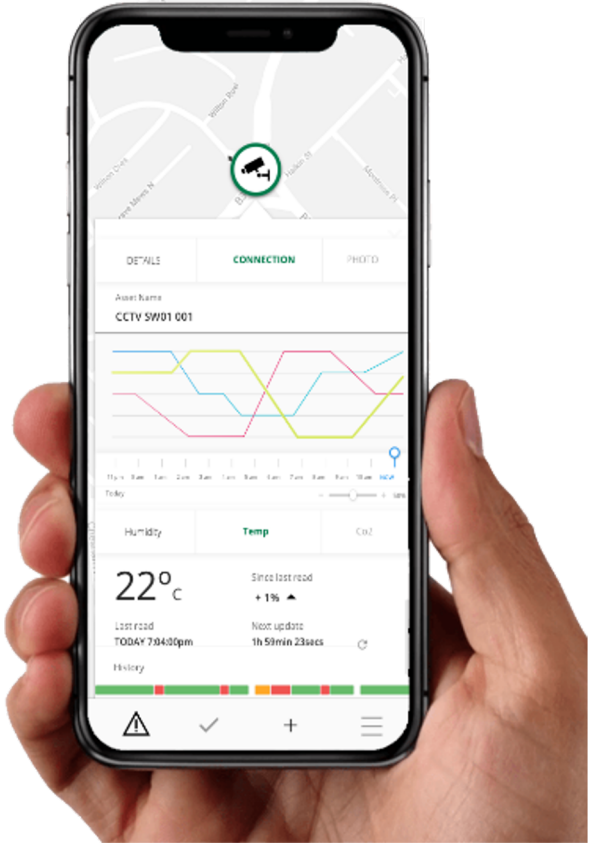
Field Visit Occurs



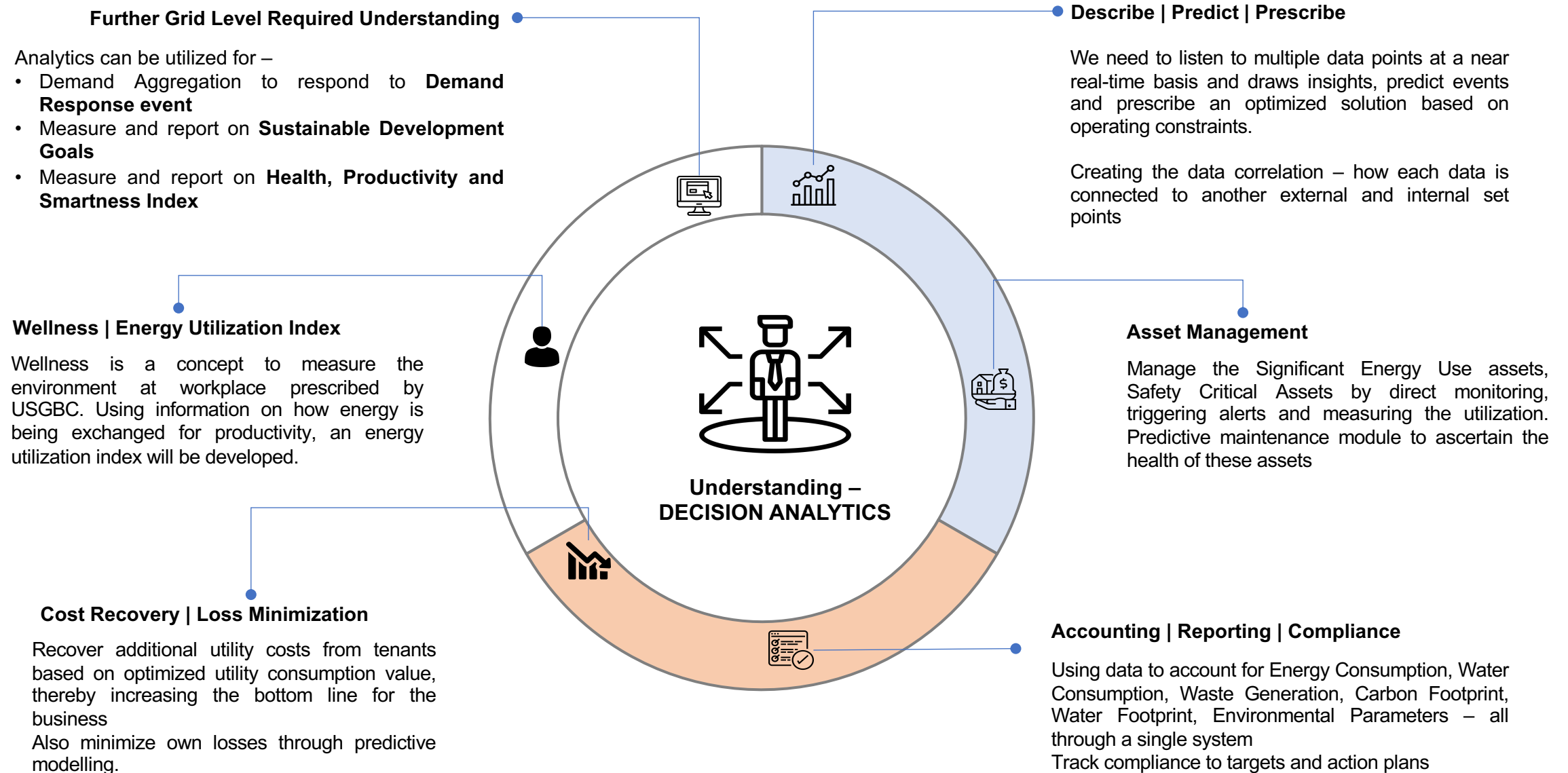
Access to Information



Equipment/ Device Analysed

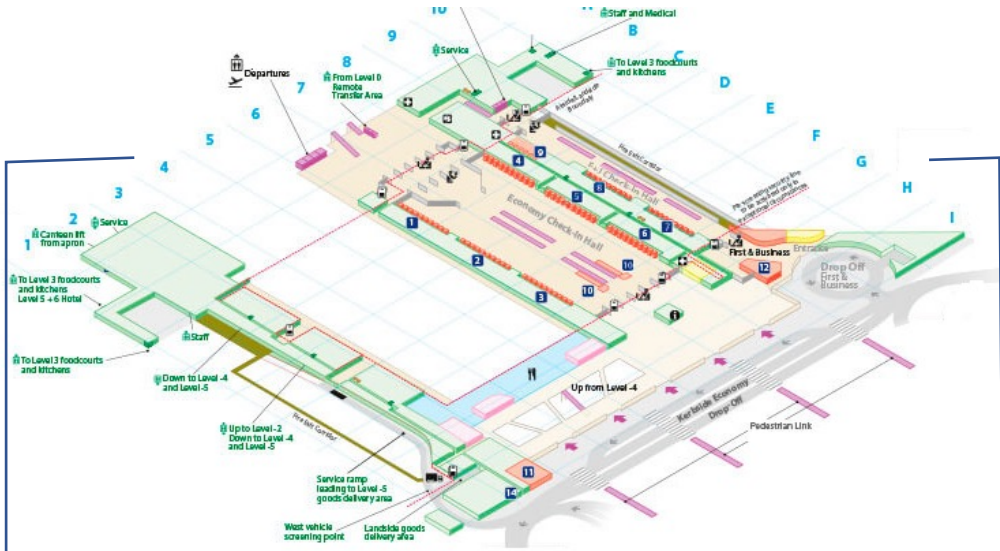


Understanding data is based on the concept of descriptive, predictive & prescriptive analytics, where “consumption” - based monitoring is converted to normalized “utilization” based monitoring



Advanced analytics is a key step in the process to reducing energy demand and thereby reduce carbon footprint

The below is a typical layout of an a premises with a huge set of energy and water utilization demand. The idea is to look at this premises and adopt the most optimal operating conditions on a near real time basis



How will a Smart UMS work?

SmartWatt will divide the premises into horizontal and vertical zones

Each zone will have it's own characteristics which will be modelled separately

A

The IOT Devices will capture data from the (or from the BMS system) and addition data from ERP system, other standalone systems

B

For each zone, there are external data sets that will be also used, like FTE count, special zone requirement, etc.

C

There will be an operational minimum utility consumption that will be estimated using Hourly Analysis Model

D

The Descriptive Analytics module will then assess the performance using EUI# and suggest optimization options.

E

A carbon calculator will calculate the carbon footprint considering the utility consumption and calculate the offset requirements

F

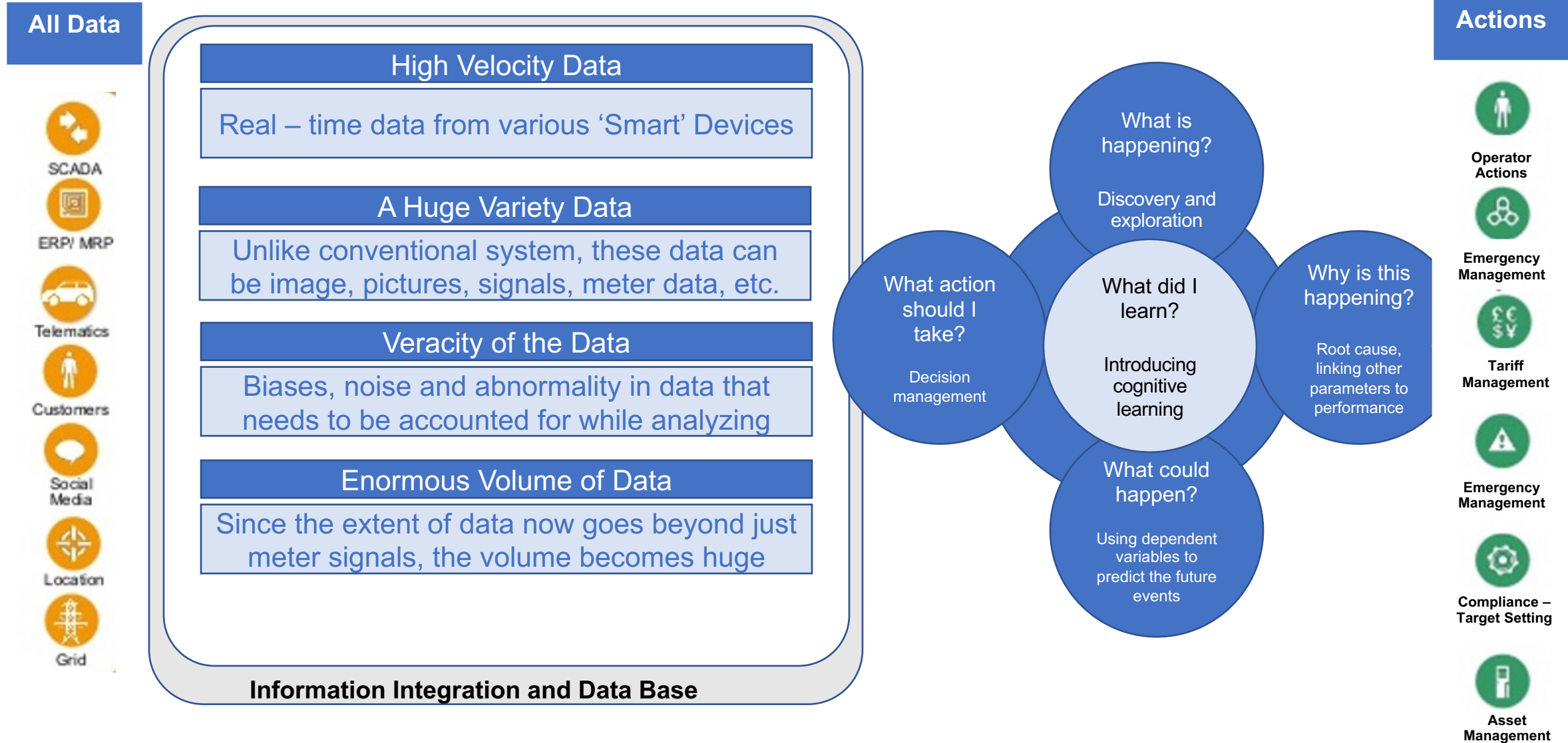
The predictive analytics will then use the other operating parameter to assess the next event for each zone

G

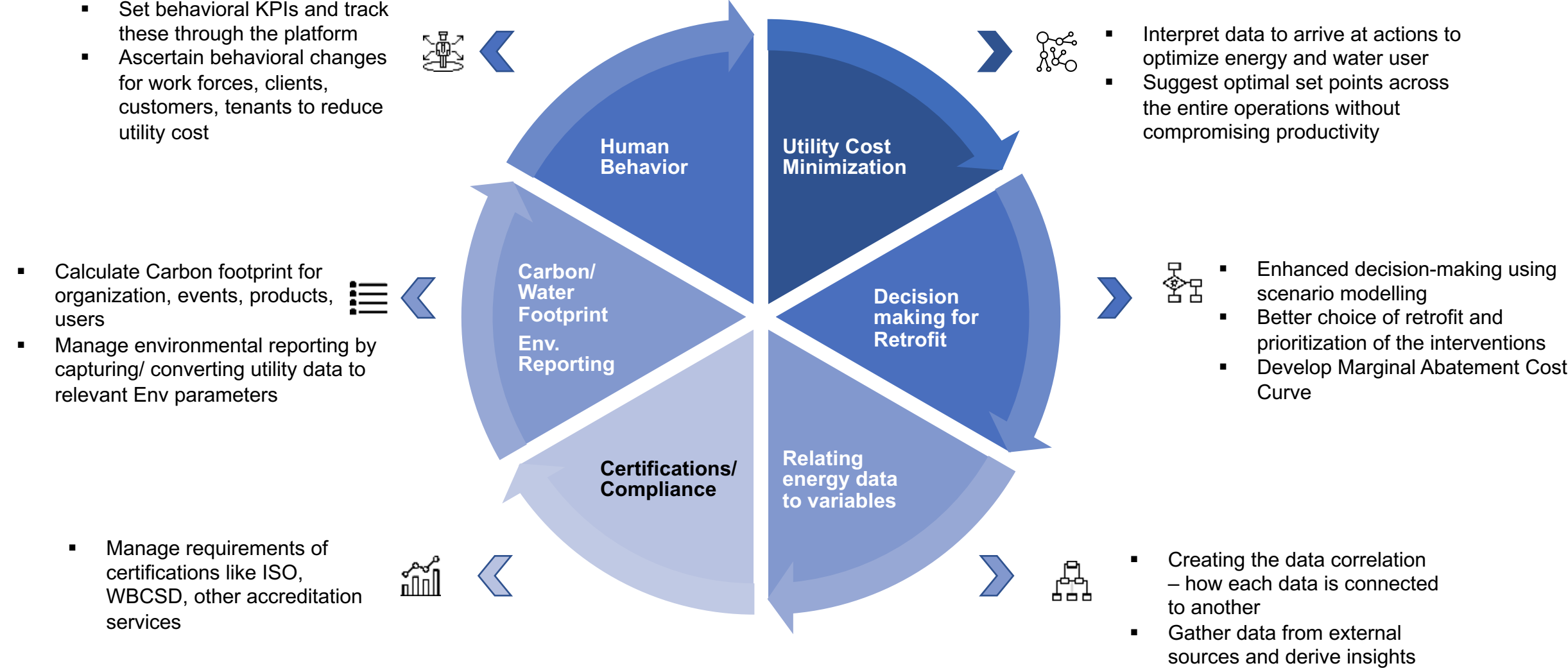
The prescriptive analytics will then come into play to suggest action plans for the next event and optimize utility use (also suggest offset requirement)

energy utilization index

The core principle of energy management platforms resides in connectivity between assets



Such understanding and computational analytics of the data can assist major utility end-users with utility related dimensions like cost minimization, compliances and human behavior among others



Acting on the analytics is energy management which essentially is making utility operation at the end user an intelligent and controllable process through existing BMS which is different from EnMS

Building Management System

BMS systems combine software and hardware to control systems such as lighting, heating, air conditioning, fire systems, etc. Despite the high degree of control that BMS systems offer, they frequently lack the insight and analytical capabilities to identify key energy savings opportunities



Image your process unit (or building) as an airplane



The Building Management System/ Automation System is the control wheel/ joystick – the tool that you use to direct the plane to the place you want to go. But this tool doesn't tell you the best way/ most optimal way to arrive at your destination under several constraints



The Energy/ Utility Management System is the cockpit: all controls are there, and you can see how each component is performing from a holistic point of view. It's the analytics that drives the auto pilot to maneuver the aircraft to its destination based on most optimal performance of its equipment

Smart Utility Management System

A smart utility management system has the ability to connect historical and real-time building performance with projected periods of increased energy costs and current peak vs. off-peak utility billing rates

How does an energy management system complement the existing BAS/ BMS for a building?



BMS/ BAS is designed to keep occupants comfortable and streamline the daily operational jobs of engineers and building operators

An EMS system is designed to provide deep insights and visibility to the energy use through benchmarking and using analytics suggest corrective action which can be implemented using BMS/ BAS

Energy management views sites as set of intertwined data & operating set points distributed at a zonal and family of subsystems dimensions producing a full loop between monitoring data to acting on it

5 Optimizes key processes

- The aggregated set points from all zones in the space will be used to program the Chiller module
- If the building has a CMS, then revised set points will be fed in the CMS, else in the chiller system directly
- The prescriptive analytics module can suggest the chiller operator the optimal set points for Chiller Compressor, Chilled Water Pump, etc.



2 Gain insights and suggest action

- Based on the signal sent to BMS, the FCU/ VAV will be shut (if they have a BAS¹ element)
- Else the BMS operator will have to manually adjust the FCU/ VAV and control the space
- But in any case, the control is I/O type. With the help of the Analytics Module the control can be advanced to an optimal set point for the empty space.

4 Aggregates action at process level

- The AHU feeding in the fresh air is often programmed based on adhoc consumptions
- The analytics module based on the meter signals can predict the optimal amount of fresh air to be incorporated
- This saves energy at many front, AHU Motors, Chilled Water Pump, Chiller Compressor

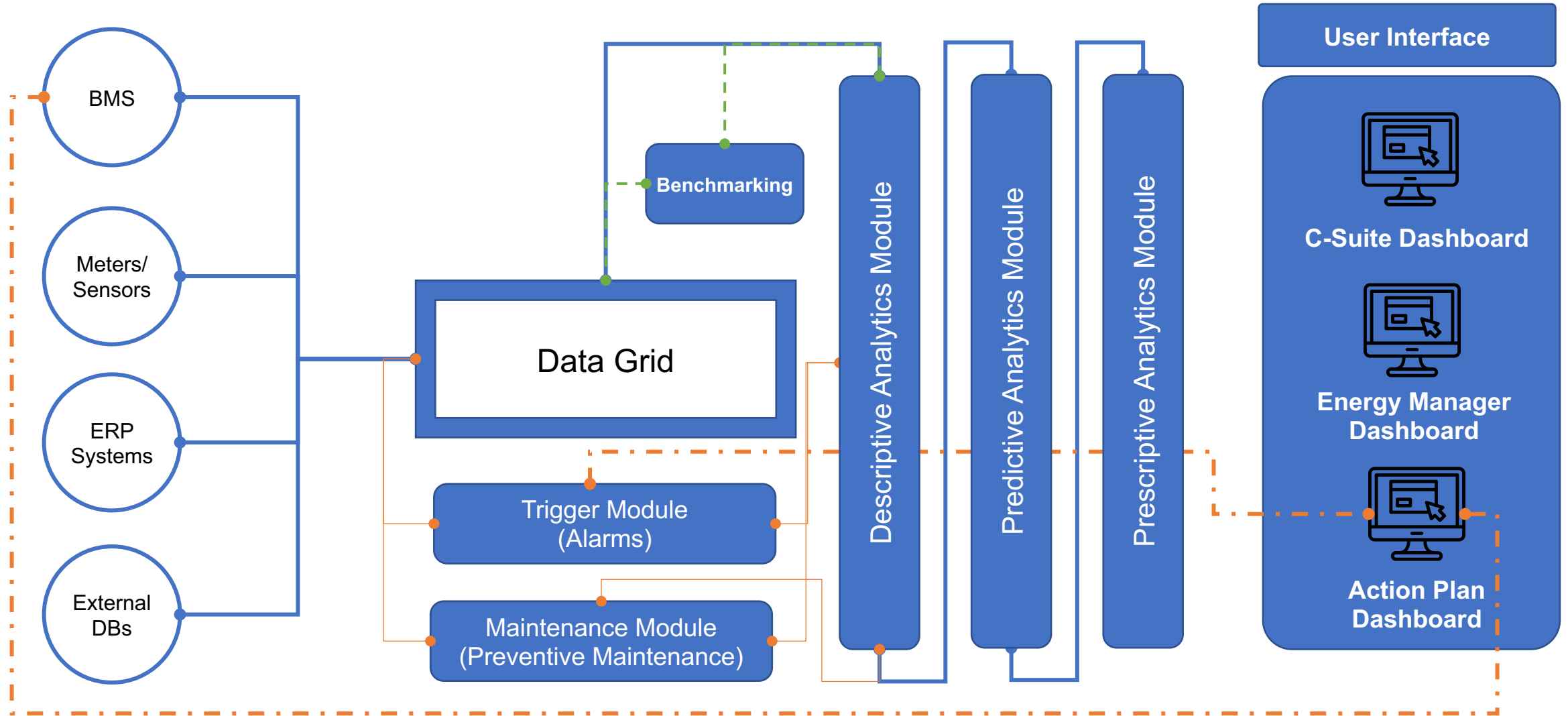
3 Identifies interlocking actions

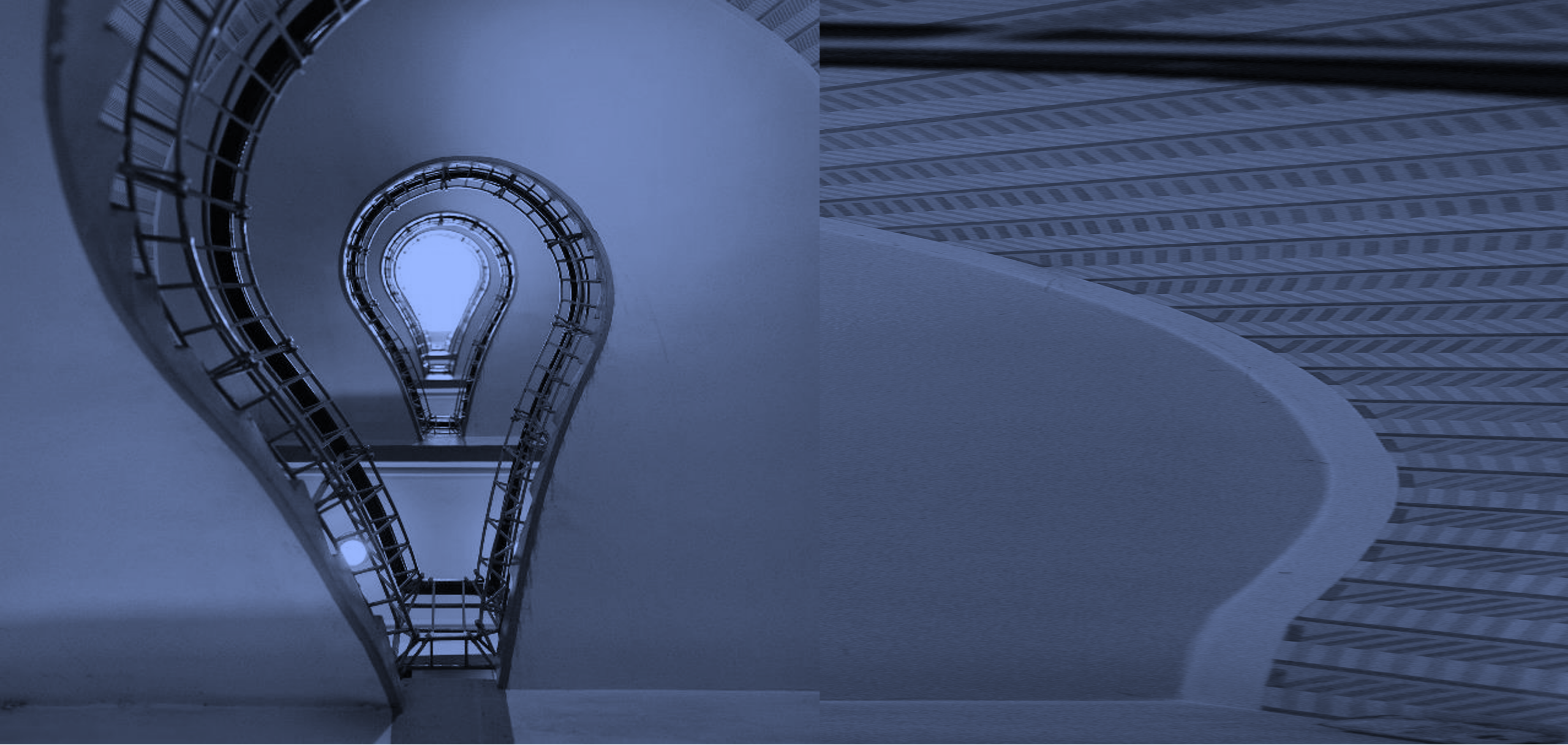
- Once the FCU/ VAV set point is scheduled, ideally the AHUs and Chilled Water valves set points should be managed.
- The prescriptive analytics module will predict the exact setpoints for AHUs and Chilled Water valve

1 Monitor, Measure and Analyze

- The IOT devices like motion sensor and occupancy sensor will send a signal to the BMS regarding the occupancy;
- This signal will be picked by the UMS as well;
- The other sensors like RH, CO₂ ppm, etc. will be correlated to the motion/ occupancy sensor

The detailed wireframe for the energy management platform which will enable the user to have the best experience loops all required modules in a manner that facilitates the services to be offered





Our Team Selected References

Tangible benefits through a systematic utility performance enhancement service in Retail and Commercial Building

75,000  USD In identified potential annual savings in utility

 1.2 Yr Potential payback period

Location	Dubai, UAE – One of the largest shopping arcade including anchor tenants
Project description	Utility Assessment
Professional services provided	<ul style="list-style-type: none">• Worked as principal advisors to the client assessing the suitable paths for improvement in the utility consumption and utility bills• Conducted utility assessment by performing the following procedures<ul style="list-style-type: none">• Conducting an energy asset walkthrough to assess energy equipment and determine system operations• Collecting existing facility documentation and assisting the facilities team to evaluate potential losses and leakages• Performing water and energy performance analysis comparing actual consumption with baseline standards• Analysing the existing operational set points against best practices and comparing with the optimal utility consumption• Identification of measures and initiatives required for achieving the desired rating level and also developing a detailed operating manual for enhanced utility efficiency
Work Products	<ul style="list-style-type: none">• Set points for AHUs, Chillers and Chilled Water pump• Scheduling of Chillers according to kW/TR values computed based on extracted data• Index based efficiency calculation and attaching KPIs with performance of facility management staff



Tangible benefits through a systematic utility performance enhancement service in Oil and Gas Sector

~275,000  USD

In identified potential annual savings in utility

 2.8 Yr

Potential payback period

Location	Abu Dhabi – one of the largest O&G companies in the region
Project description	Utility Management System
Professional services provided	<ul style="list-style-type: none">• Developed a detailed measurement and verification plan through Utility Assessment and Benchmarking• Development of the metering plan and creating a data architecture for capturing energy and material data• Identifying correlation between energy use and other variables, e.g. octane value, ambient temp. etc. through statistical analysis• Undertake advanced analytics to create control points for these variables such that the utility use is optimized• Suggest a set of interventions, schedules, load factor, etc. for operational units so that the utility bill is reduced without compromising the product and output
Work Products	<ul style="list-style-type: none">• Dashboard for utility use and consumption• Utility Use Index for benchmarking and performance management• Alarms and target setting



Tangible benefits through a systematic utility performance enhancement service in Power and Utility

~220,000  USD

In identified potential annual savings in utility

 1.8 Yr

Potential payback period

Location	UAE – One of the largest integrated power and utility company
Project description	Utility Management System
Professional services provided	<ul style="list-style-type: none">• Developed a detailed measurement and verification plan through Utility Assessment and Benchmarking• Development of the metering plan and creating a data architecture for capturing energy and material data• Identifying correlation between energy use and other variables, e.g. pressure, temp, fuel type, calorific value, ambient temp. etc. through statistical analysis• Undertake advanced analytics to create control points for these variables such that the utility use is optimized• Suggest a set of interventions, schedules, load factor, etc. for operational units so that the utility bill is reduced without compromising the product and output
Work Products	<ul style="list-style-type: none">• Dashboard for utility use and consumption• Utility Use Index for benchmarking and performance management• Alarms and target setting• Job descriptions, policies and procedures



Tangible benefits through a systematic utility performance enhancement service in University campus

~60,000  USD In identified potential annual savings in utility

 1.2 Yr Potential payback period

Location	UAE – One of the largest integrated power and utility company
Project description	Utility Management System
Professional services provided	<ul style="list-style-type: none">• Developed a detailed measurement and verification plan through Utility Assessment and Benchmarking• Development of the metering plan and creating a data architecture for capturing energy and material data• Based on the data collected an hourly analysis model was developed to calculate at any given instances the operational minimum energy consumption• This operational minimum value was compared with the actual consumption and the reasons for the difference was investigated based on data analytics• Using the results of the investigation, energy performance enhancement measures were suggested and optimization ideas were proposed
Work Products	<ul style="list-style-type: none">• Dashboard for utility use and consumption• Hourly analysis model for energy use and consumption• Detailed assessment of the retrofits and optimizations proposed



Tangible benefits through a systematic utility performance enhancement service in Manufacturing sector

~150,000  USD

In identified potential annual savings in utility

 3.1 Yr

Potential payback period

Location	Singapore – One of the largest integrated OEM for Automobile sector
Project description	Utility Management System
Professional services provided	<ul style="list-style-type: none">• Developed a detailed measurement and verification plan through Utility Assessment and Benchmarking• Development of the metering plan and creating a data architecture for capturing energy and material data• Using the MRV protocol established a series of energy efficiency and water use reduction measures were implemented• The MRV system and dashboards were used track the progress and also the achievements against the targets/ design• The deviation in the performance was continually monitored and the reasons were addressed on an immediate basis• The system was then suggested for update for automatic intervention
Work Products	<ul style="list-style-type: none">• Dashboard for utility use and consumption• Benchmarking module• Investigation module for analysis of deviation in energy use from design values



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