Visualization of Energy Consumption Using Cloud-based Computing and it's Applications

- Implementations in Green University of Tokyo Project -

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Agenda

- Background issues and solutions
  - Developing a common understanding concerning the definition of wasted energy consumption.
  - Visualization method of wasted energy
  - Applying the method of defining wasted energy in a university facility

  Importance of GUI
  - Ease of use
  - Enables continuous use

- System configuration
- Demonstration (movie clip)

Background issues and solutions

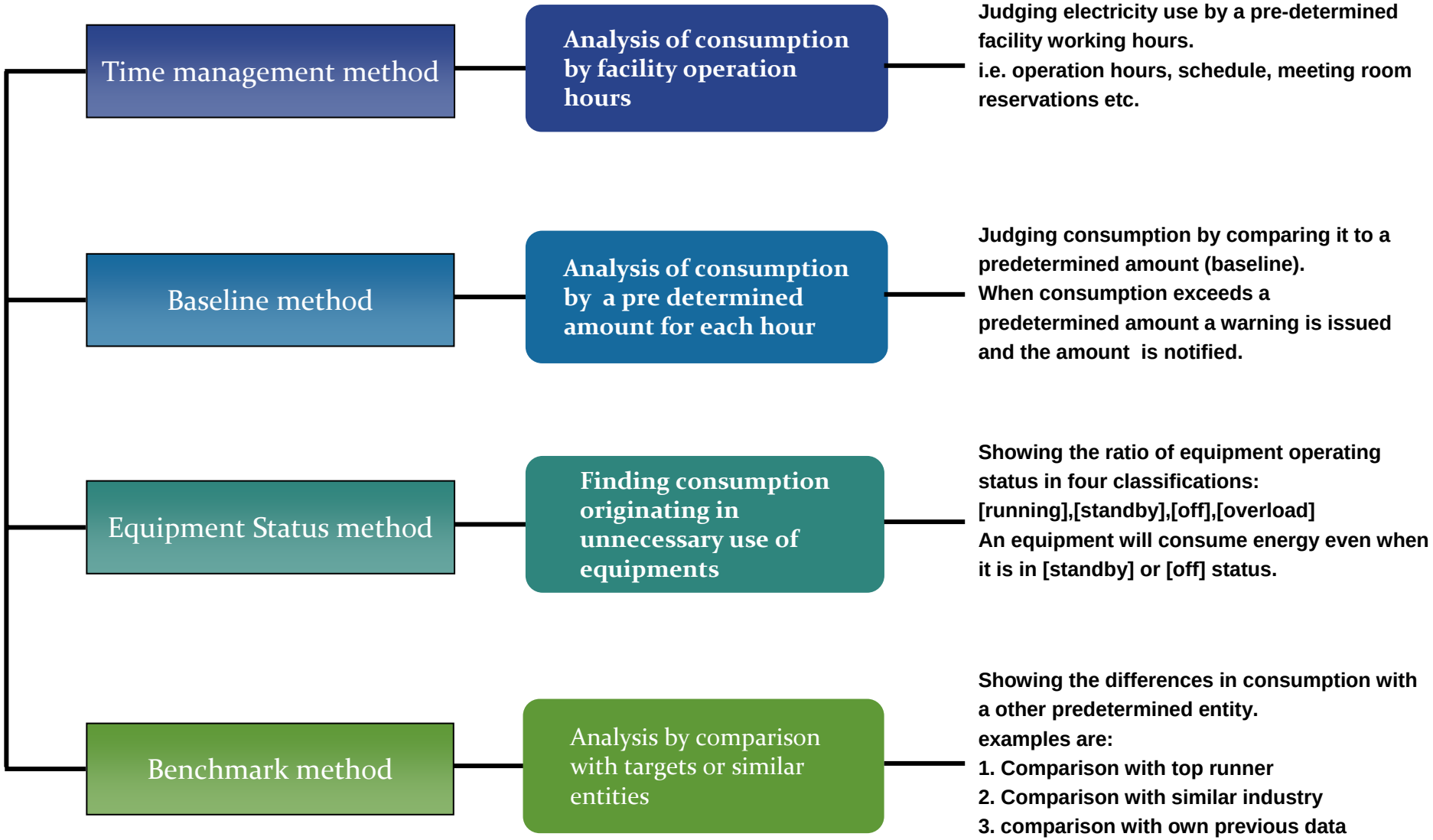
Initial Issues

- Unable to see energy consumption
- Unable to judge proper consumption
- Unable to deploy conservation measures

Solutions

- Visualizing energy consumption and wasted energy in real time.
- Visualizing the method of determining wasted energy

Four methods of defining wasted energy consumption



Implementation to a University

Location	Method used in finding wasted energy
Professor office, Faculty rooms	Determined by operation hours ▶ Time management method
Class rooms	Determined by schedule ▶ Time management method
Seminar ,Lecture and meeting rooms	Determined by schedule ▶ Time management method
Server room, Research rooms A	Comparison to similar environment ▶ Bench mark method
Research room B	Determined by usage ▶ Operation status method

System configuration

Cloud based system

GUTP Common Database

U.S Patent

Diagnostic method for analyzing power consumption of electrical equipment

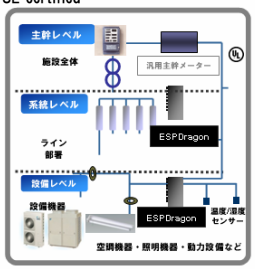
Japan Patent

Equipment operating status information system using electrical consumption waveform

CiMX Web application server

Open Standard protocol

ESP Dragon
UL certified



Sensor Network Data

Measurement devices

- **electricity**
- **gas**
- **temp.**
  etc

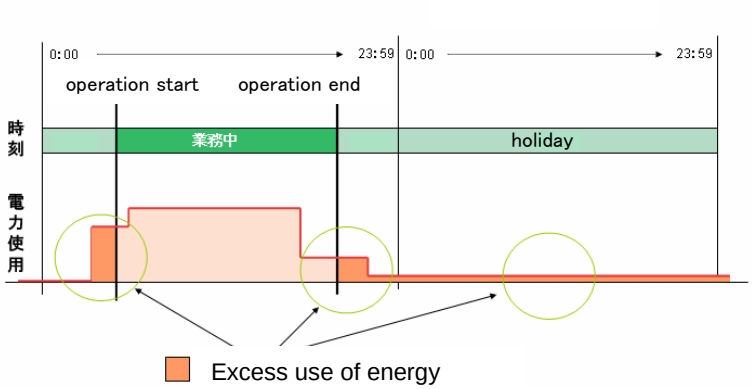
Activiti

ESP Dragon

Gamenics

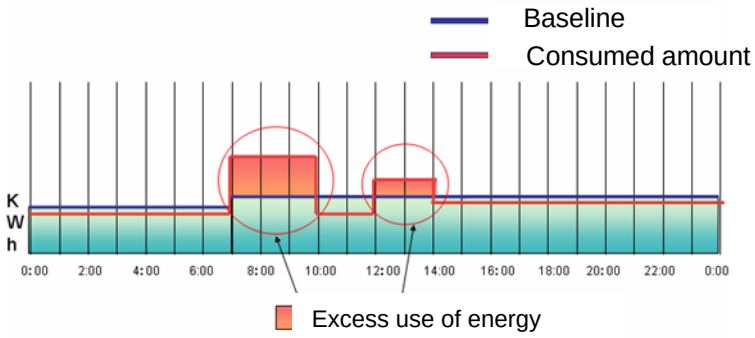
Various analysis functions

Time management



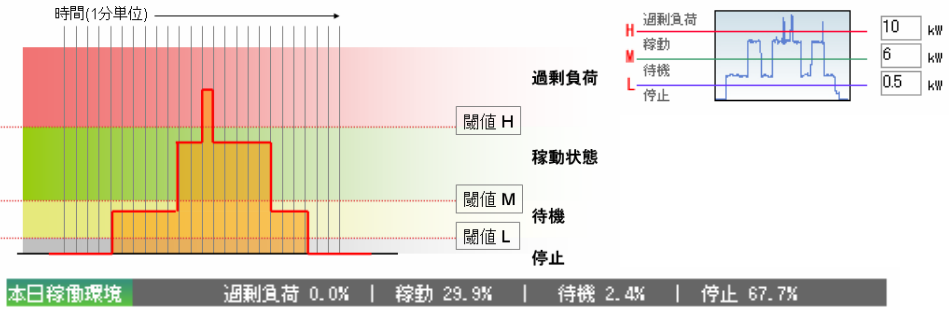
Analysis of consumption by facility operation hours

Baseline



Analysis of consumption by a predetermined amount for each hour

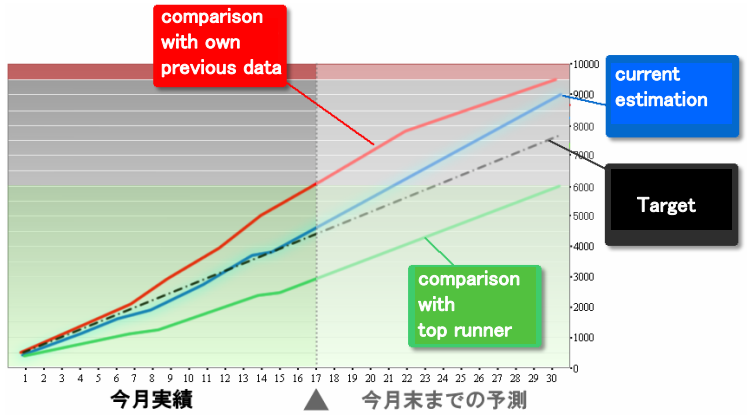
Equipment status



Summarizes the operation status of each equipment in following 4 statuses [overload] 、[running]、[standby]、[off]

Finding consumption originating in unintended use of equipments

Benchmark

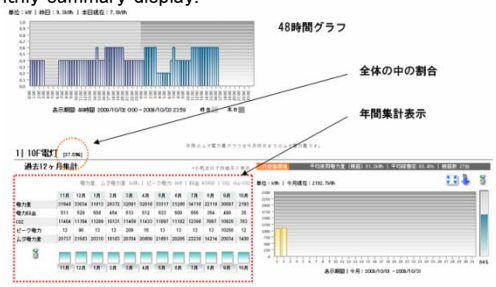


Comparison with top runner , similar industry, own previous data, or target

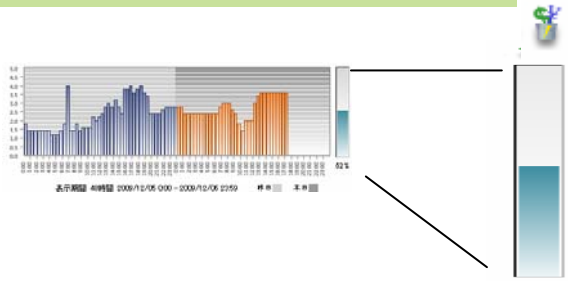
Various visualization elements

Trends

48 hour graphs for easy trend comparison. Percentages and monthly summary display.



Estimated Excess Usage



Esitmated Excess Usage ratio **45%**

Ranking

Graphs shown in consumed amount ranking

Time span

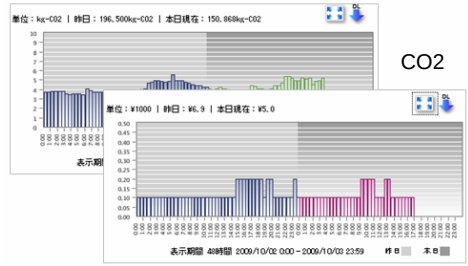
see data in Day, month, year time spans

Graphs

See data in Line graphs and bar graphs

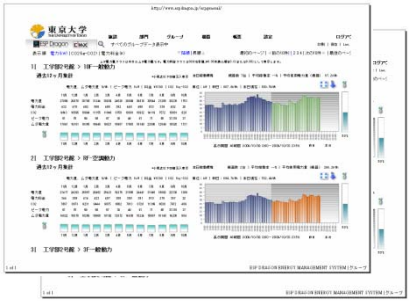
Categories

View data in Kw Co2 Kg-CO2 and electric bills



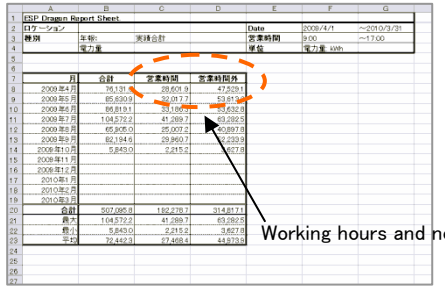
Printing

Function for printing screen image.



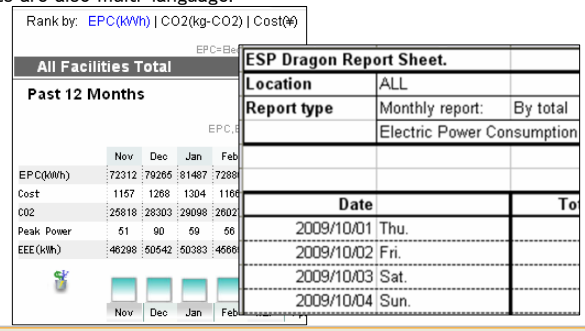
XML reporting

Report download function which generates report in xml format.



Multi-Language

Switch English and Japanese mode in one click. Downloadable repots are also multi-language.



Next generation GUI

Gamenics

Gamenics is a method of designing software with intuitive, easy to understand, efficiently designed user interfaces, for a better user experience used in the gaming industry.

Intuitive and fun to use interfaces

Core elements

Intuitive application GUI design
Intuitive interface, manual free operation

Story design / plot
Pre- designed story for achieving target

Self motivating learning curve
Multiple stages of Learning mechanism

Self motivating and persistent Participation

Gamenics applied products

- Nintendo “DS” and “Wii”
- Car navigation systems
- Home appliances

Used in many products

Advantages of Gamenics

Gain interest and enthusiasm before setting target

Story branching according to user level

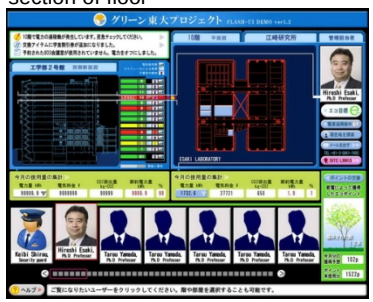
Interpretation of joy upon achieving targets

Gamenics for achieving target

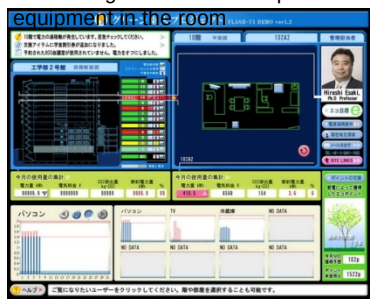
Green University of Tokyo Project Demo software

Facility diagram / layout screen

Energy Administrator assigned for each section of floor



Room diagram and consumption for each equipment in the room



Target setting screen

Eco point screen

Demonstration

Operation demonstration of Web and FLASH interface