Status quo and prospects of leading edge energy-saving technology for office buildings, etc.

Japan Federation of Construction Contractors
Chairman of Design Committee
TAISEI CORPORATION Executive Officer
Chief of Design Division

Haruhiko Kono

Activities of Japan Federation of Construction Contractors

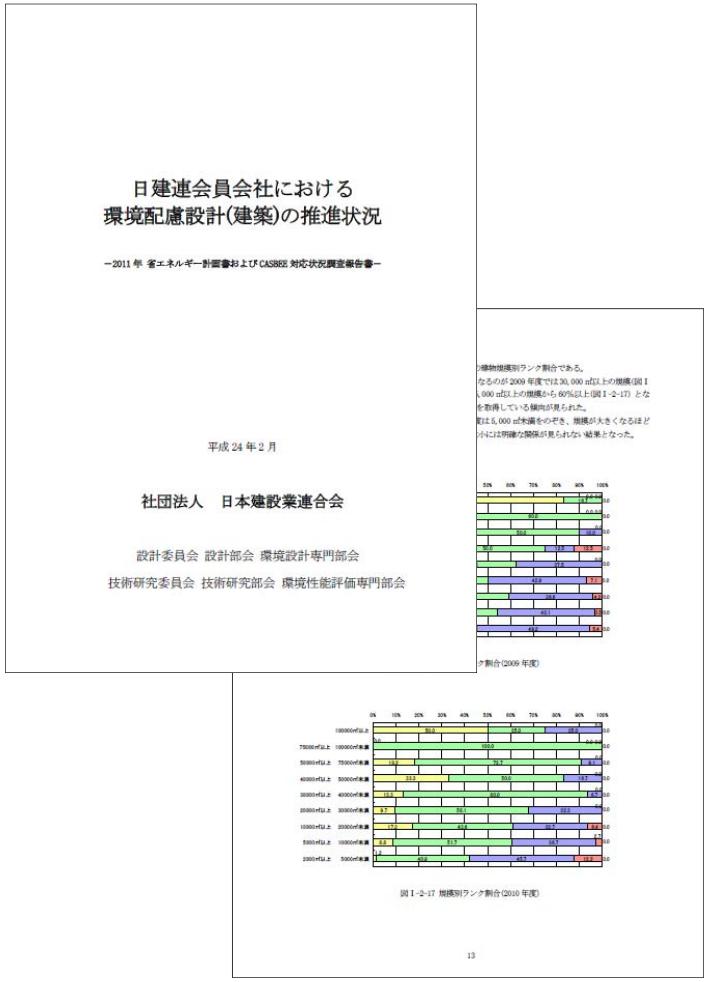
– Understanding status quo and promotion of eco-friendly design –

・Energy-saving plan document and investigative report on handling CASBEE

・Sustainable buildings cases

・Design Policy for Realizing Sustainable Building

Energy-saving plan document and investigative report on handling CASBEE



日建連会員会社における
環境配慮設計(建築)の推進状況

—2011 年 省エネルギー計画書および CASBEE 対応状況調査報告書—

平成 24 年 2 月

社団法人　日本建設業連合会

設計委員会 設計部会 環境設計専門部会

技術研究委員会 技術研究部会 環境性能評価専門部会

・Sustainable buildings cases

Sapporo Building of Taisei Corporation

Building overview

Location:	Chuo-ku, Sapporo City, Hokkaido
Start of constr.:	July 2005
Completion:	June 2006
Building type:	Office, retail, and parking
Structure:	RC, S
Total floor area:	6,970 m²
Scale:	8FL, 1BF

Concept and outline of environmentally sustainable design

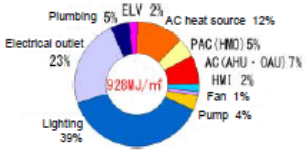
1) Minimum thermal load environment
- ●External insulation and minimized window area

2) Northern area air conditioning
- ●Natural energy utilization of free cooling, outside air cooling, and natural ventilation
- ●Energy reduction and load leveling by structure thermal storage & radiant heating and cooling

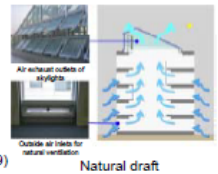
3) Day-lighting system T-Soleil
- ●Comfort eco-void by automatic sun-tracking mirror , diffusion and radiation prism mirrors

4) High-efficiency operation based on BEMS
- ● Energy-saving operation to ensure a steady increase in efficient energy performance

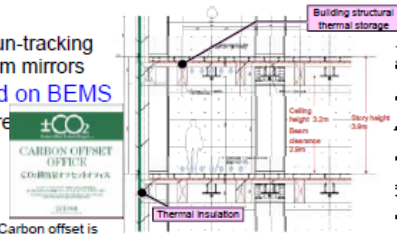
CASBEE: Rank S (BEE = 4.5 in 2006), ERR: 49% reduction (measurement in 2009)



Primary energy consumptions (figure in FY2009)

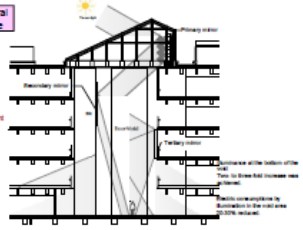


Natural draft



Carbon offset is achieved through the use of carbon credit.

Building-structural thermal storage radiant heating and cooling system



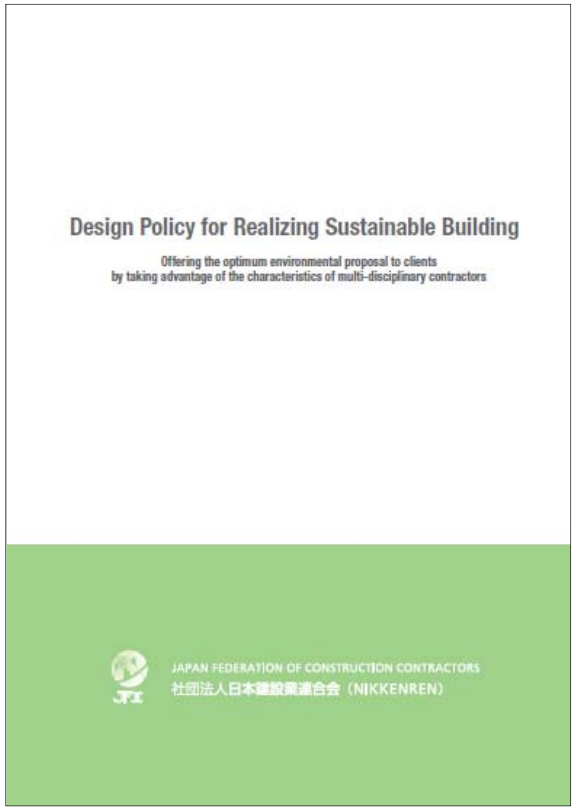
Conceptual diagram of solar power admission system T-Soleil

3

・Design Policy for Realizing Sustainable Building

（English version）

・Design Policy for Realizing Sustainable Building



1.Various approaches to realize green-buildings

2.Various approaches to operate buildings

3.Approaches to realize zero-energy of buildings

4.Approaches to Smart City

1.Various approaches to realize green-buildings

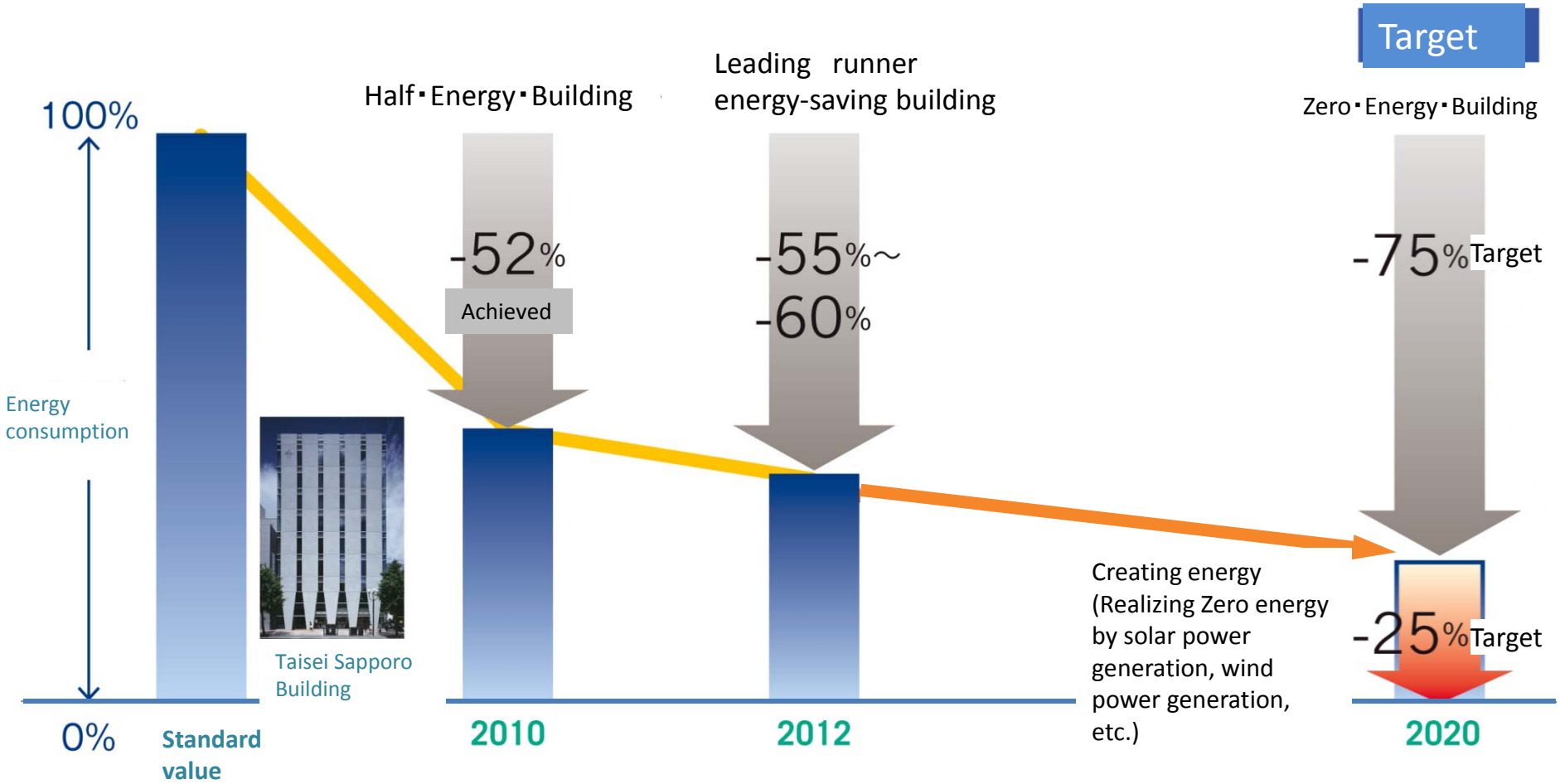
2.Various approaches to operate buildings

3.Approaches to realize zero-energy of buildings

4.Approaches to Smart City

Various approaches to realize green-buildings

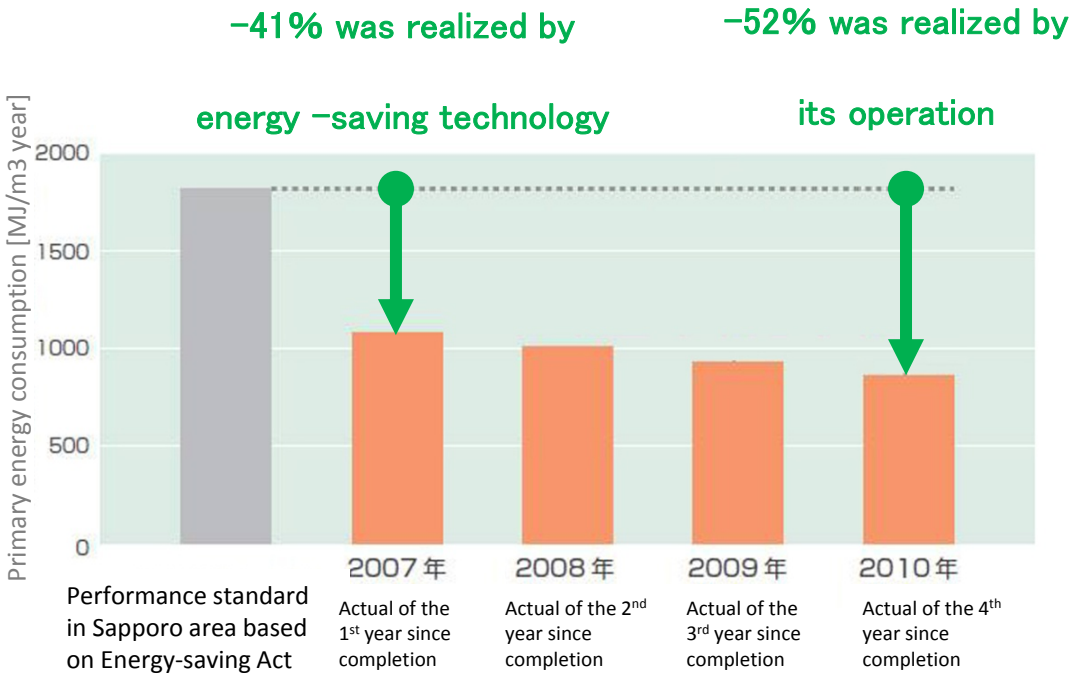
Roadmap of TAISEI CORPORATION



We have realized Half・Energy・Building in 2010, aim at further curtailment of energy.

Various approaches to realize green-buildings

Half・Energy・Building was established

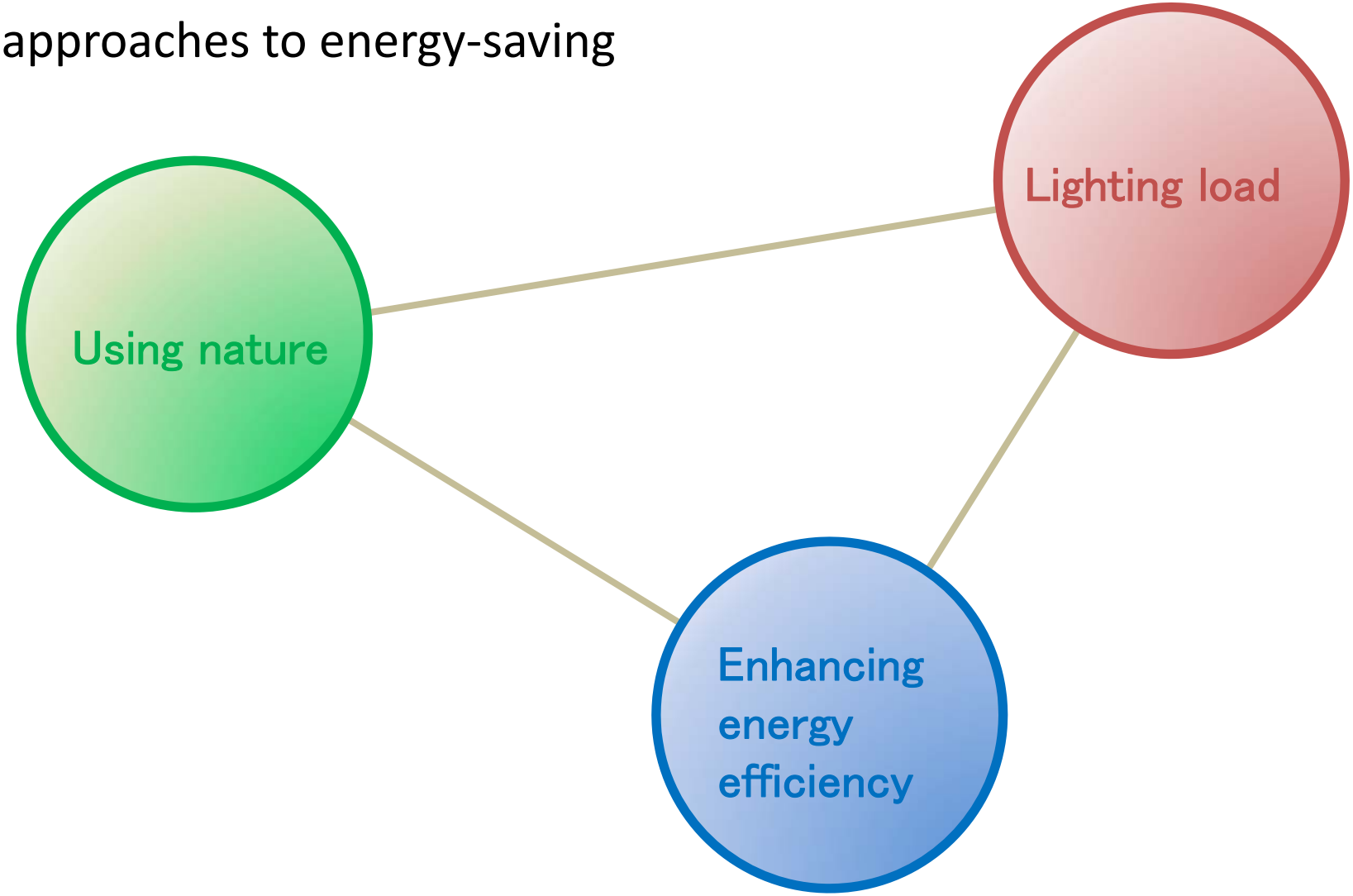


Good Design Award / Nikkei New Office Award
Eco-build Award Grand Prize / building Contractors Society Award BCS Award
The Institute of Electrical Installation Engineers of Japan Award
Facility Incentive Award
The Society of Heating, Air-Conditioning, and Sanitary Engineers of Japan Award
Technology Award and many others

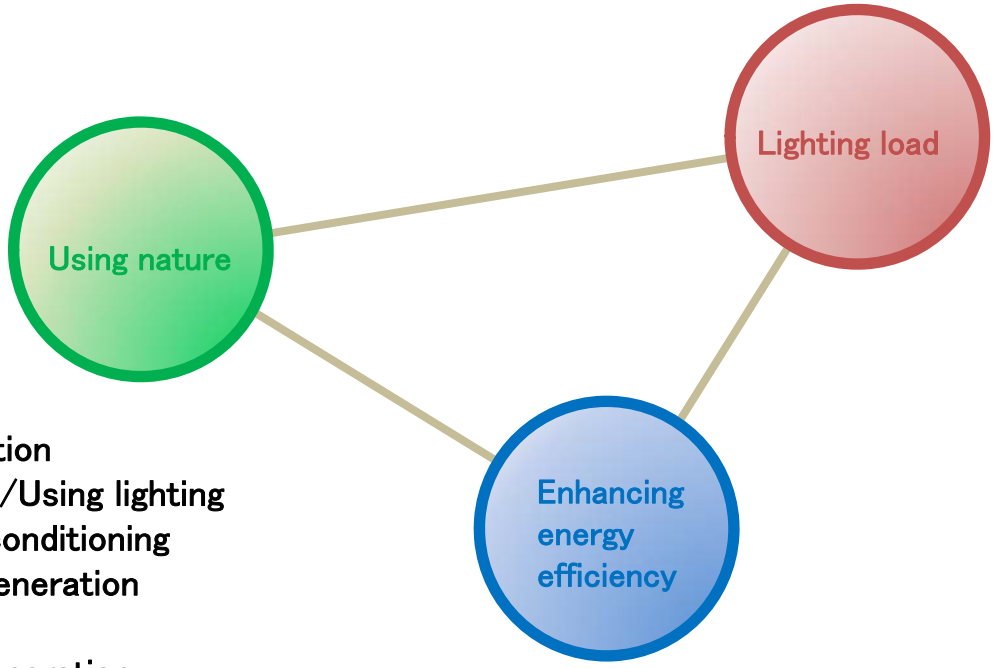
We won various awards for Half・Energy・Building of TAISEI Sapporo Building due to energy-saving technology and its operation.

Various approaches to realize green-buildings

3 approaches to energy-saving



Various approaches to realize green-buildings



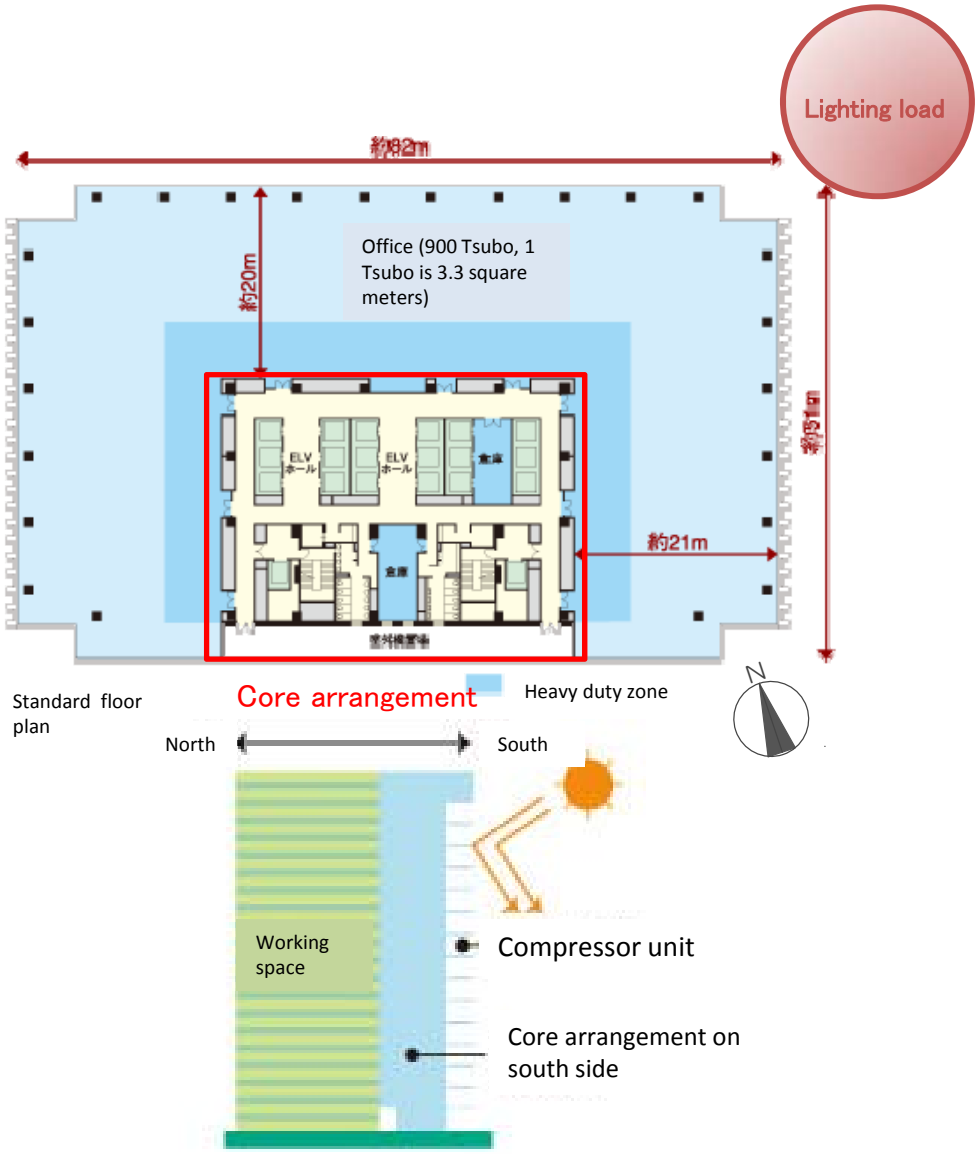
- Shielding insolation
- Enhancing thermal insulation
- Enhancing outer skin performance
- Roof greening
- Wall greening ・・・

- Natural ventilation
- Natural lighting/Using lighting
- Geo-Heat air conditioning
- Solar Power Generation
- Free Cooling
- Wind Power Generation
- Cool tube
- Using rain water ・・・

- High-efficient lighting
- High-efficient air conditioning・・・

Various approaches to realize green-buildings

Shielding insolation



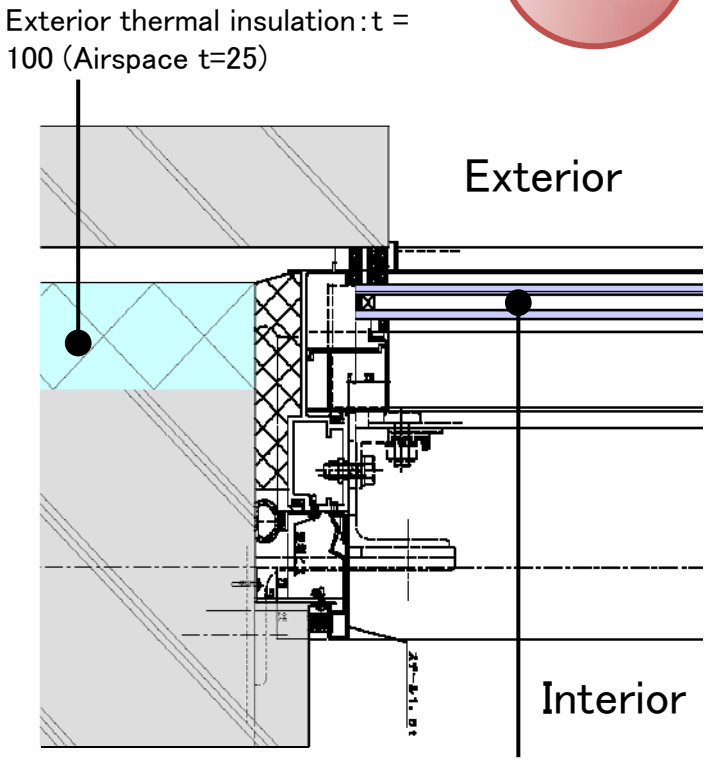
Core arrangement on south side and introducing vertical fin on east & west side of Ohanomizu Sola City

Various approaches to realize green-buildings

Enhancing thermal insulation

Lighting load

Installation status of
Exterior wall PC board
Insulation material

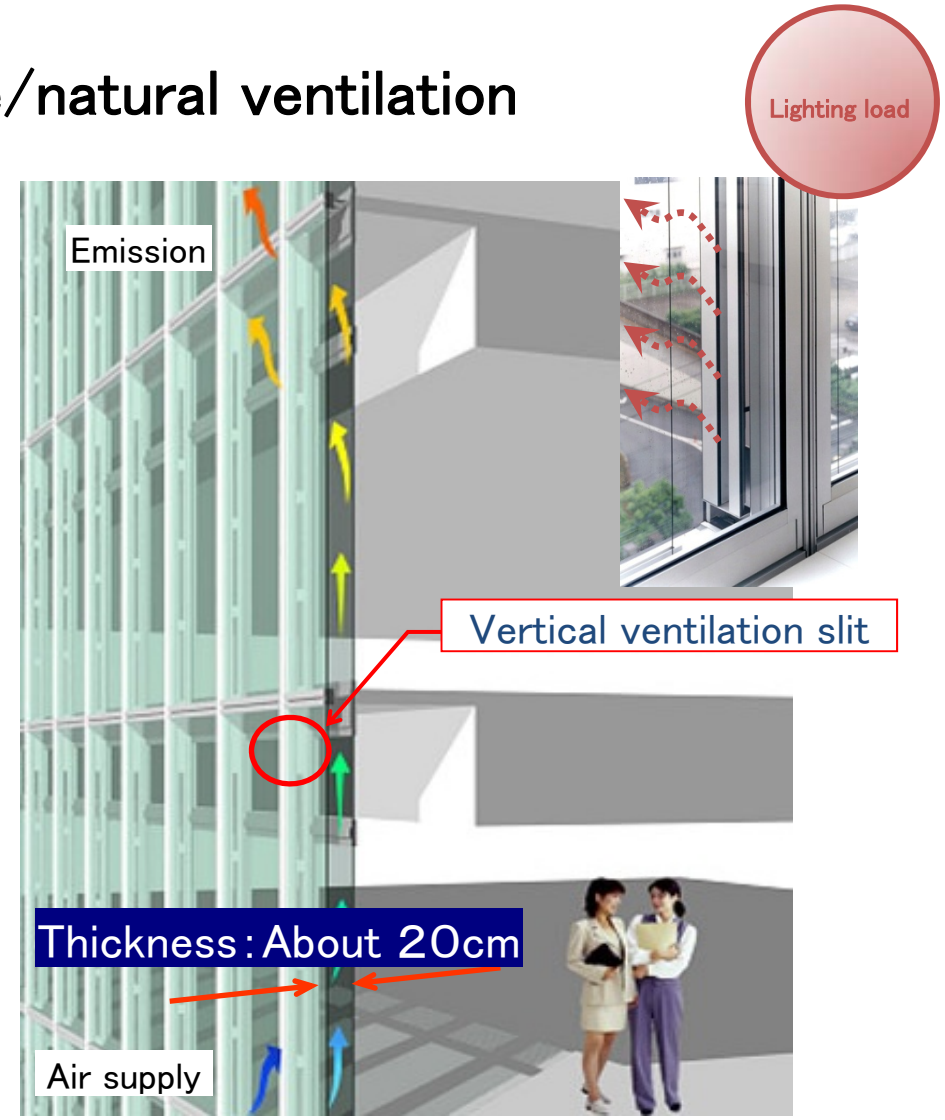


Detailed drawing of
exterior wall

TAISEI Sapporo Building has introduced exterior thermal insulation.

Various approaches to realize green-buildings

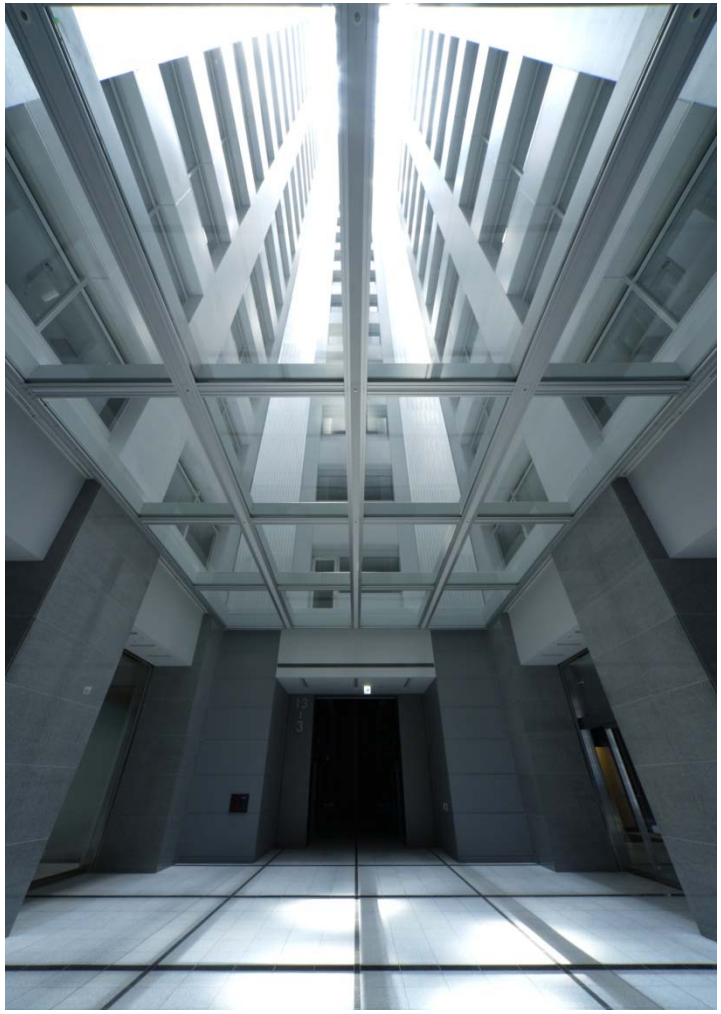
Enhancing outer skin performance/natural ventilation

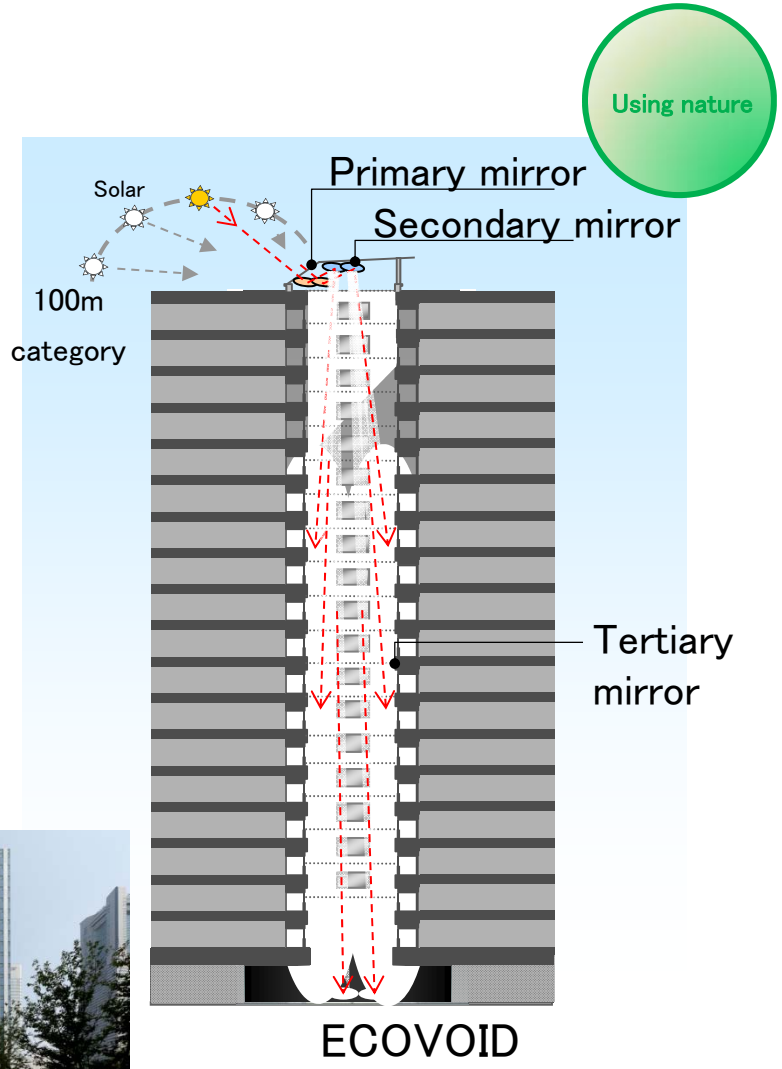


Double skin system with the thickness of 20cm and natural ventilation were introduced at the time of remodeling TAISEI CORPORATIOIN Technical Center.

Various approaches to realize green-buildings

Natural daylighting/Using daylighting



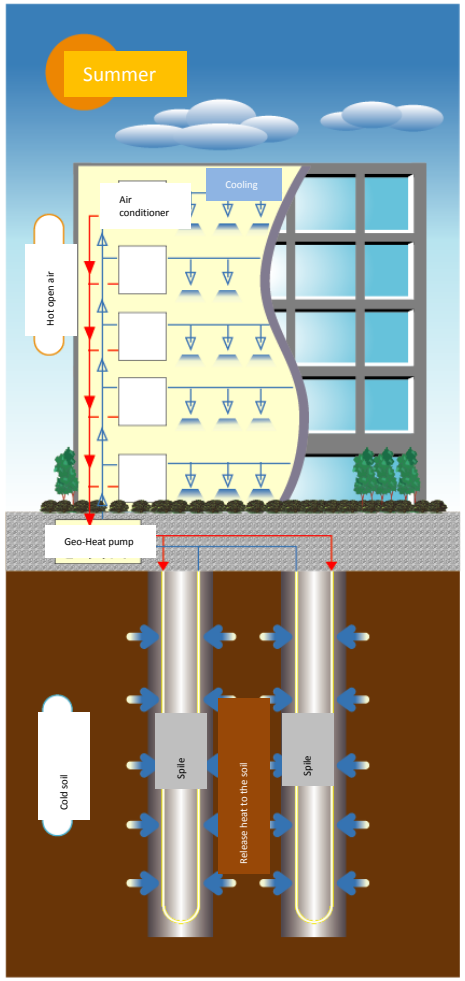


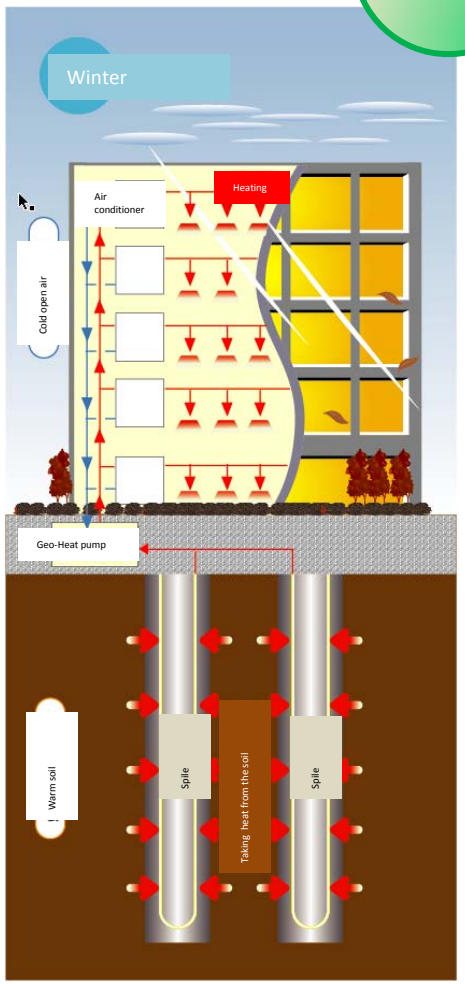
Minato Mirai Center Building has set up ECOVOID introducing T-Soleil100.

Various approaches to realize green-buildings

Geo-Heat air conditioning

Using nature



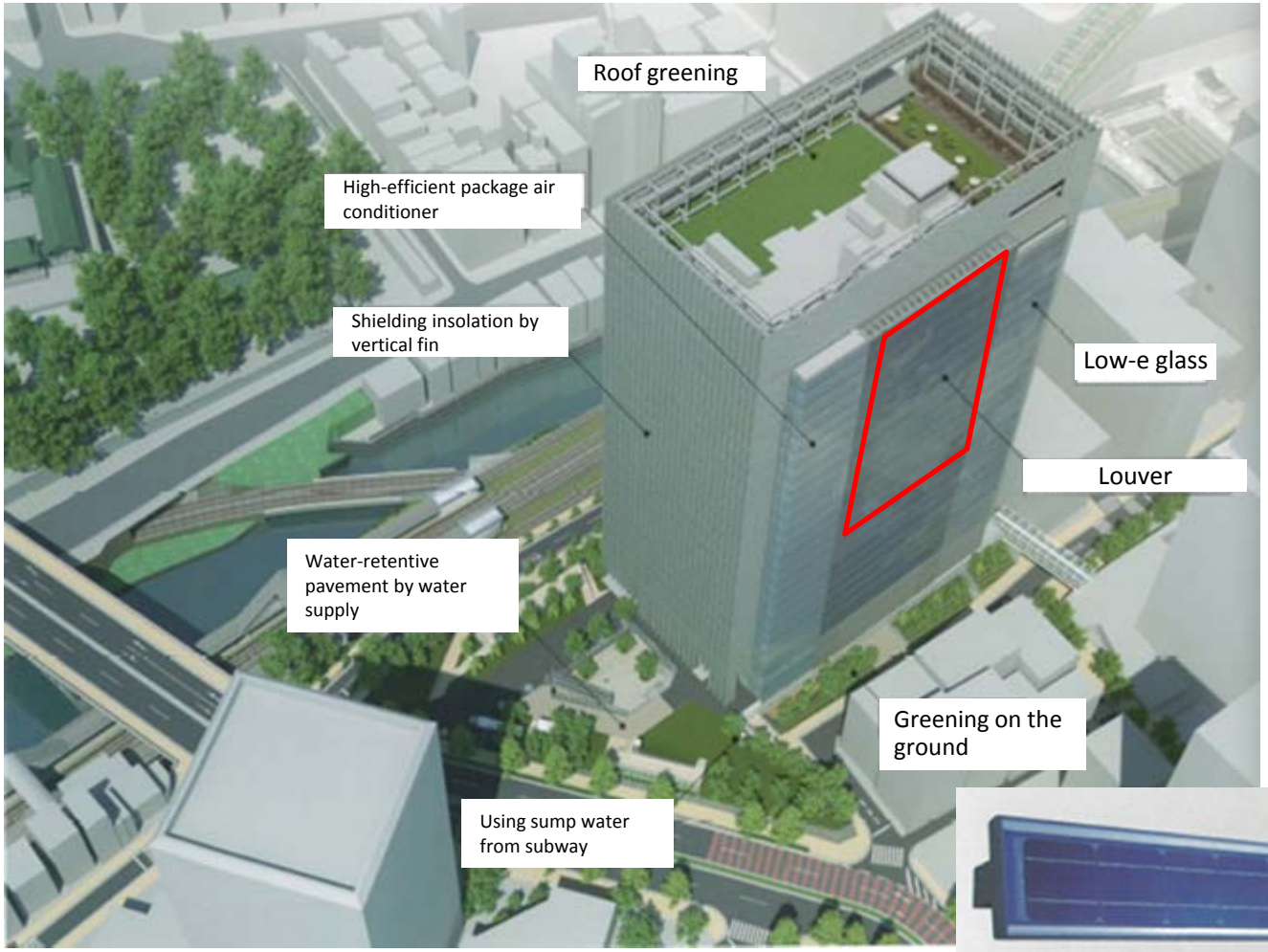


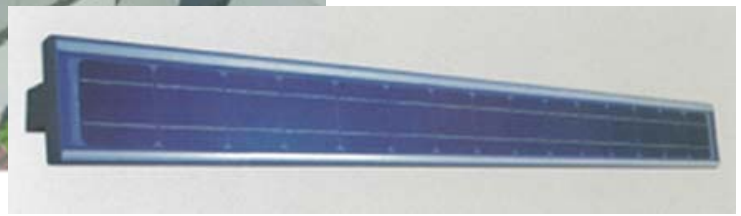
MAYEKAWA MFG. Co., Ltd. and TOKYO SKYTREE area have introduced it for supplying heat.

Various approaches to realize green-buildings

Solar power generation using wall surface

Using nature





Ochanomizu Sola City has introduced integrated photovoltaics louver (150kW).

Various approaches to realize green-buildings

Enhancing energy efficiency

High-efficient lighting

TAISEI Original LED lighting

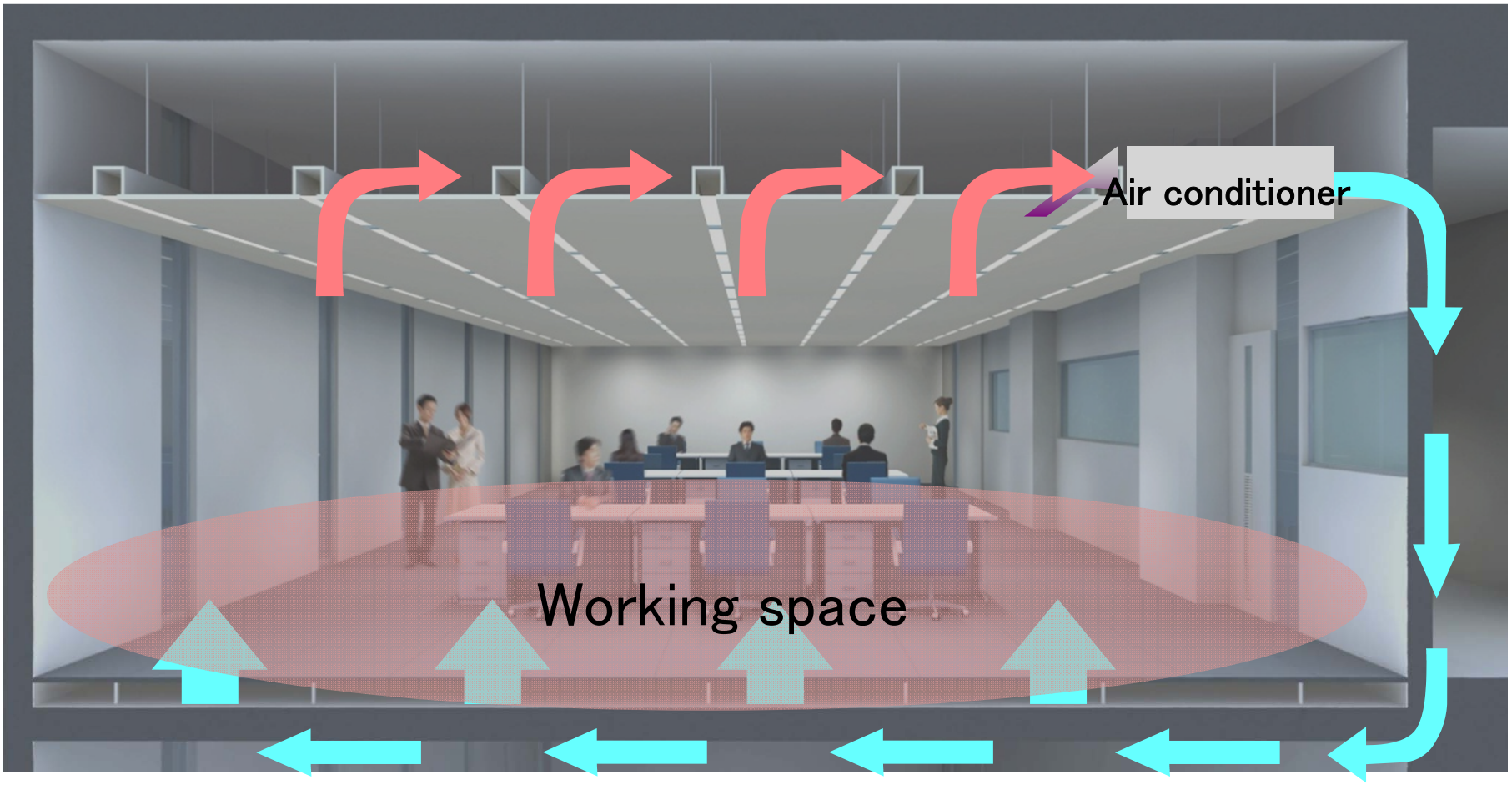
One of the top efficiency levels of energy consumption in Japan

Various approaches to realize green-buildings

Enhancing energy efficiency

High-efficient air conditioning

Floor supply displacement air conditioning system



High-efficient air conditioning for working space by floor supply displacement air conditioning system

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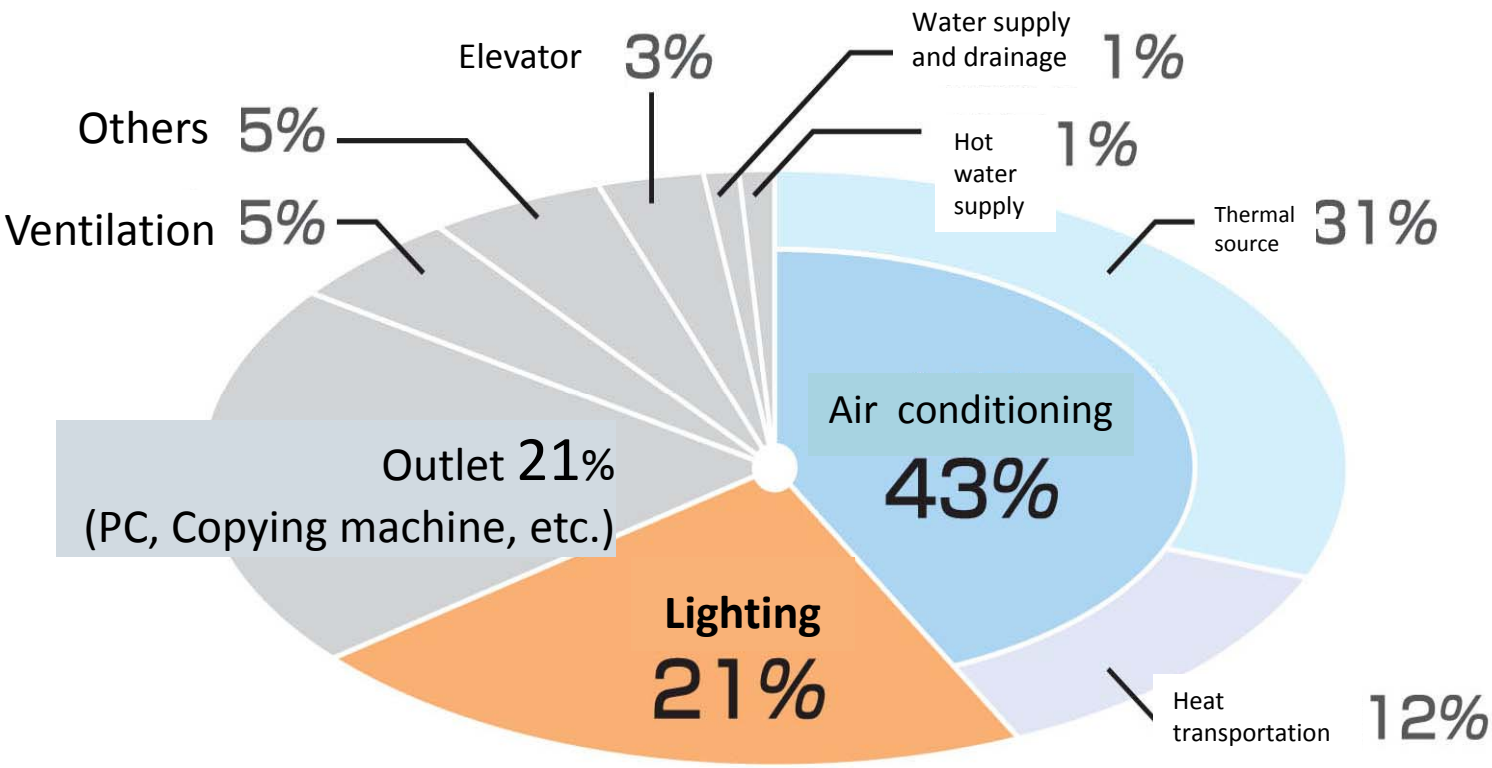
Various approaches to operate buildings

Breakdown of energy consumption of operational phase (In the case of general office building)



Source：Energy Conservation Center, Japan "Energy-saving for office buildings"

High-efficient lighting and air conditioning that occupy more than 60% of energy consumption are required.

Various approaches to operate buildings

TAISEI CORPORATION's Steps to smart saving power

Step 1 Visualization ····· T-Green BEMS *Lite*

Enlightening awareness of saving power

⇩

Step 2 Optimization ····· T-Green BEMS

Saving power with considering amenity

⇩

Step 3 Segmentation ····· T-Zone Saver

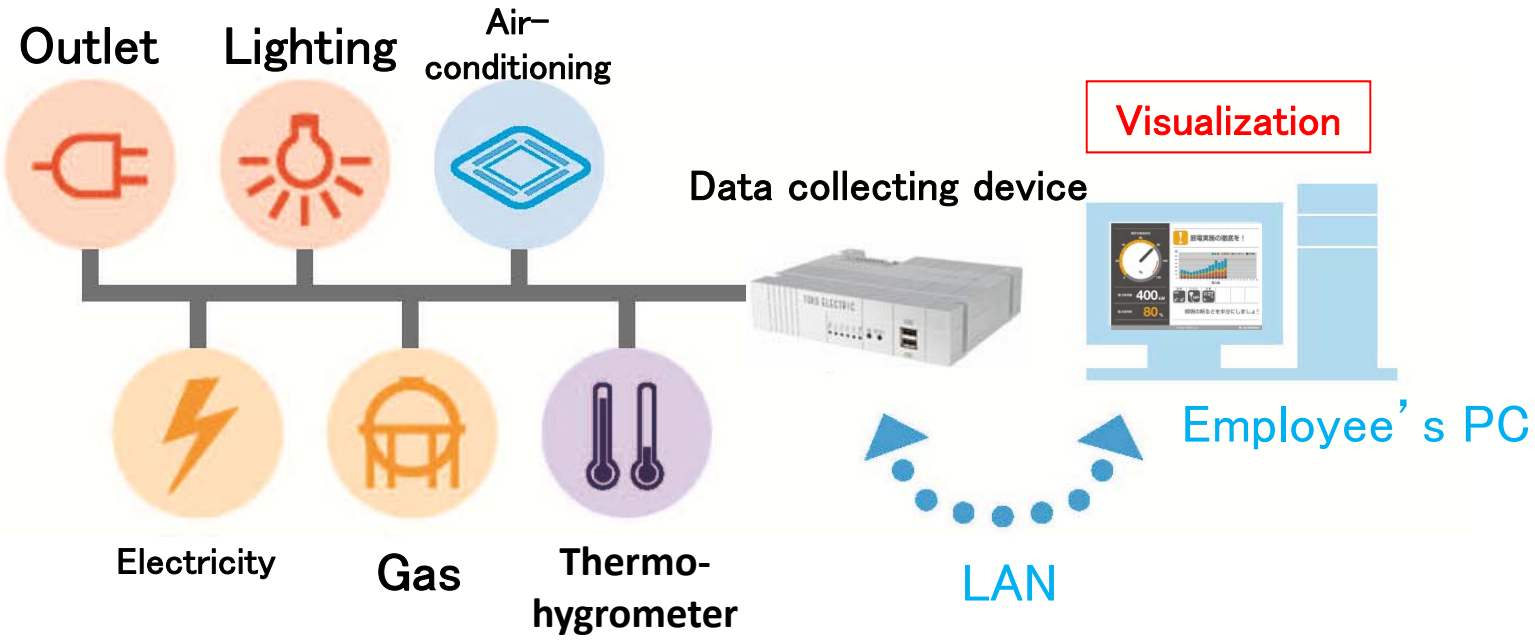
Automatic control per zone

Various approaches to operate buildings

Step1 Visualization

T-Green BEMS Lite

- Screen element to enhance saving power awareness.
- It is available for reference by PC at each seat.
- Displaying saving power / energy-saving activities.
- Setting low-cost price.

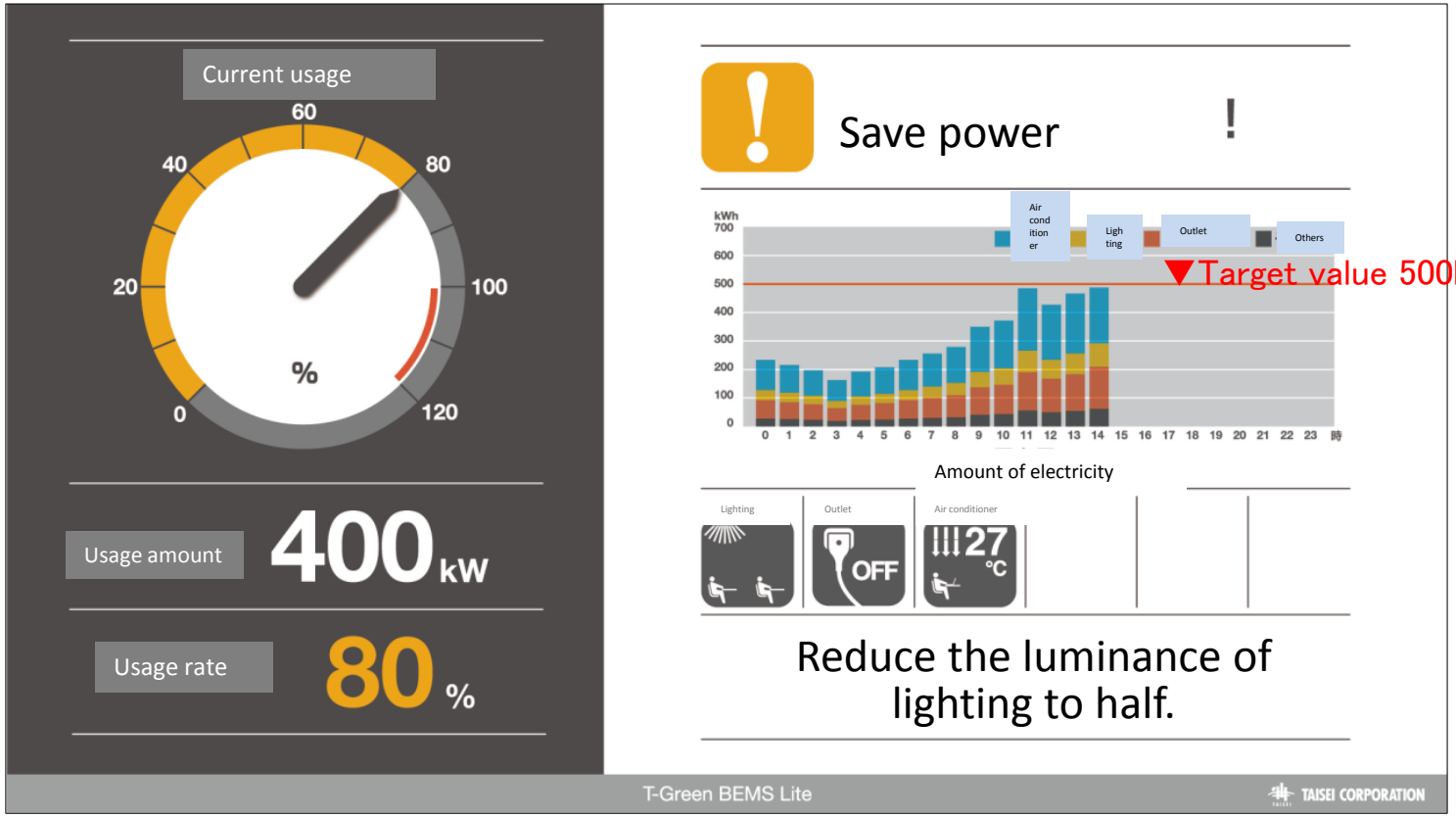


Even only visualization has energy-saving effect.

Various approaches to operate buildings

Step1　Visualization

T-Green BEMS Lite

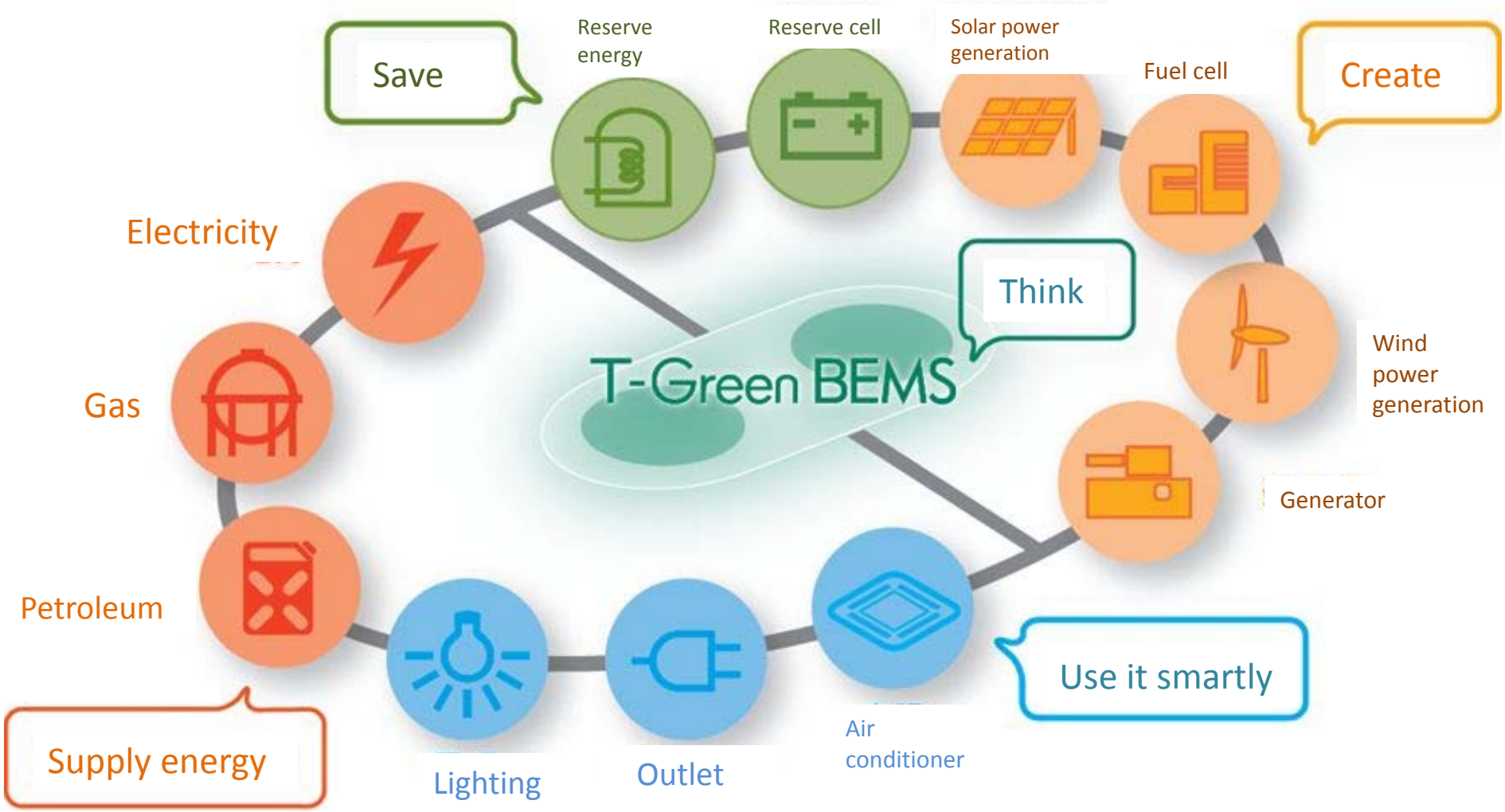


Analogue display which is easy to see, and it instructs action along with saving power level.

Various approaches to operate buildings

Step 2 Optimization

T-Green BEMS



Smart saving power is available that prioritizes lighting over the temperature of air conditioning with consideraiton of amenity.

Various approaches to operate buildings

Correlation between amenity and energy-saving / saving power effect

	Measure for energy-saving / saving power	Saving power effect	Sense of discomfort
Lighting	Decreasing by half of lighting in working space	Large	Small
Air - conditioning	Changing cooling temperature from 26℃ to 28℃	Small	Large

June issue in 2012 of Environment Business

Smart saving power considering amenity

that lighting prioritizes over cooling temperature is required.

Various approaches to operate buildings

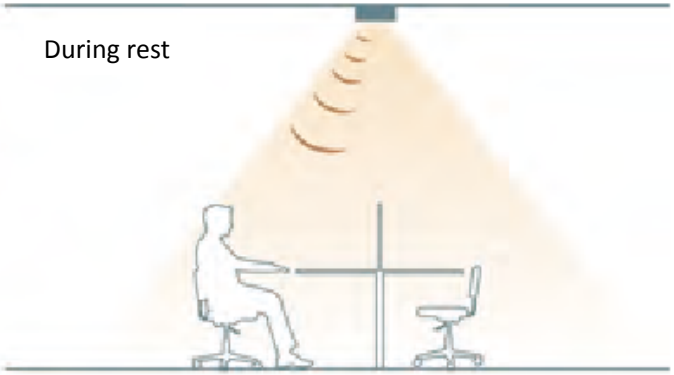
Step 3 Segmentation

T-Zone Saver

Conventional sensor

T-Smart Focus

During rest, it couldn't detect him / her and turn it OFF (Sensor glitch).



It detects him / her correctly and keeps it ON.

It keeps on till timer works (Not saving energy).

It detects his/her absence quickly and turn it OFF.

It detects only the existence of human quickly and finely (1.8m×1.8m unit).

Various approaches to operate buildings

Step 3 Segmentation

T-Zone Saver

8:30（Start time）

Lighting / air conditioning only in attended area

15:00（Meeting）

Securing appropriate lighting and heating environment

20:00（Overtime）

Lighting / air conditioning only in attended area

It provides necessary lighting and heating environment only in necessary area.

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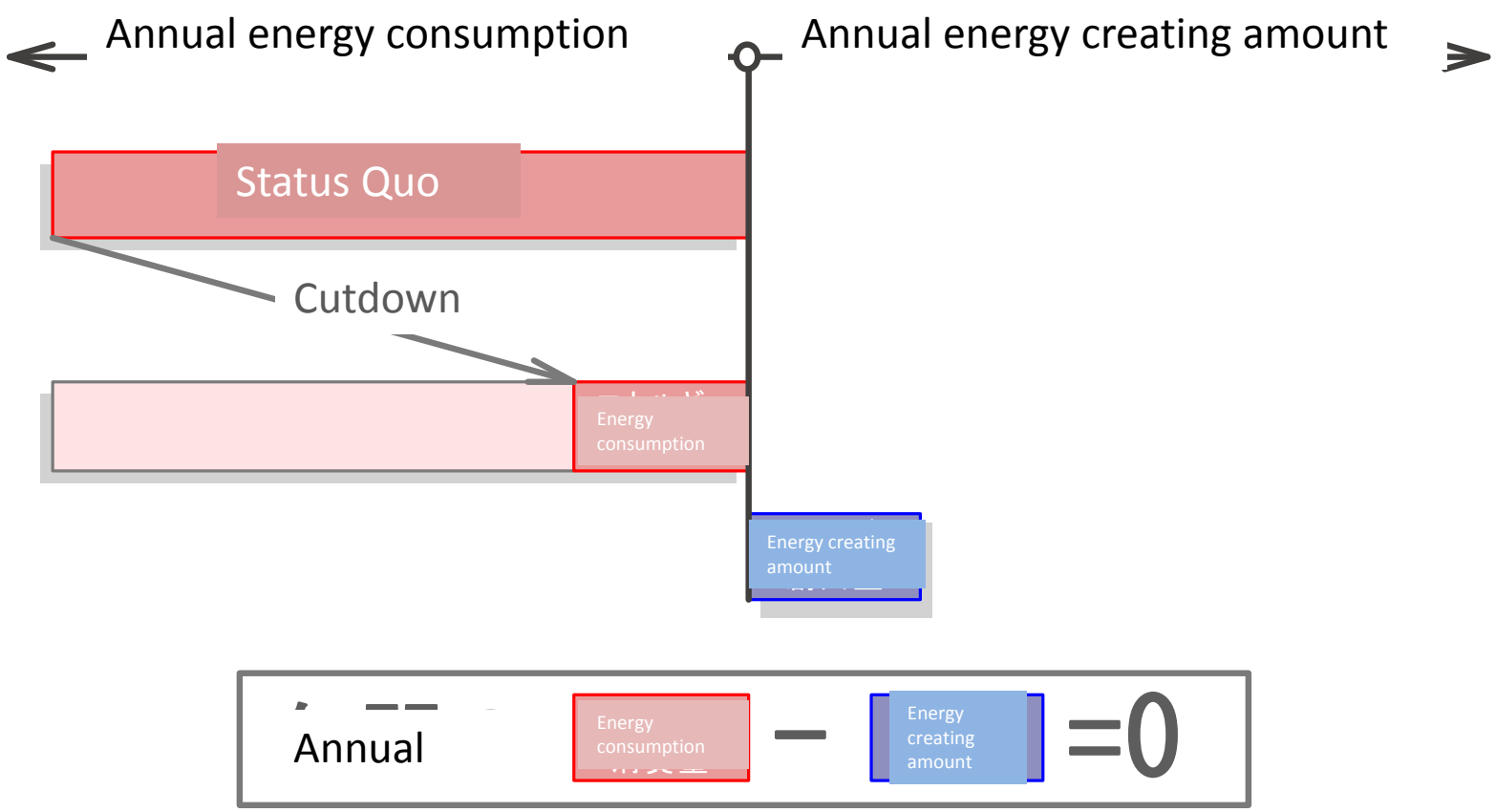
Approaches to realize zero-energy of buildings

ZEB：Net・Zero・Energy・Building



Buildings with zero energy consumption annually by creating energy

Approaches to realize zero-energy of buildings

Cases in various countries

U.S.A：Oberlin College

U.S.A：Office of Legacy Center

U.K.：Zero-carbon house

Singapore：BCA Academy
Under the jurisdiction of Building Management Agency

Approaches to realize zero-energy of buildings

Cases in various countries

Korea：Green Tomorrow
Housing of SAMSUNG C&T
CORPORATION Co., LTD.

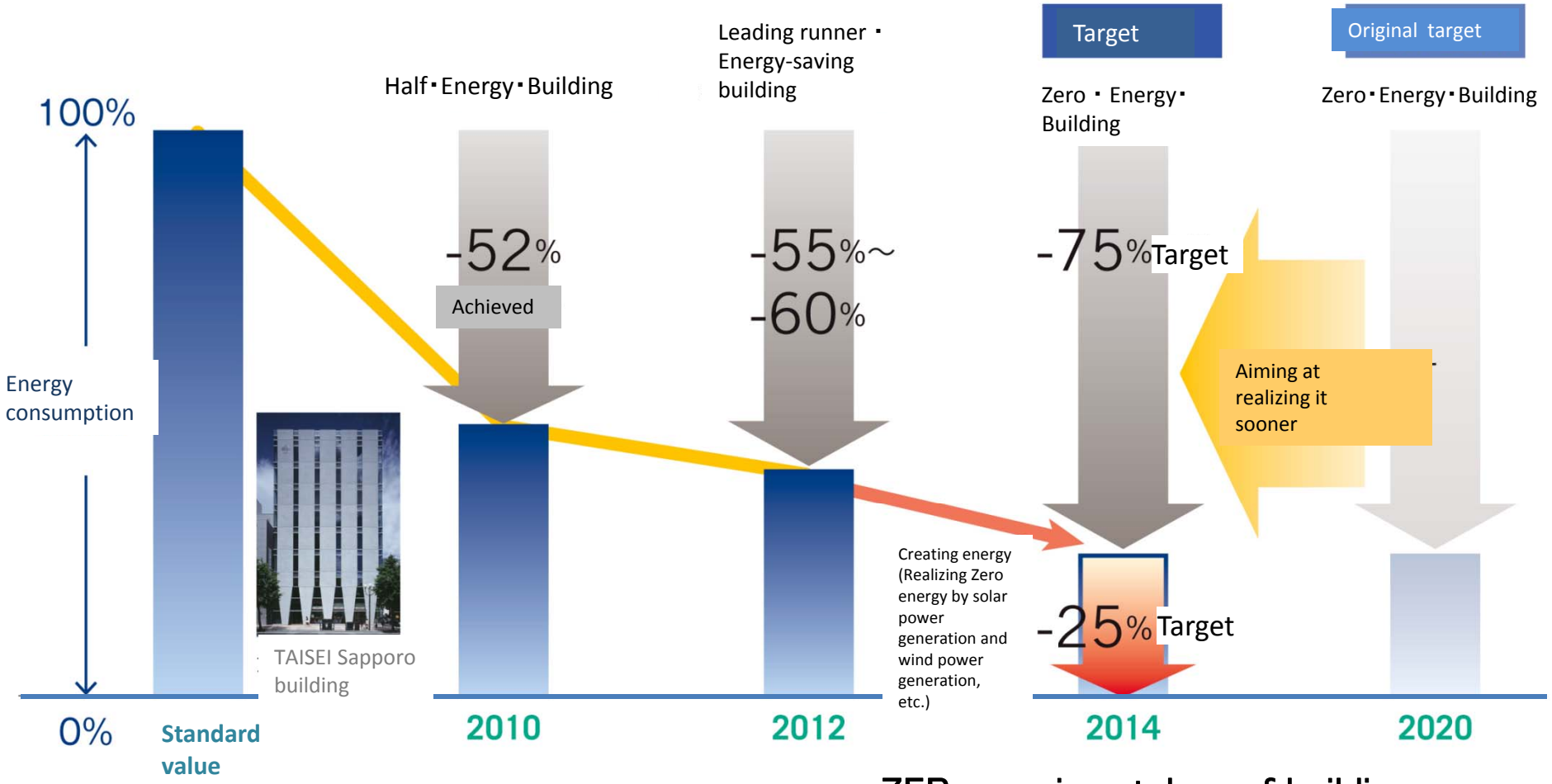
Malaysia：GEO（Green Energy Office）building
which was to be ZEB originally.

Japan：Offices in the woods

Low-rise buildings in suburban area have become mainstream.

Approaches to realize zero-energy of buildings

ZEB Roadmap of TAISEI CORPORATION



ZEB experimental proof building is to be completed in FY 2014 ahead of schedule.

Approaches to realize zero-energy of buildings

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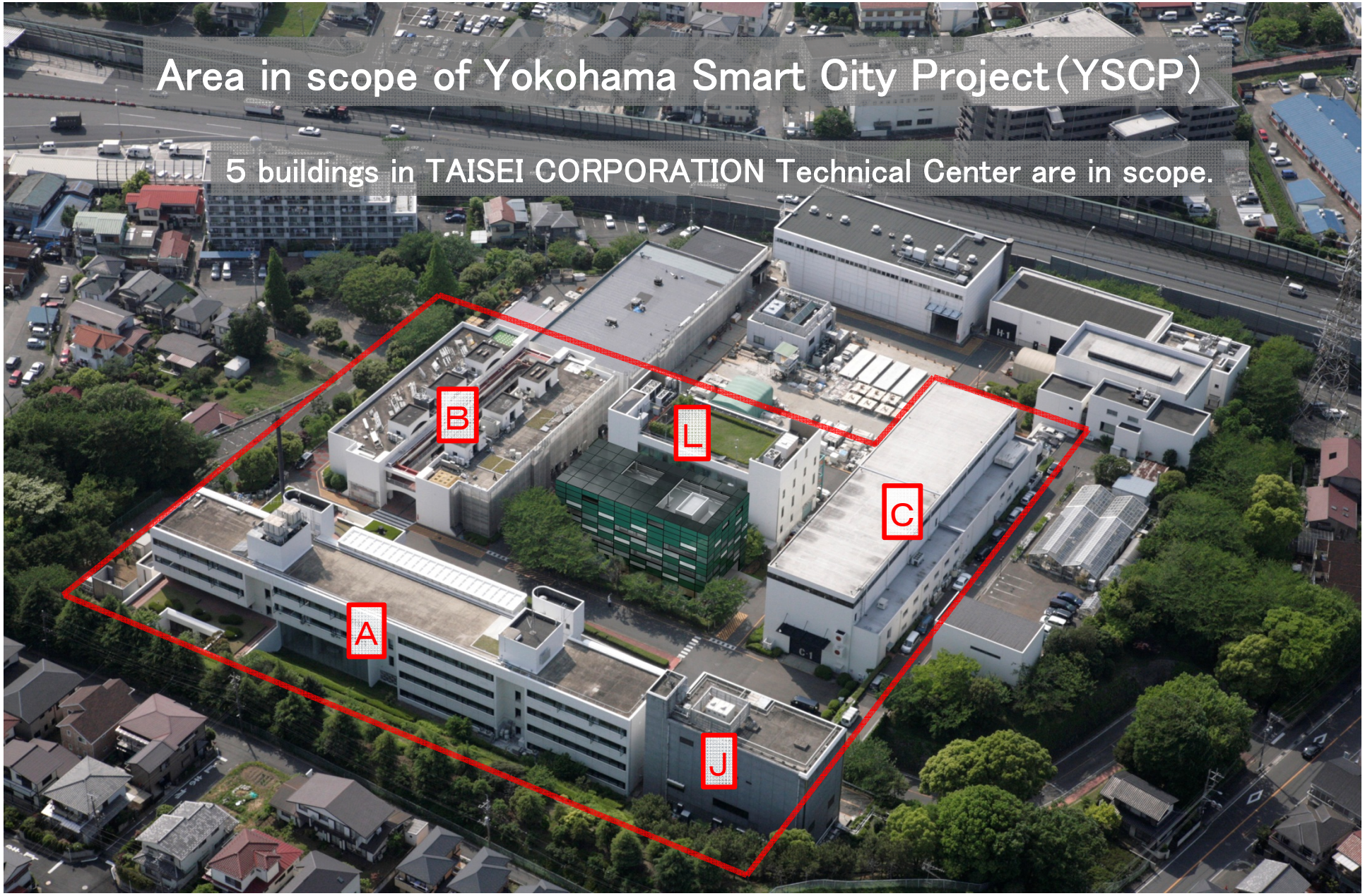
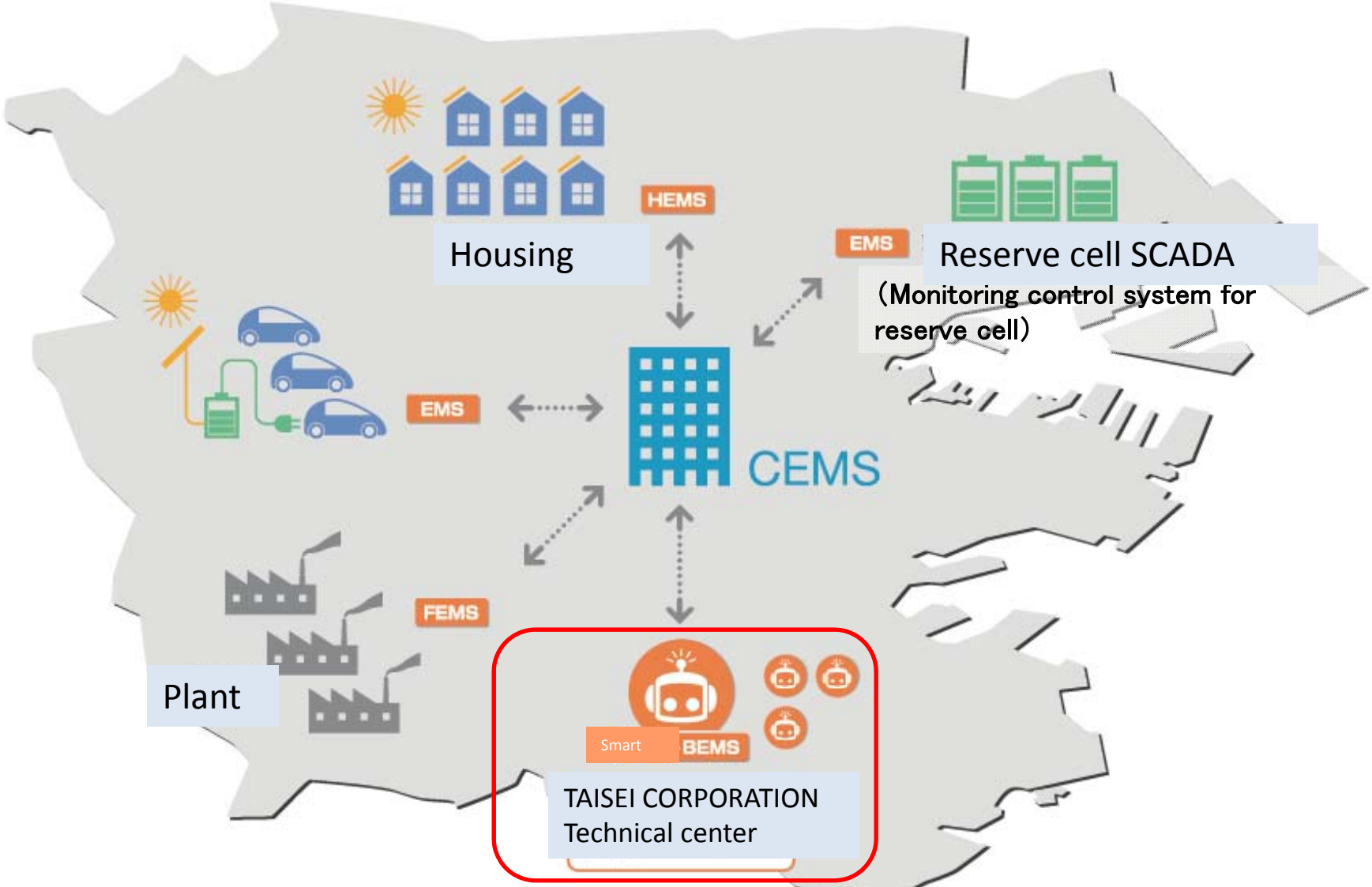
Approaches to Smart City



Whole picture of Yokohama Smart City Project（YSCP）



CEMS：Community Energy Management System

Whole picture of experimental proof system

CEMS

・Optimized control of electric supply to whole area

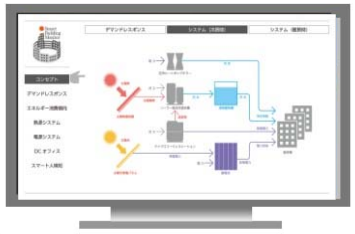
Joint experimental proof with TOSHIBA CORPORATION has started since 2012.

In TAISEI CORPORATION Technical center

Thinking

T-Green BEMS

- Demand / Supply of energy for building
- Optimized control of each facility
- Realizing demand response, etc. (Optimization of electric demand / supply)



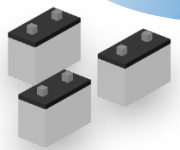
Creating

Solar power generation

Solar energy collector

Generator (Co-generation)

Saving



Reserve cell

Saving heat

Using

Lighting・OA device

Ventilation

Air conditioning

ELV

Approaches to Smart City

Starting experimental proof of demand response

大成建設

デマンドレスポンス

冬季実証スタート

横浜の技術センターで

大成建設は、使用電力の効果的なピークカットを実現するため、横浜市戸塚区の技術センターで冬季のデマンドレスポンス（需要応答）の実証を8日から開始する。同センターを含む横浜市内のビル数棟をコントロールする地域エネルギー管理システム（CEMS）からデマンドレスポンス信号を受け取ると、同センターでは創電、蓄電設備などを駆使し、室内環境の快適性を確保しながら外部からの使用電力量を削減。CEMSの要求に対応し、地域レベルでエネルギーの最適利用を実現することを目指す。

なとみらいグランドトラルタワー（丸紅）、横浜ランドマークタ（三菱地所）、横浜ビルディング（三井産）の各ビルを連携最大20%のピーク達成を目標としてCEMSや統合BEの運用は東芝が担当している。

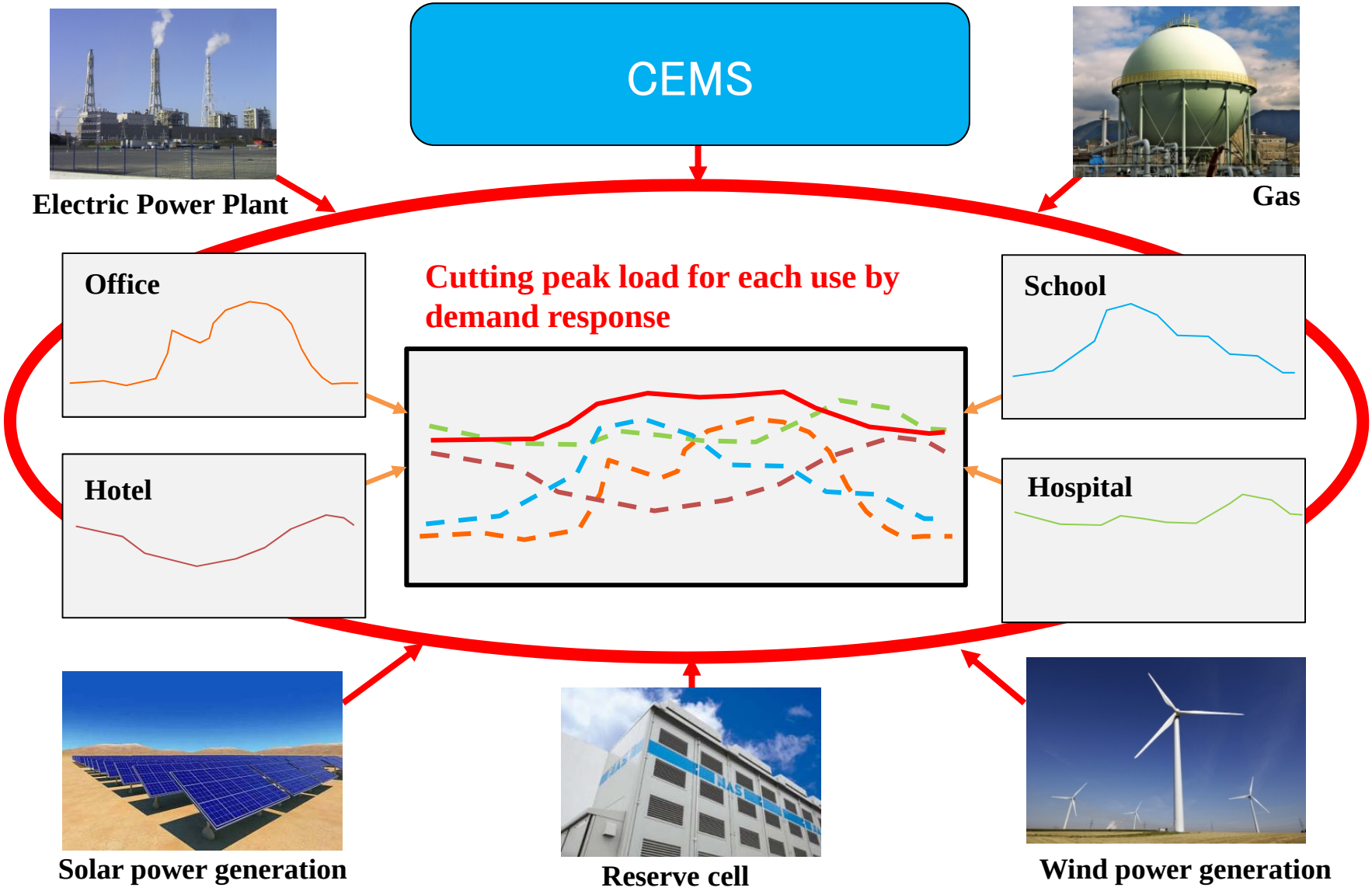
Press announced on January 18th, 2013

The 1st experimental proof with cooperation between large scale buildings in Japan by integrated BEMS started.

The reduction target is 20% at the maximum of peak cut.

Approaches to Smart City

Leveling of electricity / heat load in Smart City



Approaches to Smart City

Based on energy balance between supply and demand,
we will be able to create optimized city in the future.

Thank you for your attention.