

# Approach to achieving resilient and smart cities

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SHIMIZU CORPORATION

Today's Work, Tomorrow's Heritage



# About Shimizu Corporation

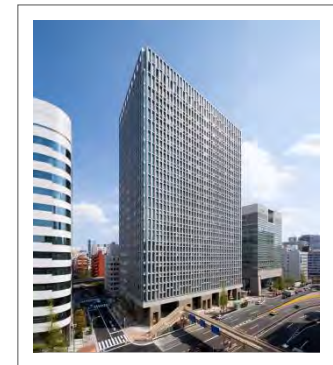
Founded 210 years ago, Shimizu is one of the largest Architecture / Engineering / Construction firms in Japan.

## Shimizu Corporation (Consolidated Accounting for FY 2012)

**Founded** : 1804  
**Net Sales** : US\$ 15,043 million  
**Ordinary Income** : US\$ 184 million  
**Employees** : 15,616 (As of March, 2013)  
**Business Line** : Building, Civil Engineering, Engineering, Construction, Real Estate Development

**Corporate Slogan** : Today's Work, Tomorrow's Heritage

### International Business Network



Head Office  
Tokyo, Japan

# Approach to achieving resilient and smart cities

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**1 Concept**

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**2 Smart city cases**

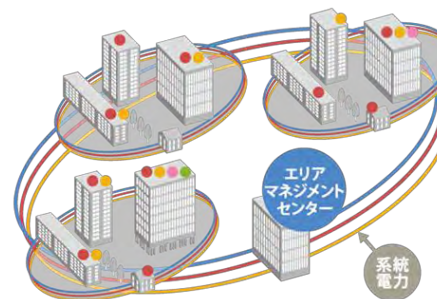
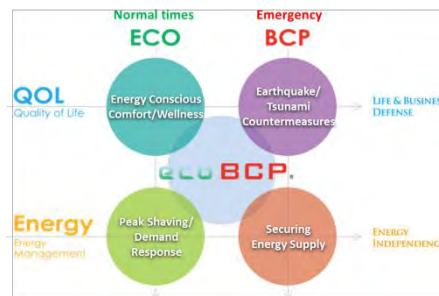
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**3 Future outlook**

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# 1 Concept

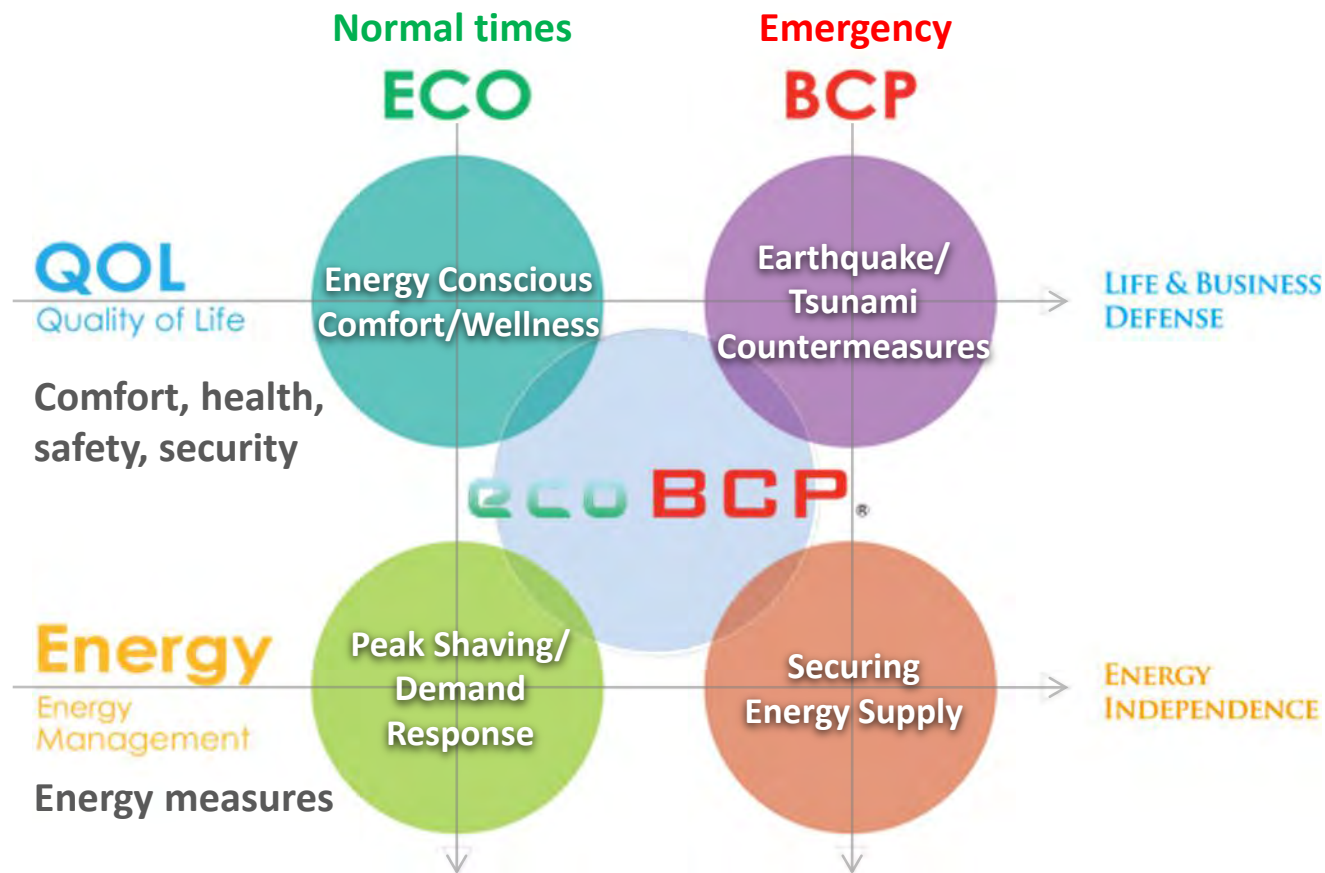
- The “ecoBCP” concept
- Shimizu’s approach to resilient & smart urban regeneration



# The “ecoBCP” Concept: Basic concept for resilient & smart cities

## Low Carbon/Peak Shaving (*eco*) + Business Continuity Plan (*BCP*)

Applying energy conservation measures during normal times to build facilities and communities while assuring business continuity and energy independence in the event of an emergency.



Resilient and smart cities

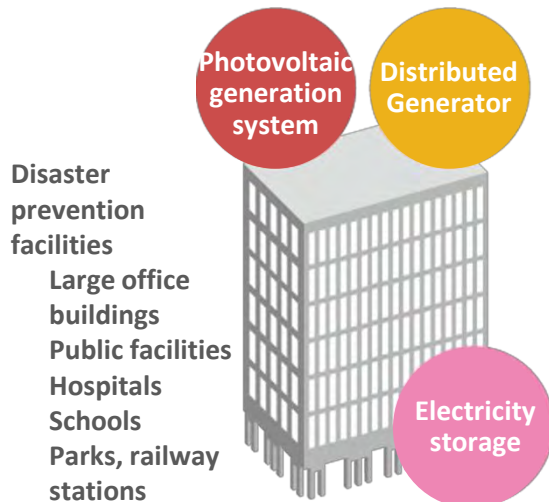
# Shimizu's approach to resilient & smart urban regeneration

- Staged “ecoBCP” solutions from facility-level to district-level and area-level.
- Increasing community value and competitiveness by enhancing “ecoBCP” and community-help.

## Enhancing “ecoBCP” of disaster prevention facilities

### ① Facility level

- Energy conservation and the improvement of QOL during normal times
- Securing energy supply during emergency

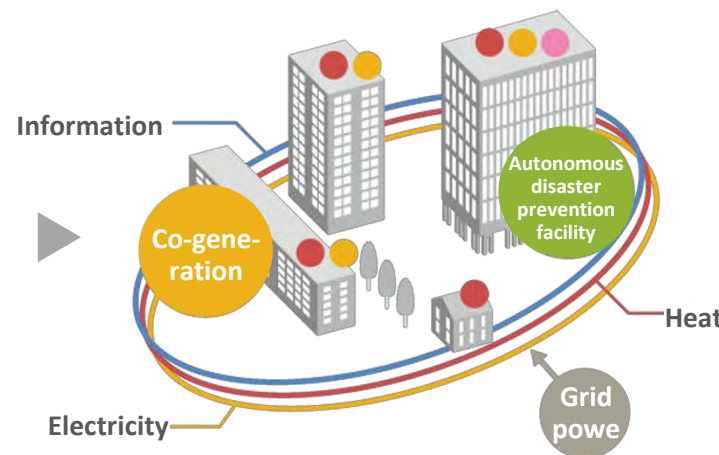


BC: Business Continuity  
LC: Life Continuity

## District-wide energy utilization

### ② District level

- Utilizing district heating/cooling/power supply
- Accommodating those unable to return home in the event of an emergency

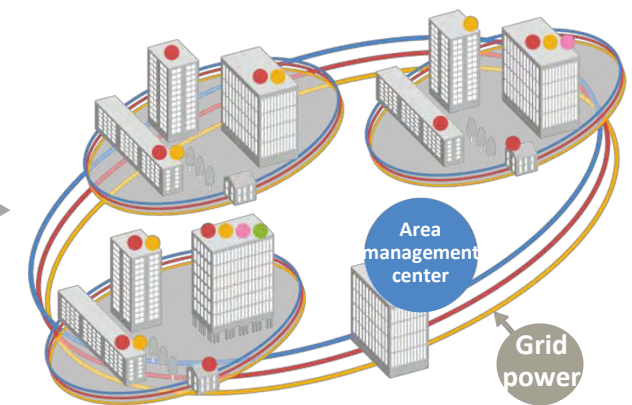


DC: District Continuity

## Area-wide “ecoBCP” management

### ③ Area level

- Area energy management
- Area business/life continuity management



CC: Community Continuity

# 2 Smart city cases

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- **Kyobashi Smart Community**
- **Kesennuma Smart Industrial Park**
- **Chubu University Smart Campus**
- **Smart building demonstration project**



## 2. Smart city cases:

# Kyobashi Smart City

- ecoBCP management and enhancing community value and competitiveness in the area around Shimizu's head office.

A high-performance, eco-friendly, and disaster prevention facility

### ① Facility level

- A high-performance, eco-friendly office building
- Accommodating those unable to return home in a disaster

- CASBEE: rank S  
BEE score: 9.7 pts.  
(highest score ever)

- Community disaster prevention facility:  
Accommodates 4,000, employees and others unable to return home.

Shimizu's  
head office

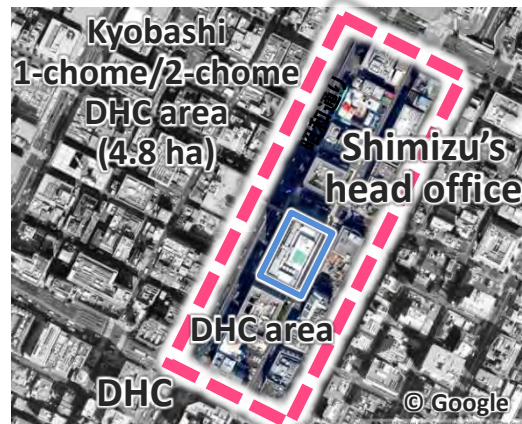


District-wide high-efficiency energy utilization

### ② District level

- District heating/cooling, effective use of waste heat
- Mutual exchange of supplies in the event of an emergency

- DHC system: comprehensive energy efficiency rate of 1.39  
(most efficient in Japan)



Area-wide "ecoBCP" management

### ③ Area level

- Area energy management
- Area business/life continuity management

- ISO 22301 (Business Continuity)
- ISO 50001 (Energy Management)  
(certified as the first area-wide cases in Japan)





# Shimizu's head office: an ecoBCP model building



**Location:** Chuo City, Tokyo  
**Completed:** May 2012  
**Site area:** 3,000 m<sup>2</sup>  
**Building area:** 2,200 m<sup>2</sup>  
**Total floor area:** 51,800 m<sup>2</sup>  
**Floors:** 3 underground levels, 22 above ground levels, one penthouse  
**Height:** 110 m  
**Structure:** Reinforced concrete (partial steel frame)  
Seismic isolation structure  
**CASBEE:** S Rank (BEE = 9.7; highest score ever achieved)  
**LEED:** NC Gold  
**CO2 emissions:** Reduced 58% in 2013 (compared to the average of general office buildings in Tokyo, 2005)

# Area level: ecoBCP management

- Area energy management (EnMS; ISO 50001 certified)
- Area business continuity management (BCMS; ISO 22301 certified)  
(Model projects of group business competitiveness enhancement: FY 2012, METI)
- Area management with “ecoBCP cloud system (CEMS)”
- District power supply (planned)

① Facility level : Shimizu's head office  
High-performance, eco-friendly,  
and disaster prevention facility

Planned area

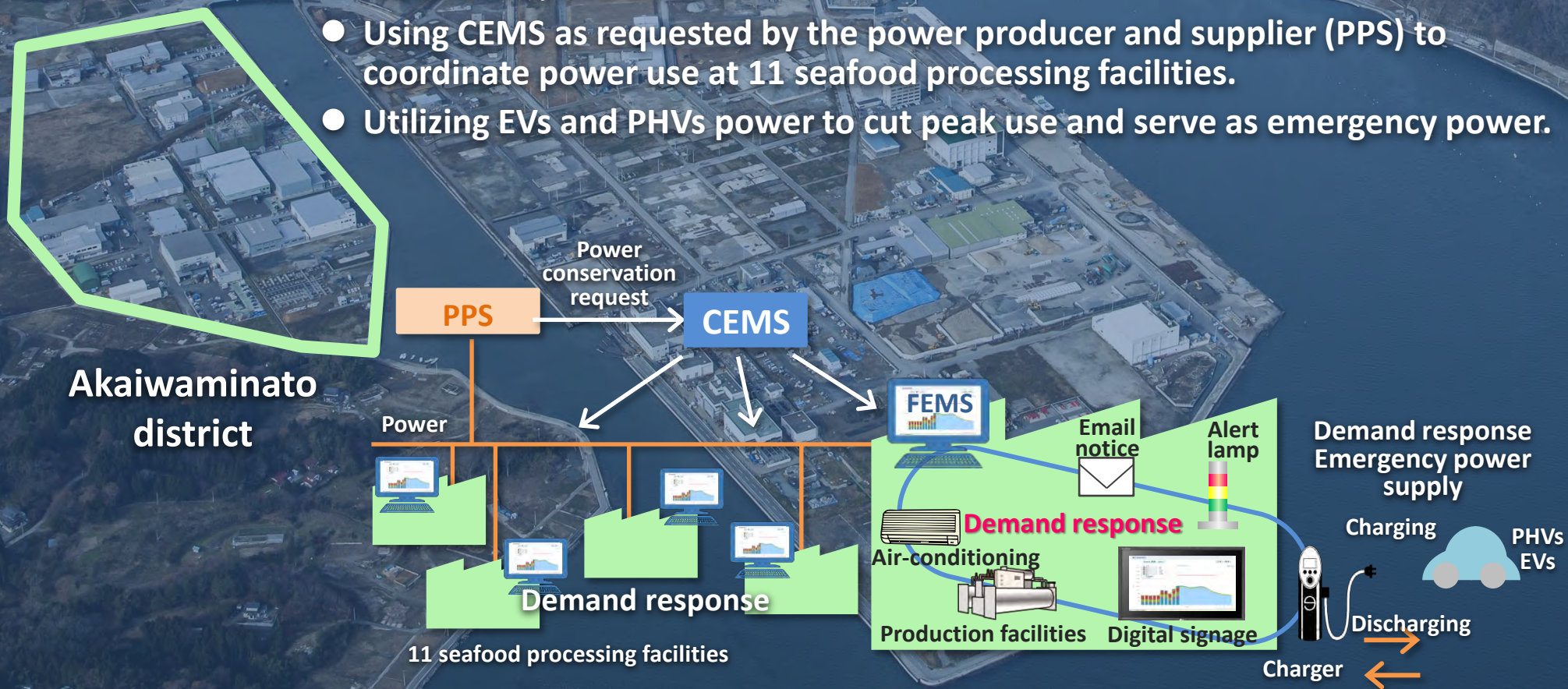
③ Area level :  
Area-wide ecoBCP management

DHC area

② District level : DHC  
District-wide high-efficiency energy utilization

# Kesennuma Smart Industrial Park

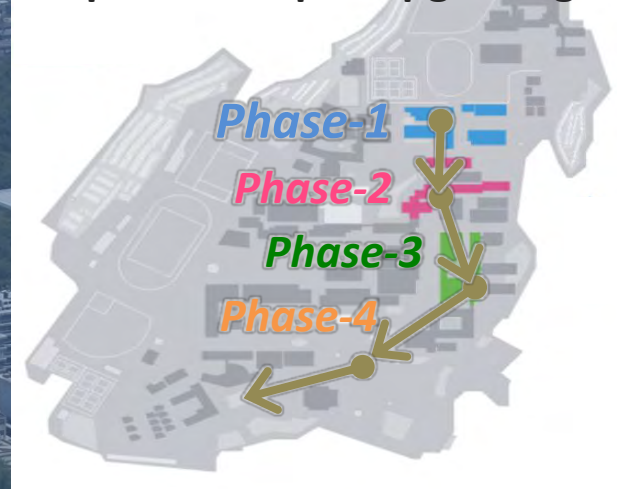
- Energy management for a cluster of seafood processing facilities involved in earthquake restoration projects.
- Sponsored by METI (Project to promote the adoption of Smart Community technologies).
- City of Kesennuma, Ebara Environmental Plant, Smart City Project (Shimizu Corp.), Hachiyo Suisan, Abecho Shoten, Kesennuma Fisheries Cooperative Association, and others.
- Using CEMS as requested by the power producer and supplier (PPS) to coordinate power use at 11 seafood processing facilities.
- Utilizing EVs and PHVs power to cut peak use and serve as emergency power.



# Chubu University Smart Campus

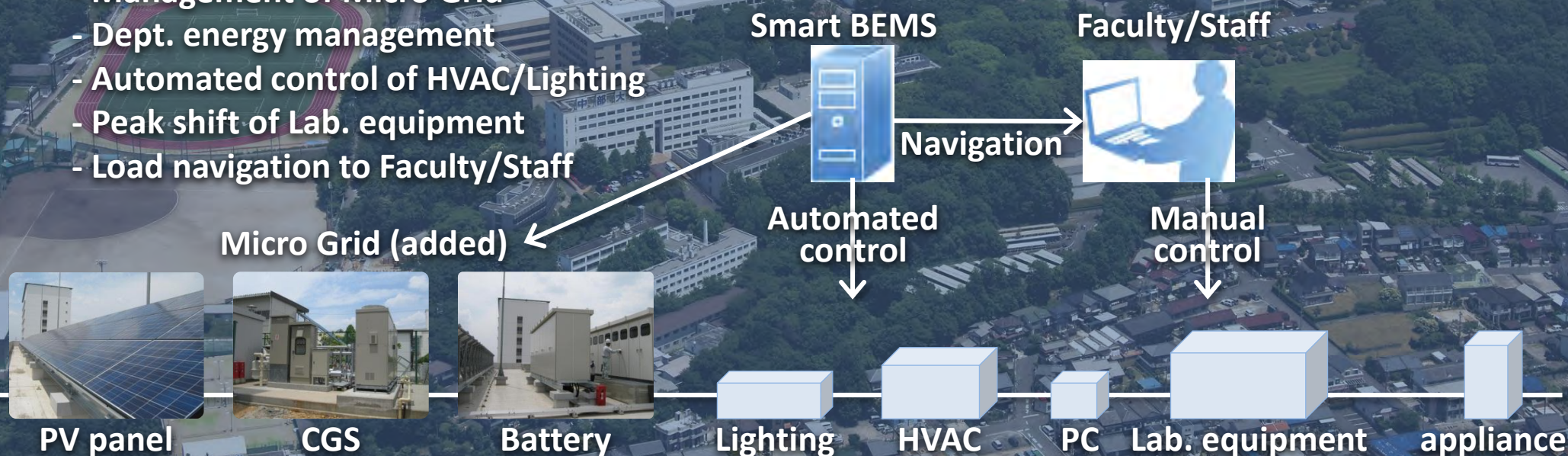
- Stepwise smart renovation at department level
- Installation of micro-grid (PV/CGS/Battery)
- Energy management of department facilities
- Phase-1: Energy saving: 30%/Peak shaving:24%

## Stepwise campus upgrading



## Phase-1: Department-A (five buildings)

- Management of Micro Grid
- Dept. energy management
- Automated control of HVAC/Lighting
- Peak shift of Lab. equipment
- Load navigation to Faculty/Staff



# Smart building demonstration project (Albuquerque, New Mexico)

- Demand response level -1: Peak-shifting/peak-shaving controls
- Demand response level -2: Controls of purchased power as zero
- Demand response level -3: Supply of power to the grid



## Community EMS

Power monitoring  
Demand response signal output

### Smart Grid

Solar power: 500 kW  
Storage cells: 2 MWh  
PNM/DOE

Smart meter



Demand response signal

### Micro-grid controls



<p><b>TOKYO GAS</b> CHP controls</p>	<p><b>TOSHIBA</b> Leading Innovation &gt;&gt;&gt; Grid monitoring, smart meters</p>	<p><b>SHARP</b> Photovoltaic power generation</p>
<p><b>Mitsubishi Heavy Industries</b> Gas engine CGS</p>	<p><b>SHMZ</b> Project management and EPC of micro-grid, smart BEMS, and heat storage system</p>	<p><b>MEIDEN</b> Power conditioners</p>
<p><b>Fuji Electric</b> Fuel cell CGS</p>	<p><b>Furukawa Electric</b> Storage cells management</p>	<p><b>Furukawa Battery</b> Storage cells</p>

Power	Photovoltaic power generation 50 kW	Power conditioner	Lead storage cells 160 kWh	Micro-grid	
	Heat	Heat storage tanks	Air-cooled chiller 70 USRT		Fuel cell CGS 80 kW
		Absorption-type chiller 20 USRT	Cooling tower		Gas engine CGS 240 kW

# 3 Future outlook

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- Achieving real sustainability
- The GREEN FLOAT concept



# Achieving real sustainability

**Resilience**

Responding to  
various risks

**Wellness**

Creating healthy  
and comfortable  
environment

**Management**  
Community  
revitalization

District-wide  
energy utilization

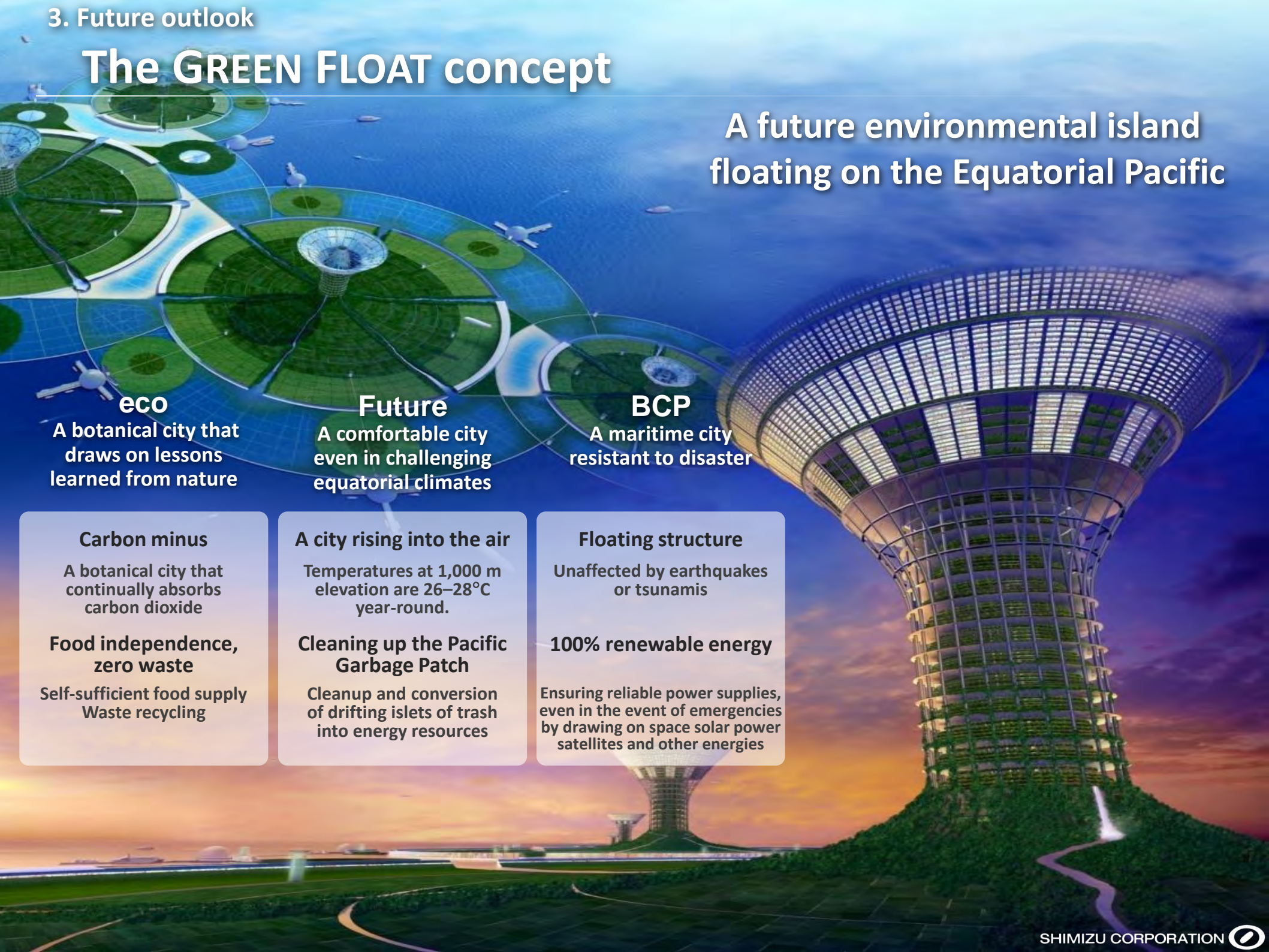
**Smart energy**

Responsibility  
for the planet,  
community,  
and people

**Environment**

# The GREEN FLOAT concept

A future environmental island floating on the Equatorial Pacific



## eco

A botanical city that draws on lessons learned from nature

### Carbon minus

A botanical city that continually absorbs carbon dioxide

Food independence, zero waste

Self-sufficient food supply  
Waste recycling

## Future

A comfortable city even in challenging equatorial climates

### A city rising into the air

Temperatures at 1,000 m elevation are 26–28°C year-round.

Cleaning up the Pacific Garbage Patch

Cleanup and conversion of drifting islets of trash into energy resources

## BCP

A maritime city resistant to disaster

### Floating structure

Unaffected by earthquakes or tsunamis

100% renewable energy

Ensuring reliable power supplies, even in the event of emergencies by drawing on space solar power satellites and other energies



Today's Work, Tomorrow's Heritage

