

Energy Saving for Air-Conditioning at Shopping Mall with High Efficiency Centrifugal Chiller





TUNJUNGAN PLAZA RETAIL MALL

- **The most famous and symbolic** shopping mall
- Opened in 1995 as the first large-scale mega complex in Surabaya
- Total area 125,000m² + a (Still expanding)

SUPERBLOCK GANDARIA CITY



Located on a 7.5 hectare site, Superblock Gandaria City is the largest integrated mixed-use development in South Jakarta, with a total gross floor area of 564,784 square meters and over 4,000 car park lots. Positioned as a "one-stop lifestyle hub" Superblock Gandaria City consists of a retail mall (Gandaria City), two towers of executive condominium (Gandaria Heights), a Green Mark office tower (Gandaria 8) and a five-star hotel.

Strategically located in the prime residential neighborhood and emerging commercial hub of South Jakarta, Superblock Gandaria City is situated on the main thoroughfare that connects northwest and south Jakarta and is 5 kilometres away from the outer ring road.

SUPERBLOCK TUNJUNGAN CITY



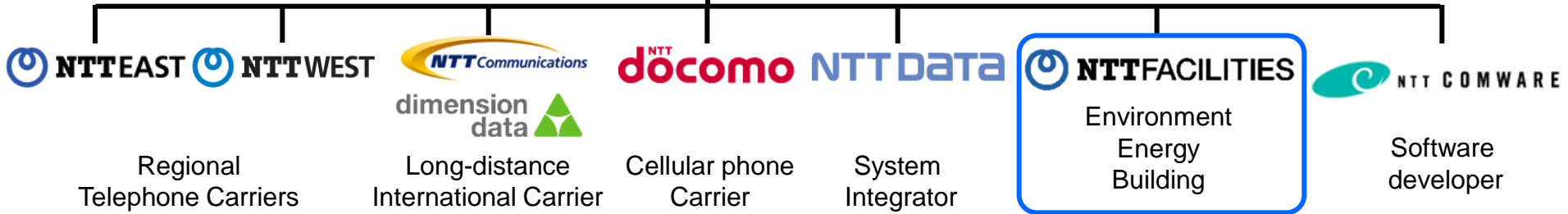
Superblock Tunjungan City is a landmark and lifestyle destination of East Indonesia. Located on a 7.4-hectare site in the heart of Surabaya's City Center. Tunjungan City is the first Superblock in Indonesia and consists of Tunjungan Plaza, Mandiri Office Tower, Condominium Regensi and the five-star Sheraton Surabaya Hotel and Towers.

SUPERBLOCK KOTA KASABLANKA

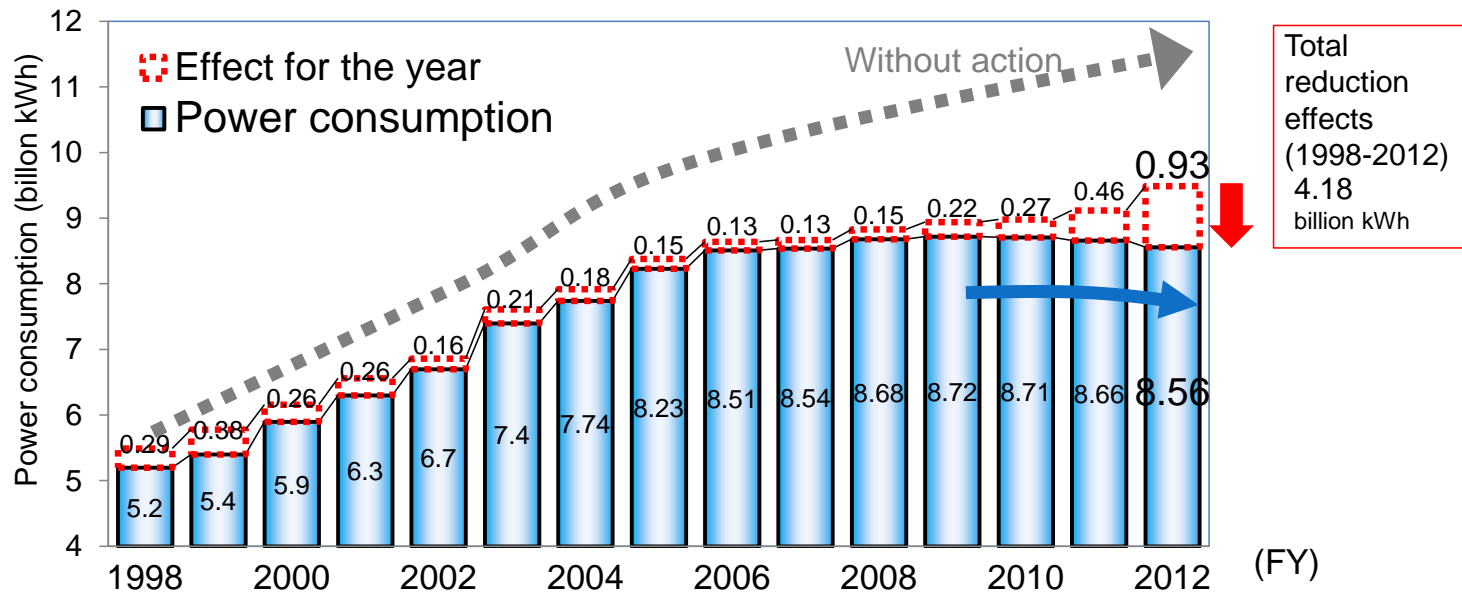


Located on a 9.5 hectare site, Superblock Kota Kasablanka is the largest integrated mixed-use development in South Jakarta, with a total gross floor area of 564,784 square meters and over 4,000 car park lots. Positioned as a "one-stop lifestyle hub" Superblock Kota Kasablanka consists of a retail mall (Kota Kasablanka).

NTT NIPPON TELEGRAPH AND TELEPHONE CORPORATION (Holding Company)



Total Power Reduction campaign by NTT Group

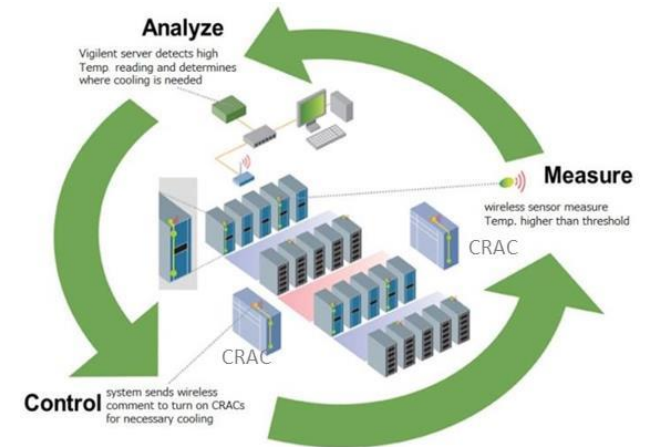


NTT FACILITIES has led NTT group's effort for TPR

NTT FACILITIES is

- One of the **largest design & engineering firm in Japan**
- Providing **Energy-Architecture-ICT** combined services

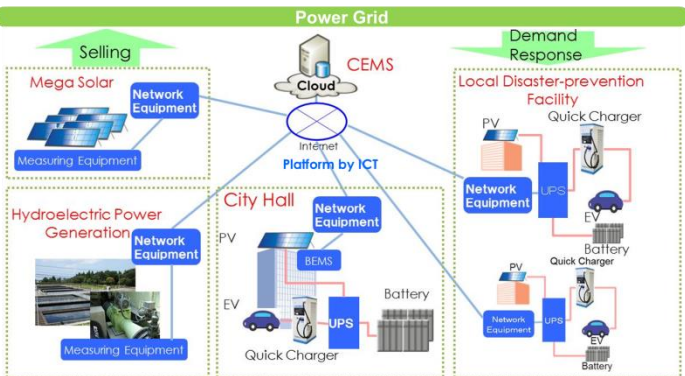
Est. : December 1, 1992
Employees: 5,300
Revenue : 261 billion JPY



Data Center Cooling Energy Saving by AI Technology



GreenTy Building



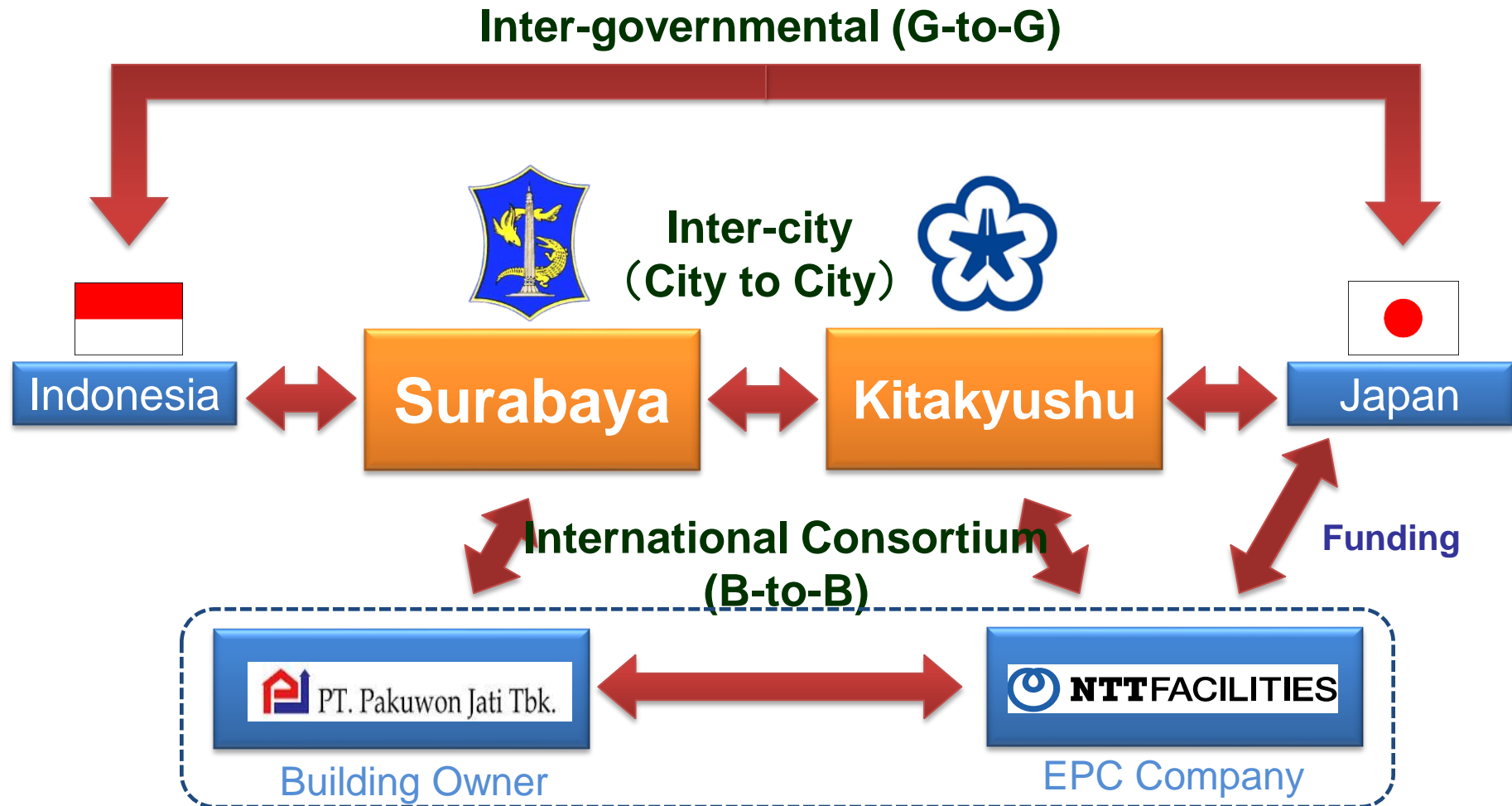
CEMS(Community Energy Management System)



Mega solar power systems



ZEB(Net Zero Energy Building)



1. Objective of the Kitakyushu Model

- Kitakyushu, which faced and overcame pollution for the first time in Asia, became a leading environmental city in Japan.
- Kitakyushu is developing the Kitakyushu Model (support tool) that systematically arranges information on the technologies and know-how of Kitakyushu from its experience in overcoming pollution to its quest as an environmental city.
- Kitakyushu is utilizing the Kitakyushu Model to promote the export of customized infrastructure packages to cities overseas, and grow together with Asia.

2. Applications of the Kitakyushu Model

- Support tool to examine future ideal city image and for cities to take appropriate measures and procedures to achieve this.
- Support tool to examine management systems for waste, energy, water and sewage services, and environmental protection.
- Support tool to develop sustainable master plans that integrates waste, energy, water and sewage services, and environmental protection.



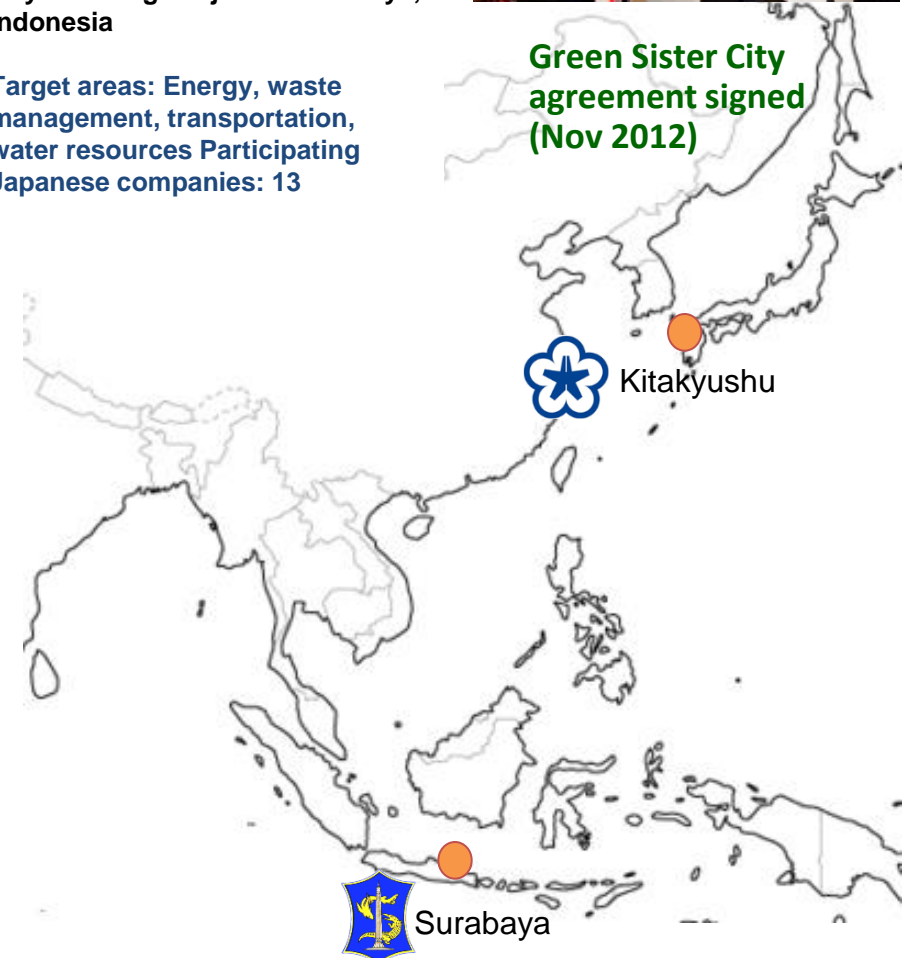
Surabaya, Indonesia:
2nd largest city in
Indonesia with a
population of 3 million

<FY 2013- 2015> Low Carbon
City Planning Project in Surabaya,
Indonesia

Target areas: Energy, waste
management, transportation,
water resources Participating
Japanese companies: 13



Green Sister City
agreement signed
(Nov 2012)



FY2013

Energy sector

63,000t-CO₂/yr

Transportation sector

1,000t-CO₂/yr

Solid waste sector

72,000t-CO₂/yr

Water resource sector

15,000t-CO₂/yr

FY2014

Energy sector

Solid waste sector

FY2015

Energy sector

Solid waste sector



Coordinating Ministry
for Economic Affairs
Republic of Indonesia



Ministry of the Environment
Government of Japan

**Joint Crediting Mechanism (JCM)
Model Project (2015)
INDONESIA and JAPAN**

Prioritization

(feasibility & cost-effectiveness)

Application & Expansion

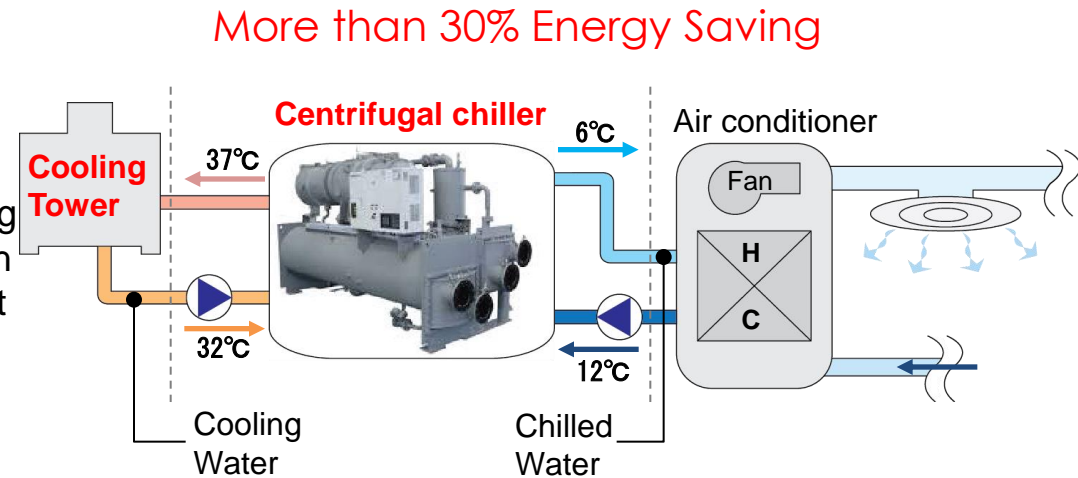
(feasibility study → model project)

- These FS has been developed by Kitakyushu City and IGES
- Tunjungan Plaza was one of potential buildings in Energy sector

Outline of GHG Mitigation Activity

The project aims to reduce electricity consumption in the shopping mall through introducing advanced & efficient Japanese centrifugal Chiller system.

The project is to replace existing central cooling system with high efficient centrifugal chiller with capacity of 966TR x 4 units and 569TR x 1 unit in Pakuwon's shopping mall, Tunjungan Plaza, as well as to replace existing 8 cooling towers with efficient Japanese models.

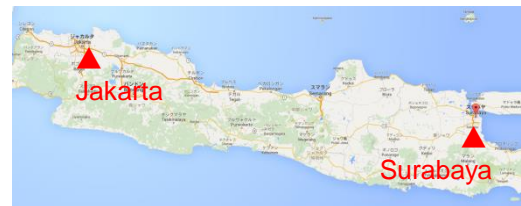


Estimated GHG Emission Reductions

398tCO₂/year

The GHG emission reductions are calculated based on the estimated electricity consumptions based on the conservatively estimated COP of a reference cooling system and a project COP of the centrifugal chiller as well as the grid emission factor.

Sites of JCM Project



Java Island



Tunjungan Plaza (@Surabaya)

HC-F-GXG-S/GFG-S Series



① Ozone-Safe HFC-134a

Adopting HFC134a refrigerant

② High Efficiency

COP over 6.5 (in case of $\Delta T=5^{\circ}\text{C}$)

Excellent Energy Saving

③ Compact Design

Space Saving & Easy Replacement

④ Easy Operation

With Color Touch Panel Screen

⑤ High Reliability

*based on 80 years' experiences
with various unique technologies
Wide operation range (at high CW temp)
No Surging Design etc.*

Capacity Range

300 ~ 2,500RT (1,055 ~ 8,790kW)

with single compressor

*380~460V, 3/3.3kV, 6/6.6kV, 10/11kV,
50/60Hz*

*Max. 5,000RT (17,580kW) with
Twin Module (LEAD-LAG) Application*

Schedule

	2015	2016				2017				2018			
	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Project Implem entation	▲Project Start Site Survey, Design		Manufacture, Factory test, Shipping									◀ Current	
				Replacement of Chillers and Cooling Towers									
					▲Completion								
MRV				Preparation of MRV methodology PDD					Monitoring				
					▲Validation					▲Registration		▲Verification Credit issuance▲	

*Utilize existing MRV methodology(ID_AM002)

Implementation Image



Chillers before replacement



Carrying out



Unloading Machinery

Implementation Image



Demolishing wall for unloading



Unloading Chiller



Lifting Chiller from unloading shaft



Chillers after replacement



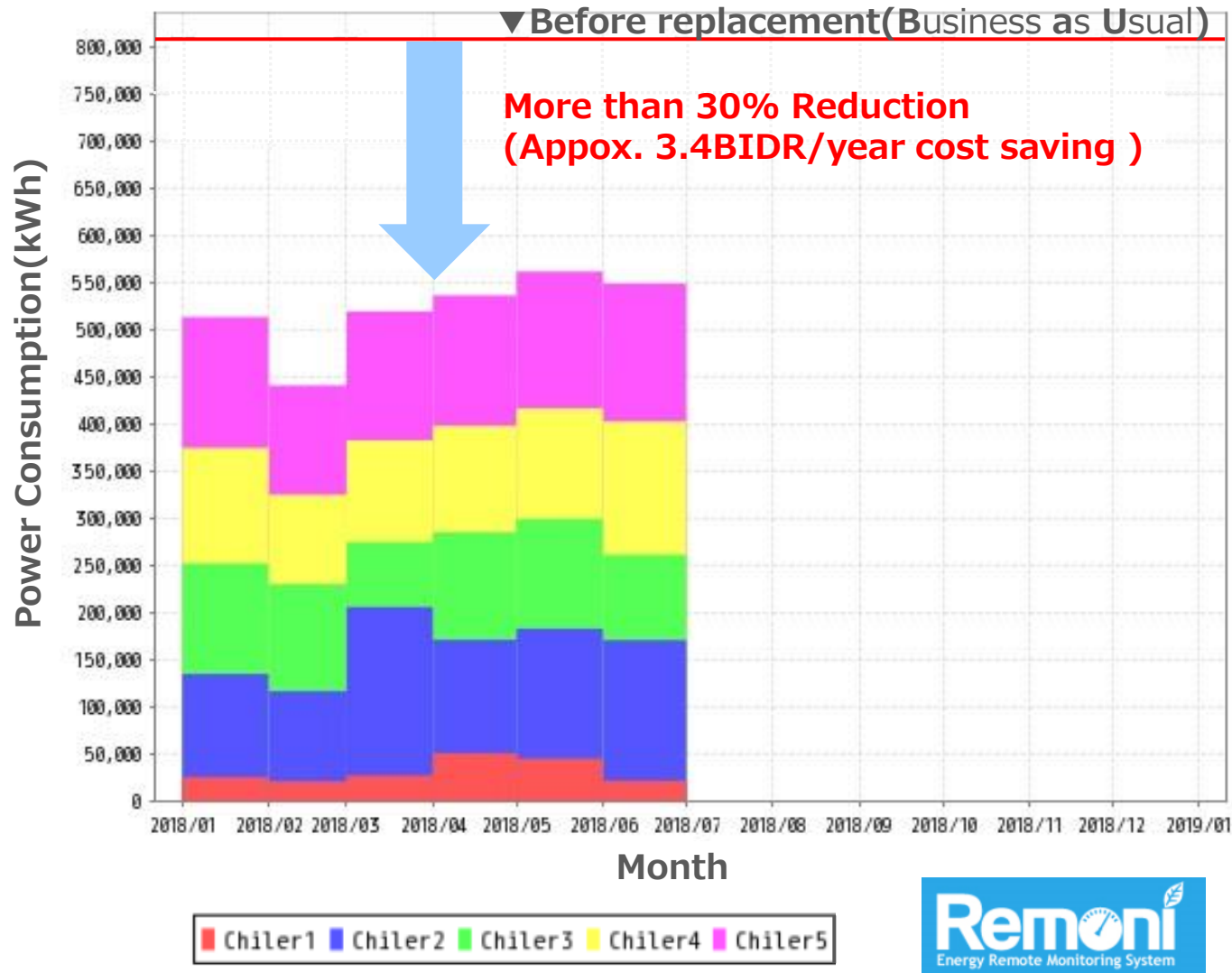
Cooling Towers before replacement



Cooling Towers after replacement

Challenges in Implementation

- Every Chillers and CTs had to be replaced one by one, while keeping normal operation of shopping mall.
- Unloading conditions of Chillers and limited time and work space of CTs



1 Viewpoint of technology replication

Technology replication is not difficult technically.

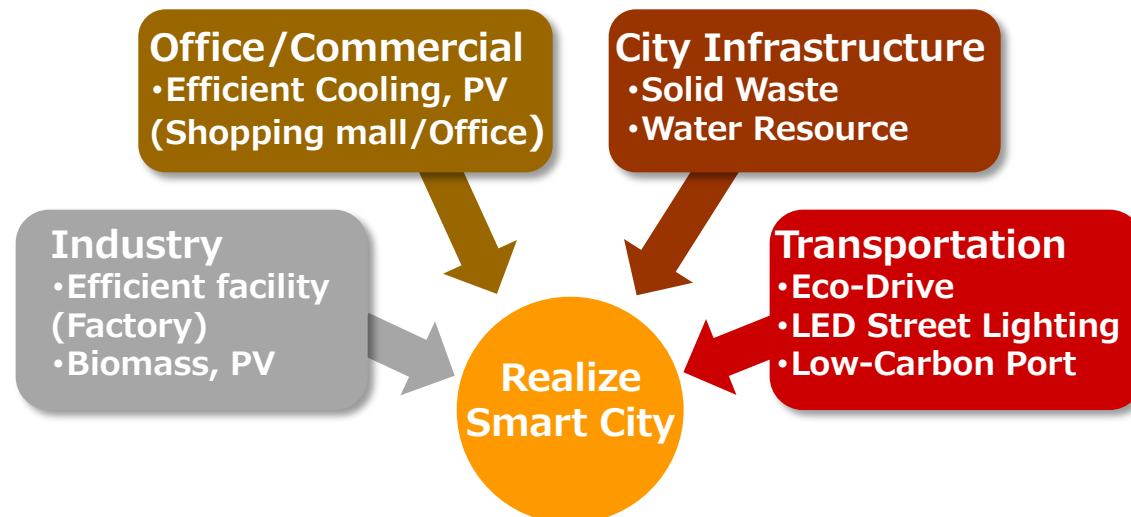
Number of supply record of Japanese high efficient chiller is increasing little by little thanks to this symbolic JCM project.

Getting easier to convince building owners of OPEX benefit(Low Life Cycle Cost).

2 Contribution to realize Smart City

Deployment of high efficient cooling system in shopping malls is one of the strategies to realize Smart City based on City to City collaboration. More cooperative approach of stakeholders in various field will be necessary.

Smart City Image by C2C Collaboration





Terima kasih atas perhatian Anda.

Our goal is to provide reliable
environmentally-friendly integrated facilities service,
as your most trusted partner