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Increasing Spread of Micro CHP and Improvement of Added Value as Secure Power Supply System

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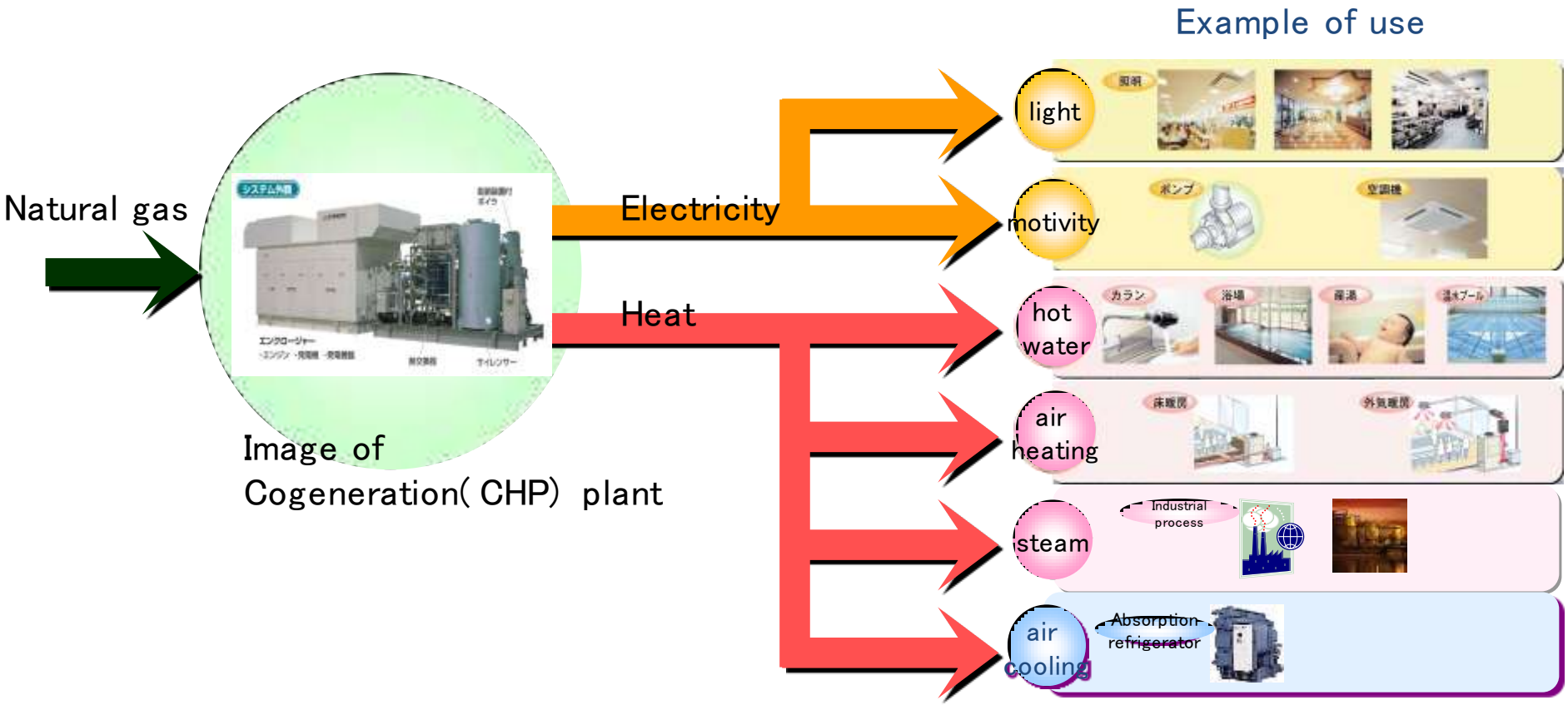
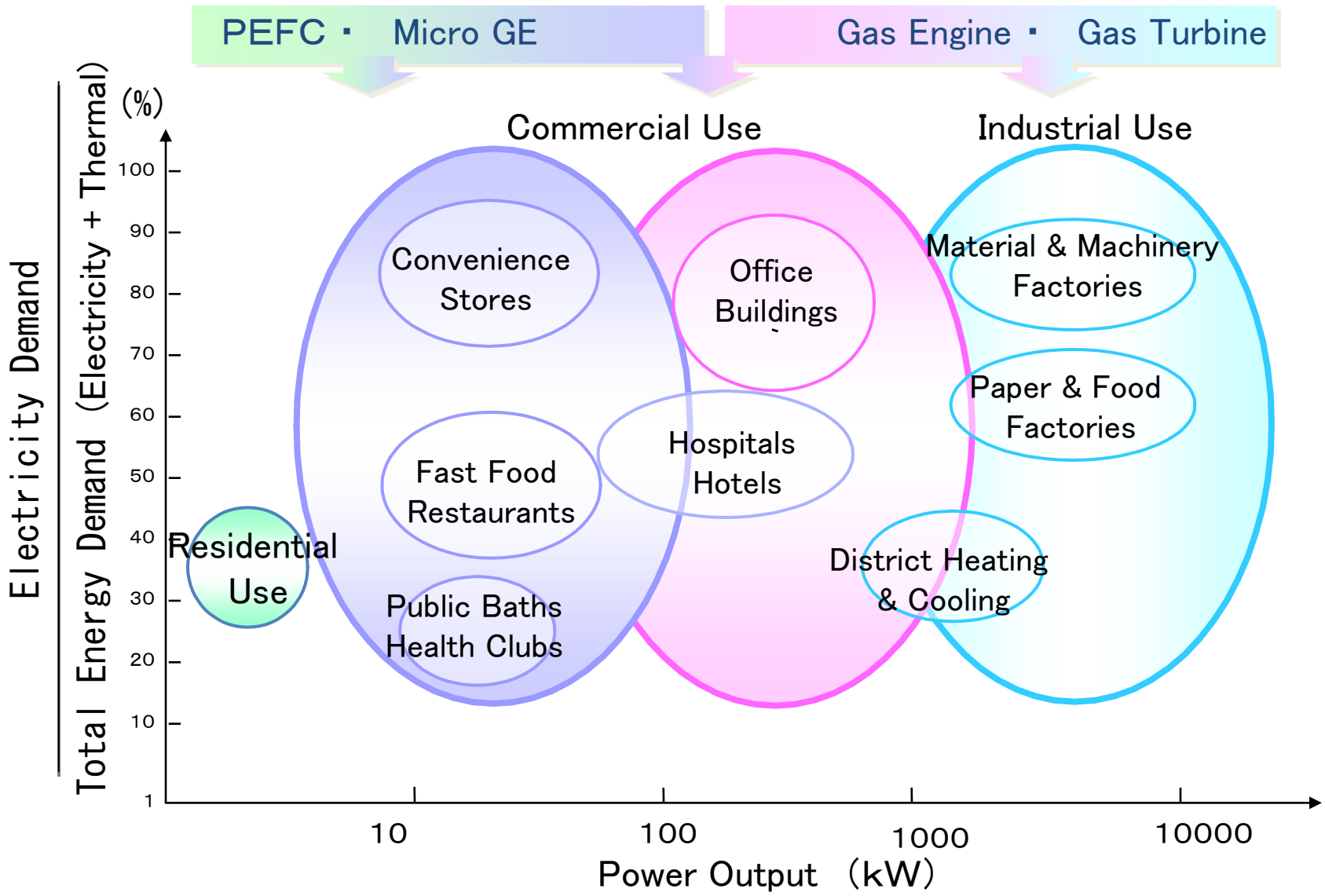
About CHP

- CHP (=Combined Heat and Power) is the system to produce electricity and usable heat simultaneously from gas fuel on site.



CHP Market in Japan



Current Status of CHP Market in Japan

- Since the Great East Japan earthquake in 2011, customers have placed emphasis on measures to power shortage in case of power grid failure.

- Even in small size customers along with medium and large size customer, the use of electricity during power grid failure is needed.

Trend of Micro CHP

Energy Saving

Low CO2

+

Secure Power Supply

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Line-up of Micro CHP Series of Osaka Gas

- The Line up of Micro CHP series of Osaka Gas is from 5kW to 35kW. They are marketed as “GENELITE series”.
- All of them have high total efficiency of 85%.

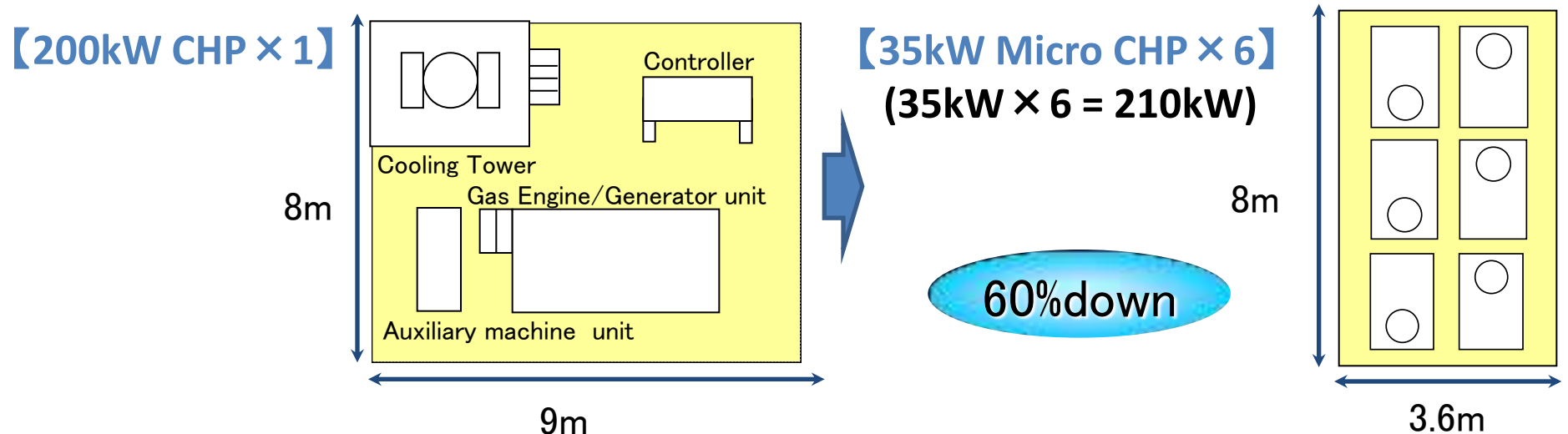
Type	5kW	10kW	25kW	35kW
Maker	Yanmar Energy System	Yanmar Energy System	Yanmar Energy System	Yanmar Energy System
External Appearance	 CP5VB-SNJB	 CP10VB1(Z)-SNB	 CP25VB3(Z)-TNB	 CP35VC(Z)-TN
Generation Efficiency	29.0%	31.5%	33.5%	34.0%
Exhaust Heat Recovery Efficiency	56.0%	53.5%	51.5%	51.0%
Total Efficiency	85.0%	85.0%	85.0%	85.0%

Specifications of the 35kW Micro CHP

- 35kW Micro CHP which is the newest model has high generating efficiency and high durability.

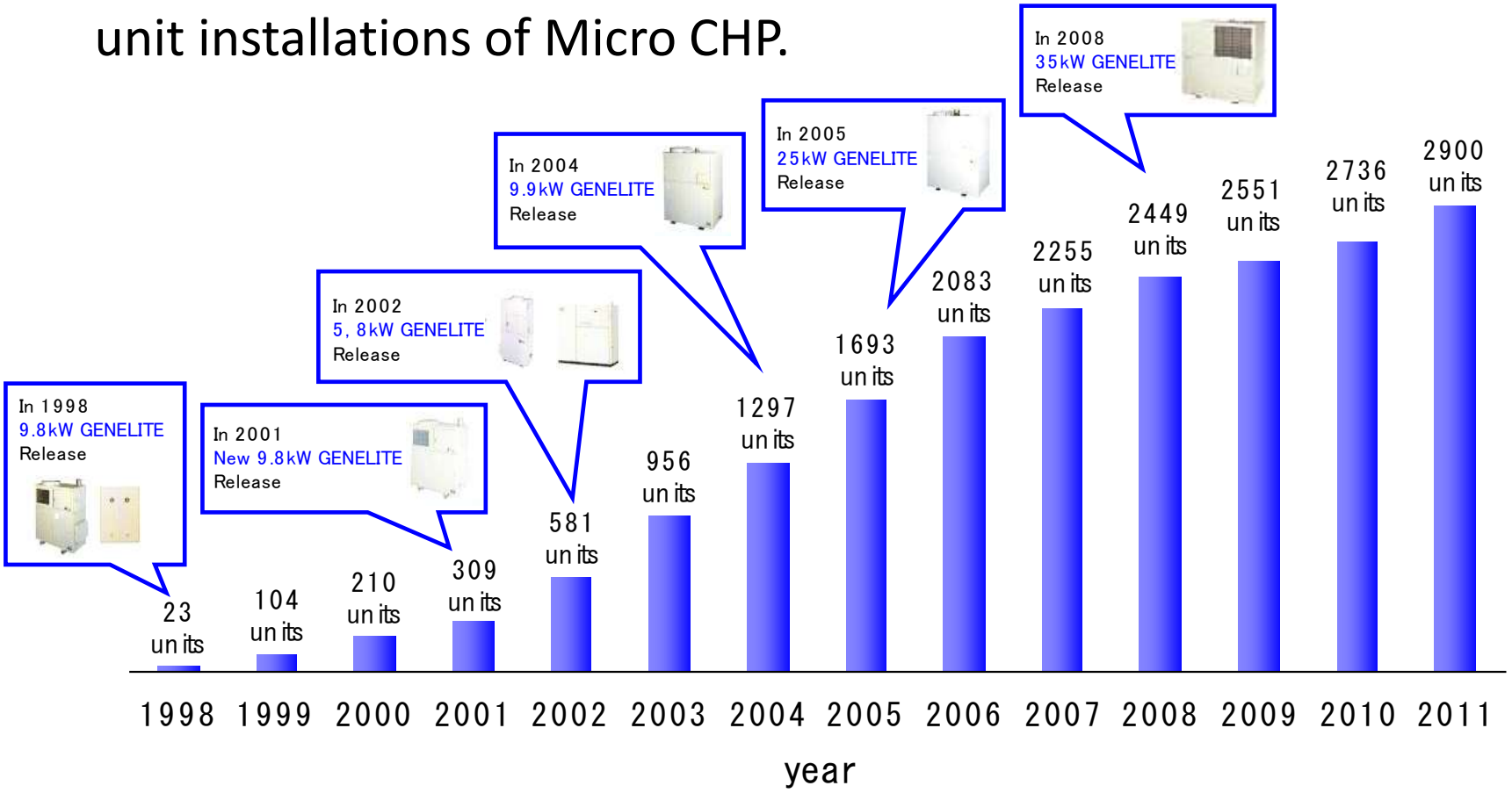
Generation Efficiency		%	34.0
Exhaust Heat Recovery Efficiency		%	51.0
Total Efficiency		%	85.0
Dimensions	Width	mm	2,000
	Depth	mm	1,100
	Height	mm	2,000
Maintenance Interval		hr	10,000

- It is small all in one package which includes an engine, a generator, a radiator, a control board, and so on.



Sales Figures of Micro CHP Series

- Year by year, the number of Micro CHP system operating in the field has been increasing.
- In Osaka Gas supply area, there are now more than 2500 unit installations of Micro CHP.



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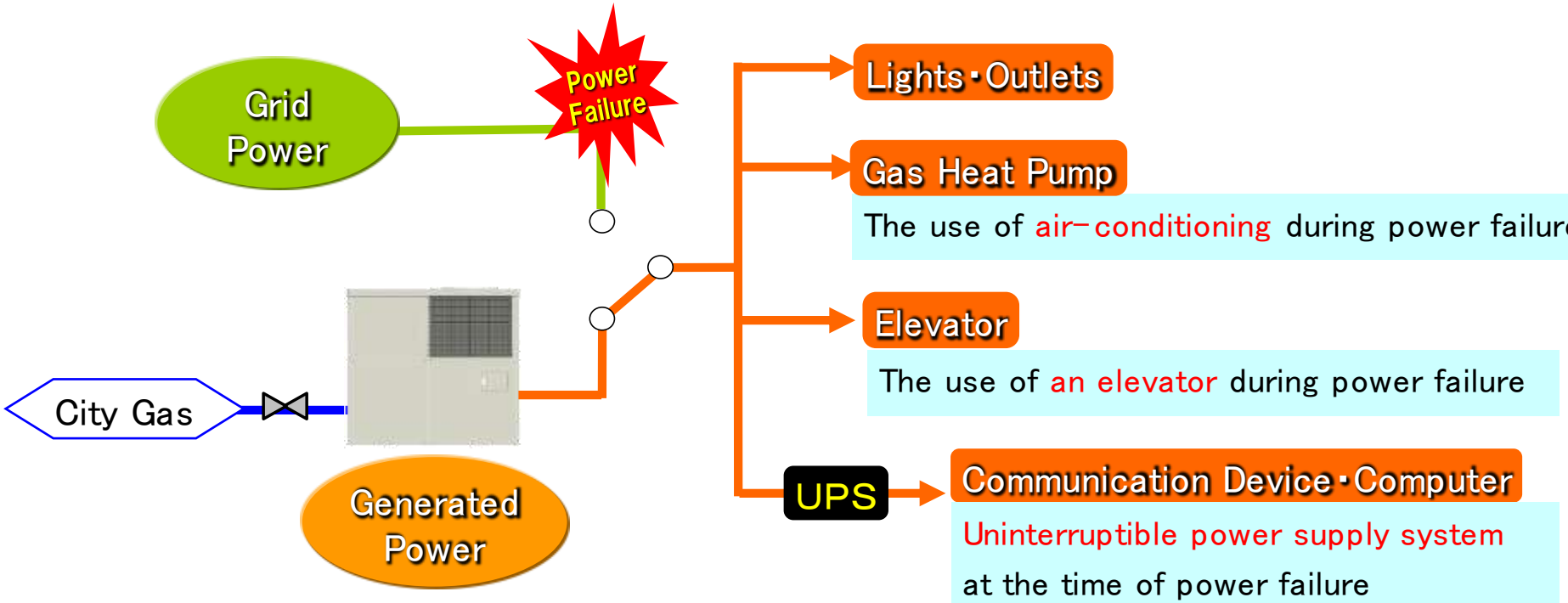
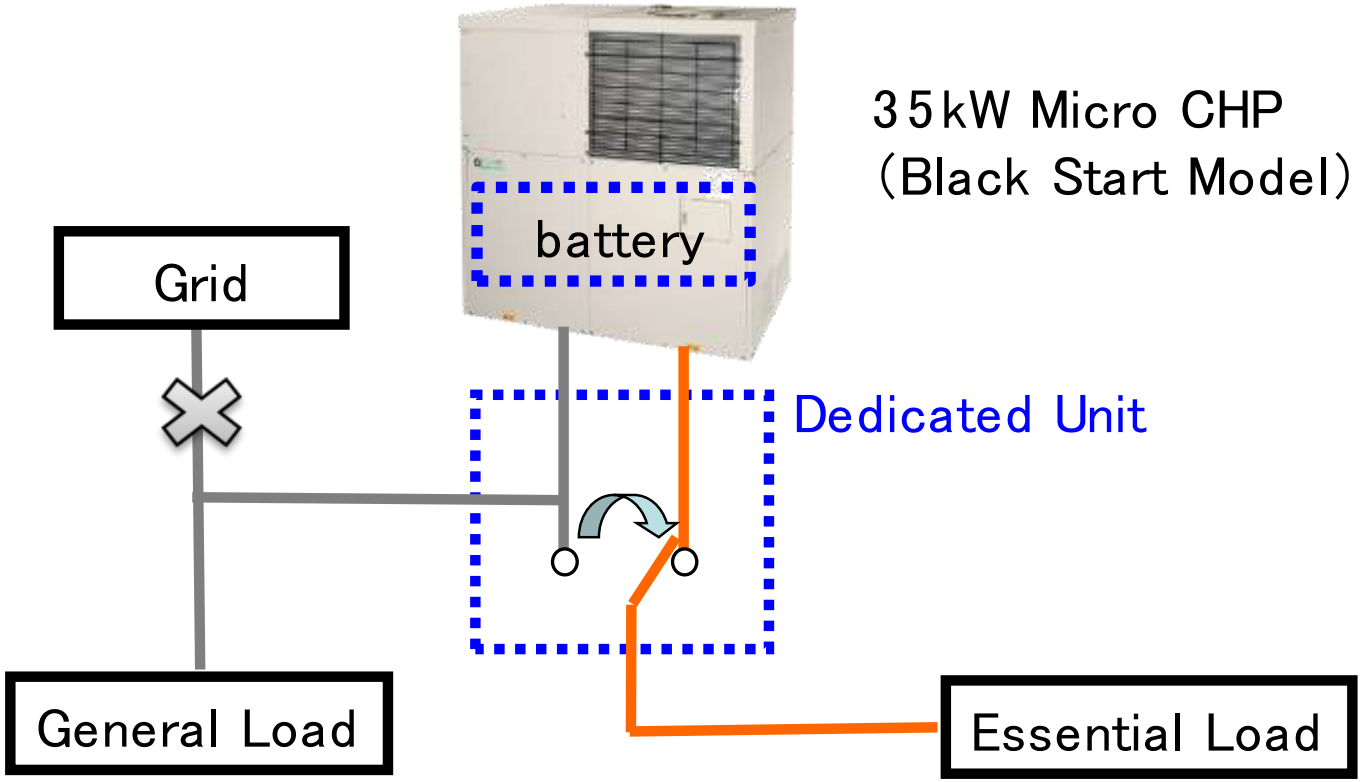
View of Secure Power Supply System

- Before the Great East Japan earthquake in 2011 Osaka Gas have designed secure power supply system using a black start model Micro CHP. And recently the demand for it is increasing.



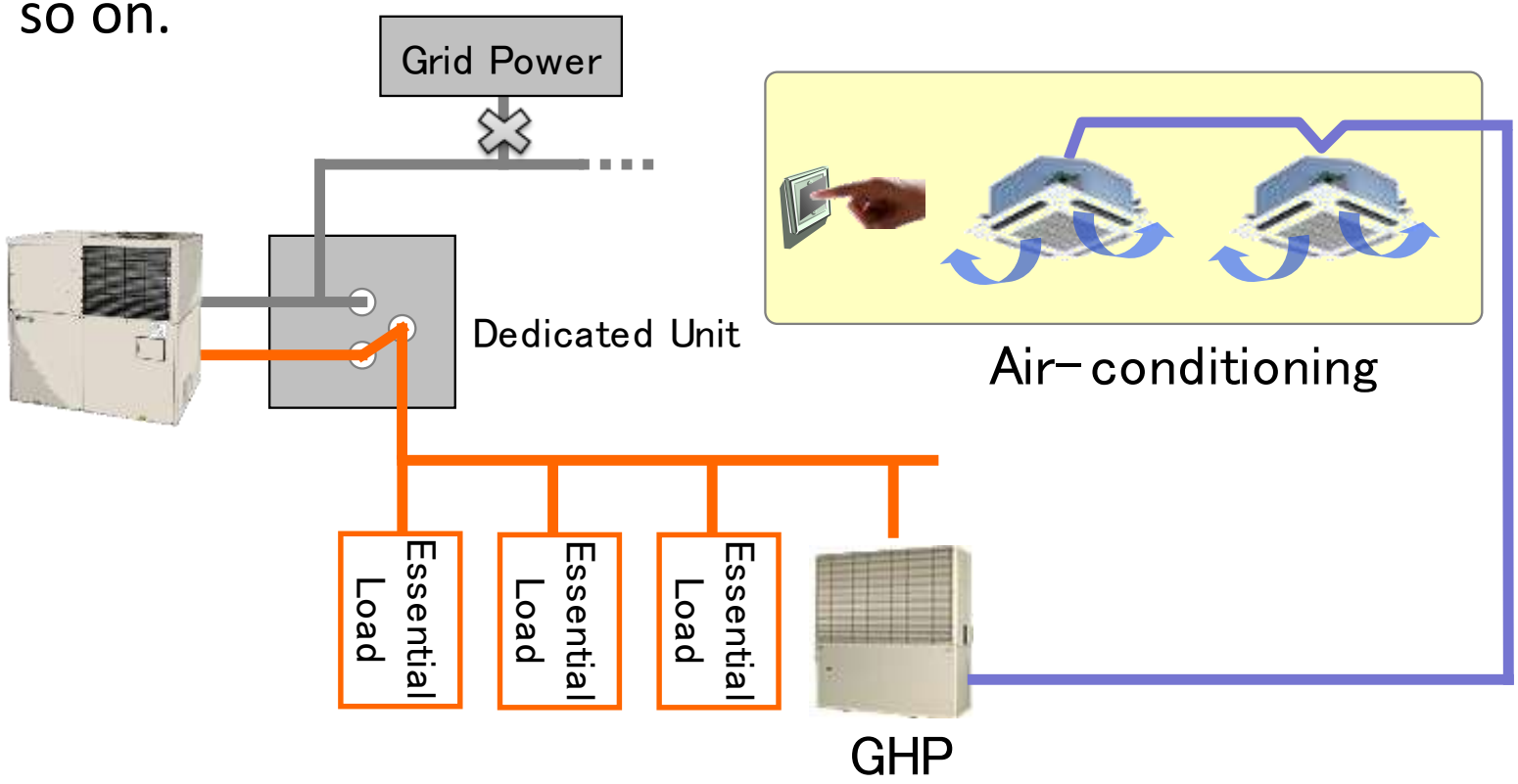
Black Start Model

- The Micro CHP over 9.9kW has a black Start Model.
- The model can supply the pre-selected load (e.g. lighting and outlet) with electric power during power grid failure.



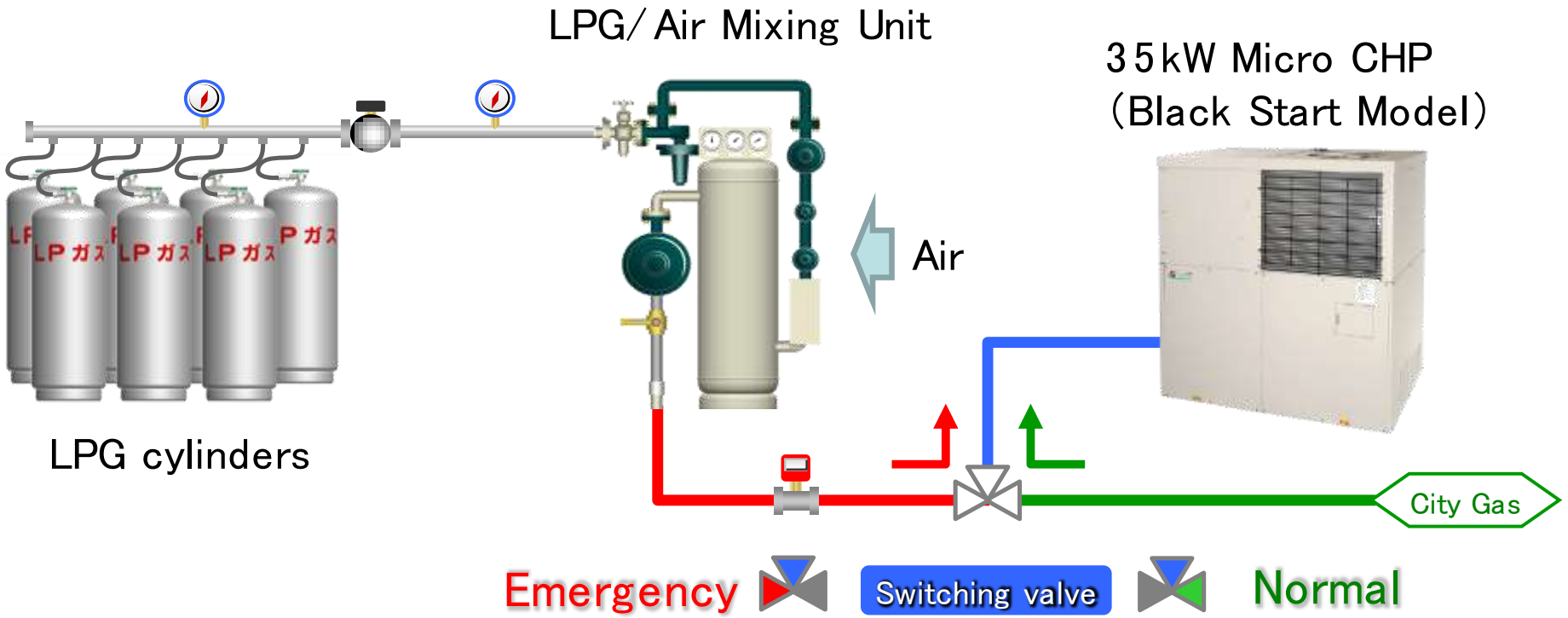
Combination with Gas Heat Pump

- The system of the combination with GHP (=Gas Heat Pump) enables air-conditioning to be available during power grid failure.
- The system is suitable for hospitals , welfare facilities and so on.



Emergency Responds with LPG/Air Mixture

- An emergency system with a LPG (=Liquefied Petroleum Gas)/air mixing unit can supply power even if the power grid and the city gas supply network fails by natural disasters.



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Conclusions

- Micro CHP is a highly efficient and realizes energy-saving and low-CO2. Year by year, sales figure of it is increasing.
- To improve secure power supply system using Micro CHP we developed the following systems.
  - the combination system　with GHP
  - the combination system with an elevator
  - the uninterruptible power supply system with an UPS
  - the emergency power supply system by LPG and air mixture

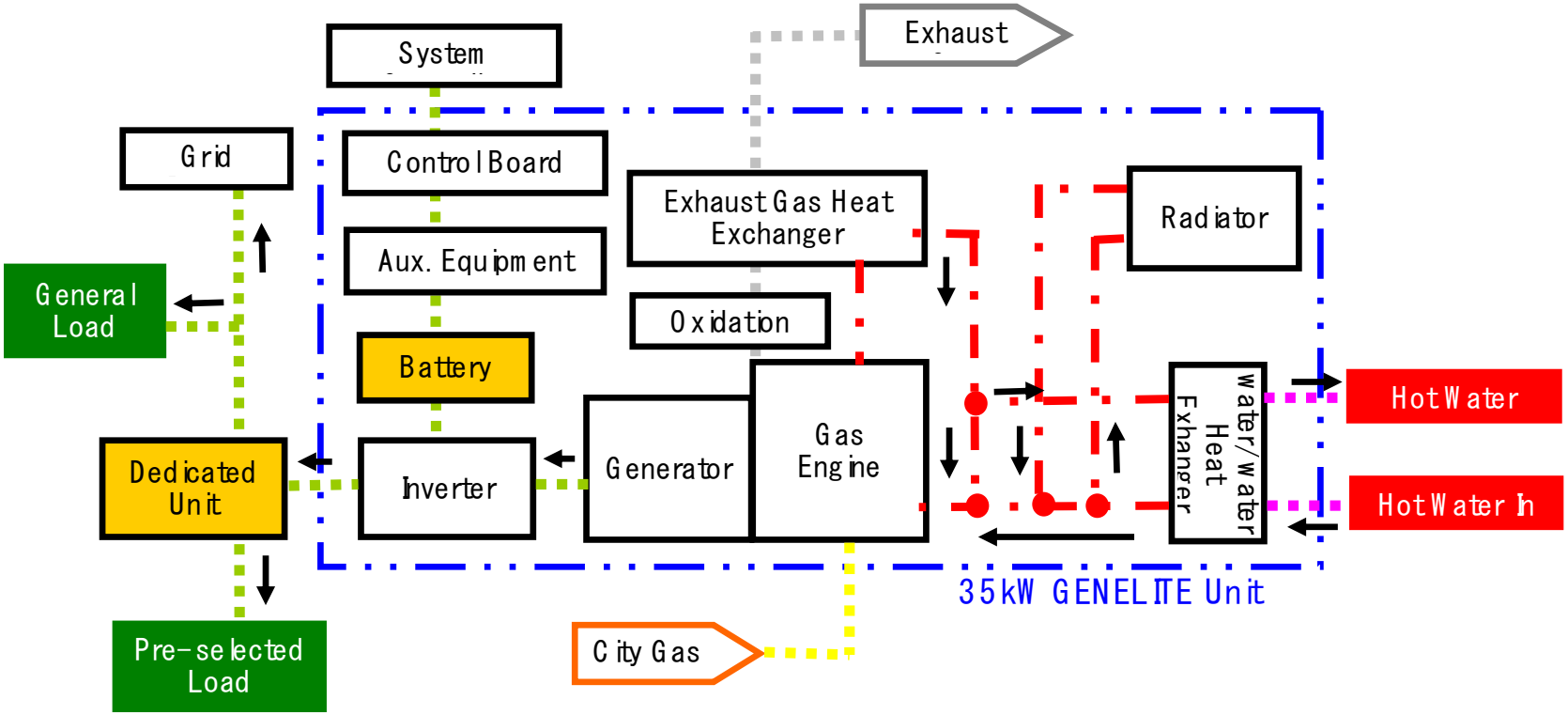
We have a multiple of secure power supply system.

In the future, we will expand the range of application.

Reference

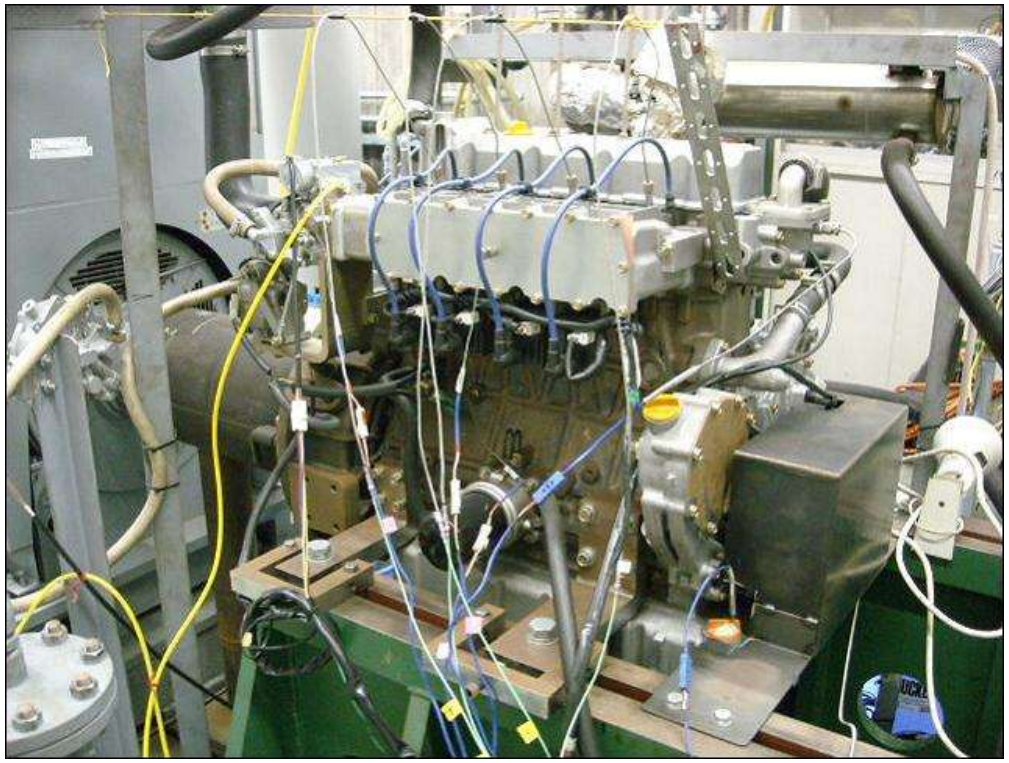
System Flow of the 35kW Micro CHP

- The system consists of a gas engine, a generator, and other equipments including an inverter and supplies electricity and hot water.
- The black start model has a battery built in the package.



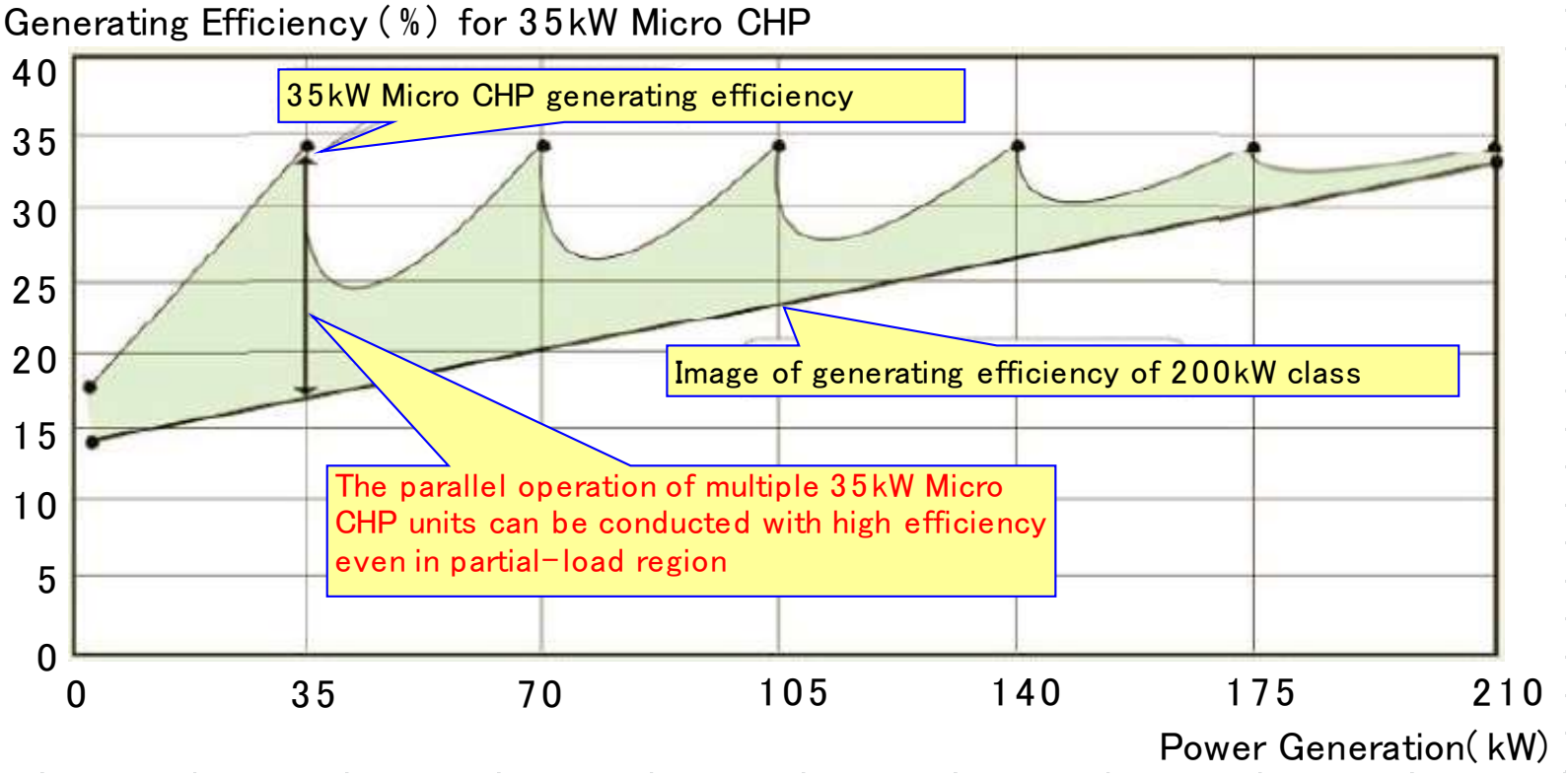
New Development of Gas Engine

- In order to achieve high efficiency, the gas engine for the 35kW Micro CHP unit was newly developed.
- This engine design was optimized by the testing of engine and the analysis of fuel combustion.



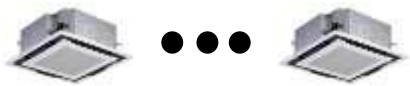
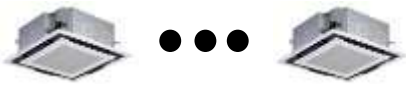
Control of Multiple-unit Operation

- The system controller enables the use to control the operation of multiple units up to 16 units.
- High efficiency operation on partial load is possible by controlling the number of units in operation.



Combination with Gas Heat Pump

- The system of the combination with GHP (=Gas Heat Pump) enables air-conditioning to be available during power grid failure. The power consumption of GHP is 2% that of EHP (=Electric Heat Pump). The combination with GHP enables lager space to be air-conditioned than that with EHP.

System	Micro CHP	GHP or EHP	Capacity of Air-conditioning
GHP ＋ Micro CHP	 35kW	GHP 20HP × 12  Indoor Equipment 8 × 12 Lines 	GHP 240HP 3,400m2
EHP ＋ Micro CHP	 35kW	 EHP 20HP × 1  Indoor Equipment 8 × 1 Lines	EHP 20HP 280m2

Air-conditioning System and Elevator System

- The former system enables air-conditioning to be available during power grid failure by the combination with the black start model Micro CHP and GHP (=Gas Heat Pump). The power consumption of GHP is 2% that of EHP (=Electric Heat Pump).

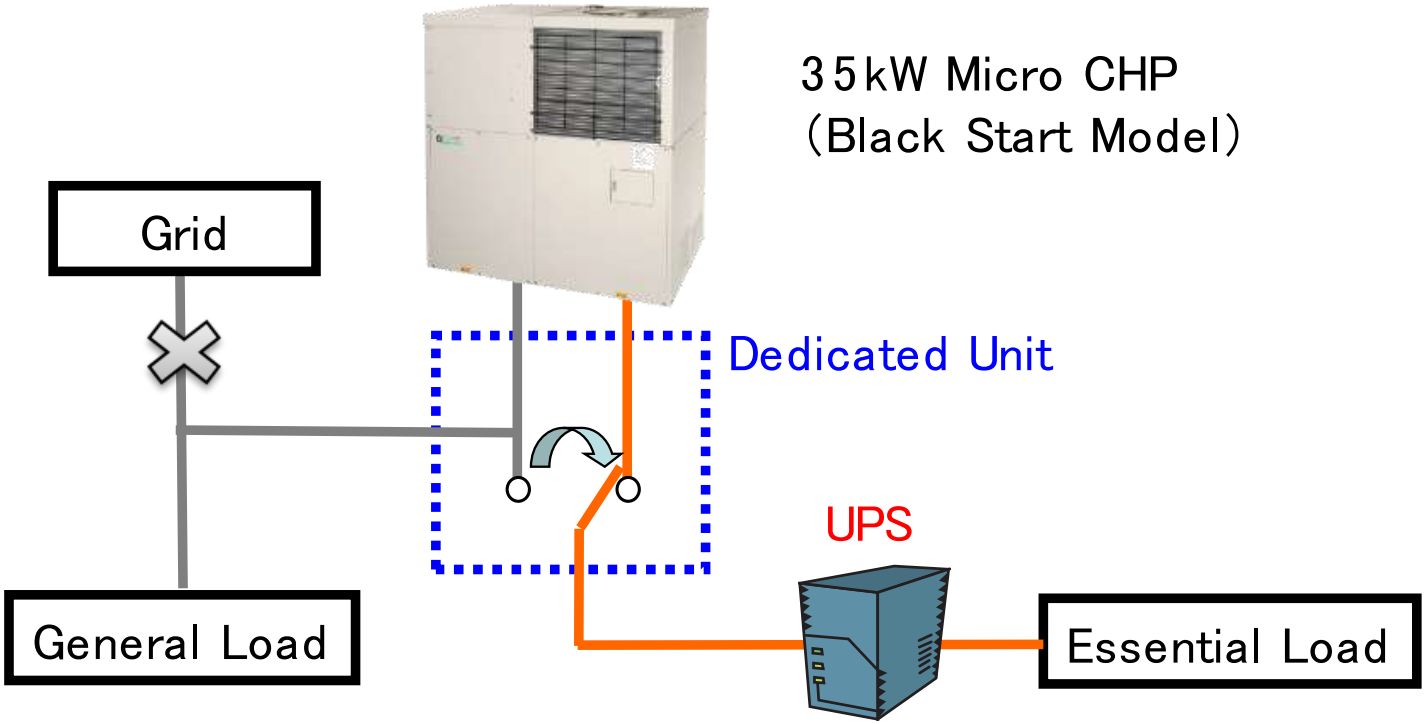
  → The combination system with GHP enables lager space to be air-conditioned than that with EHP.

- Elevator System enables the use of elevator to be available during power failure by the combination with the black start model Micro CHP and an elevator.

  → The system is suitable for high-rise offices and condominiums.

Uninterruptible Power Supply System with UPS

- The system is able to supply power to essential loads for a long time with no instantaneous power interruptions during power grid failure by connecting the 35kW Micro CHP unit (black start model) as the primary power source of a UPS (=Uninterruptible Power Supply).



Example in the Hikone Gas Building, Osaka Gas

- The Micro CHP system of the Hikone gas building has an UPS and LPG/air mixing unit, and so can continue to supply power to essential loads at the time of a blackout and when the city gas network is disrupted.
- The building is expected to play an important role as a disaster control center if necessary.