

# Energy-saving Skills Handbook, Sapporo Edition



City of Sapporo



Odori Park



Clock Tower



Statue of Dr. William S. Clark



## How to use this handbook

This handbook, Energy-saving Skills, Sapporo Edition (Smart System, 3S), is a collection of energy saving tips for buildings in the cold and snowy region of Sapporo.

The contents are excerpts of points from actual energy saving examples used at Sapporo City Hall.

Please consider practicing the energy-saving examples in your own facilities.

**How do you measure  
your energy saving?**



In order to continue your own efforts, begin by evaluating the results correctly.

To do that, it is necessary to create easy-to-understand measurement criteria suitable for your own facility's usage.

Take the annual energy costs for the building's unit area, for example.

Approximate figures are displayed below.

Normal circumstances:  
**3,000 yen/m<sup>2</sup> per year** (Sapporo)

Extensive energy-saving  
circumstances:  
**2,000 yen/m<sup>2</sup> per year** (Sapporo)

**Is it possible to estimate the amount of energy used from the total floor space of the building?**



The approximate values for the amount of electricity and gas used annually for every 10,000 m<sup>2</sup> of floor space of a building in Sapporo are shown below.

For each 10,000m<sup>2</sup> of floor space:

Amount of electrical power:

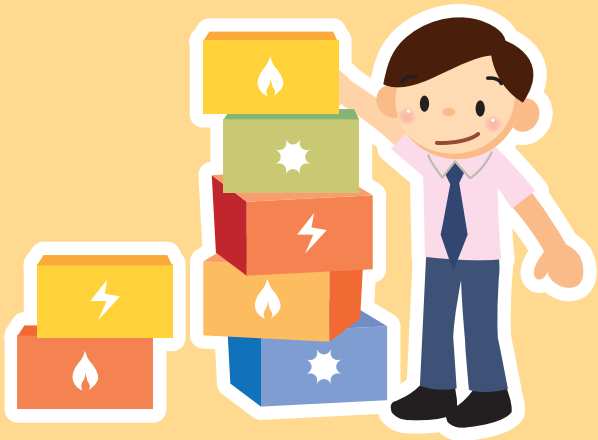
**1,000,000 kWh/year**

Amount of gas:

**100,000 m<sup>3</sup>/year** (Sapporo)



**Do you know  
the rough unit-prices  
of energy  
when appraising  
energy saving?**





It's convenient to remember them.

## Average unit-prices of energy

Electricity

20 yen/kWh

(Sapporo)

Heating  
supply

5 yen/MJ

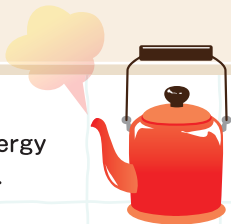
(Sapporo)

Gas

100 yen/m<sup>3</sup>

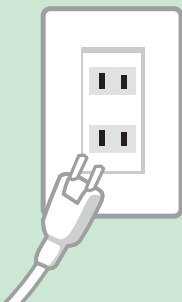
(Sapporo)

\*1 MJ (megajoule) is  
the approximate amount of energy  
required to boil 2.5 ℓ of water.



**How much  
can be saved per year  
by reducing  
the contracted power  
by 1 kW?**

**And how much  
can be saved  
by stopping machinery  
(1 kW) that operates  
continuously?**



## As a basic rate

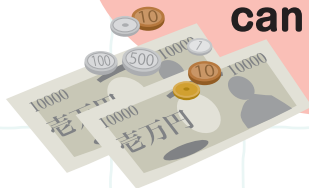
Approximately  
**20,000 yen** per year  
can be saved.

(Sapporo)

## With basic rate and usage-based charges combined

Approximately  
**200,000 yen** per year  
can be saved.

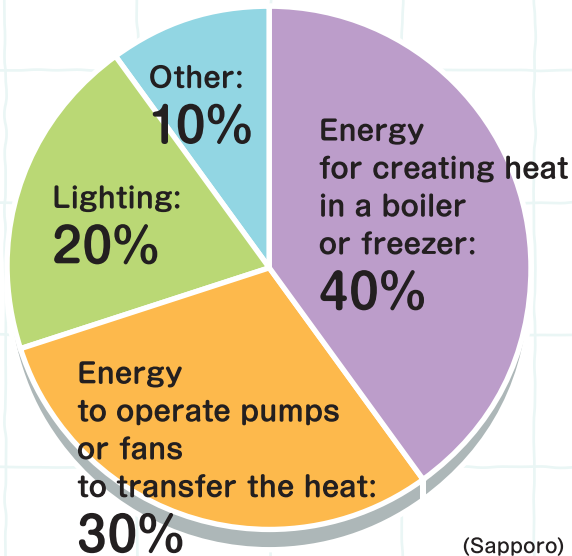
(Sapporo)



**With regard to  
a building's energy,  
about how much is  
used and on  
what is it used?**



The percentages of the total amount of energy used in one year in a building are shown below.



The creation and transfer of heat alone makes up **70%** of the total costs.

**What areas  
of energy saving  
should be tackled first?**



Things that use a lot of energy!

In cold, snowy regions, **heating and road heating** are areas in which energy savings can be made.

If snow falls, the amount of energy used in one day is three times that when just heating is used.



**About how long  
is the operating time  
for road heating  
during the season?**

(Sapporo)





The approximate operating times for seasonal road heating in Sapporo are shown below.

**1** Continuous operation:  
**3,000 hours**

**2** With preheat operation:  
**2,000 hours**

**3** Without preheat operation:  
**1,000 hours**

**4** Manual operation  
**500 hours**

However, if the operating time is less than 500 hours per season, manual snow clearing is also implemented.

**What are the points  
to keep in mind  
when operating  
road heating?**



**The points to keep in mind are as follows:**

**1** Is the road surface temperature setting appropriate?

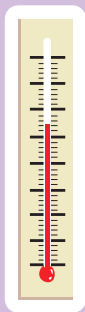
**2** Is the air temperature setting appropriate?

**3** Is the sensor malfunctioning?

**Cases in which the moisture sensor responds continuously even without snow.**



**What are the normal  
road heating  
temperature settings  
and operating times?**



The normal road heating temperature settings and operating times are as shown below.

1

Preheat settings

ON  $-3^{\circ}\text{C}$

OFF  $-2^{\circ}\text{C}$

2

Snow melting settings

ON  $0^{\circ}\text{C}$

OFF  $1^{\circ}\text{C}$

3

Operating time per season

1,200 hours

**What are the points  
for energy saving  
with regard to boilers?**



## Check the air-fuel ratio.

The air-fuel ratio is the ratio of the actual amount of air being used to the amount of air necessary for combustion.

The air-fuel ratio is measured by a specialist inspector and recorded on the inspection records.

Just by reducing the air-fuel ratio from 1.7:1 to 1.4:1 you can increase energy saving by 3%.

The standard air-fuel ratio changes according to the type of fuel being used.



Gaseous fuel

**1.25 ~ 1.4**



Liquid fuel

**1.3 ~ 1.45**

**Are there  
any good ways  
of discovering methods  
of energy saving?**





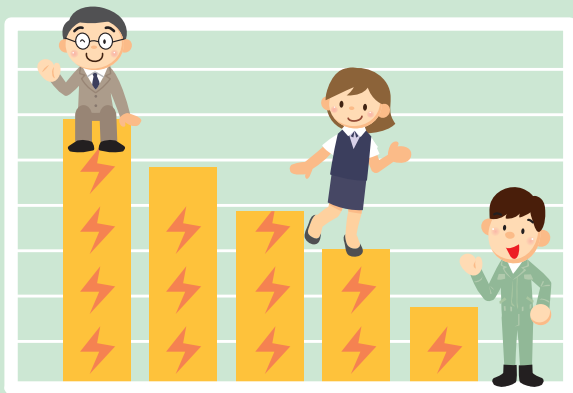
**The problems you encounter act as hints.**

**For example, if the machine room is hot or your feet are cold, solving those problems often leads to energy saving.**

**In one actual case, the temperature of a boiler room was 50°C in summer and over 40°C in winter.**

**By insulating the piping, it was possible to solve the problem and save energy.**

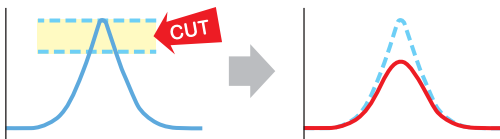
# What kinds of electricity saving methods are there?



# Typical electricity saving methods are as follows:

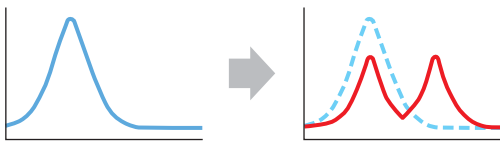
## Peak cut

Distributing the use of machinery that starts simultaneously



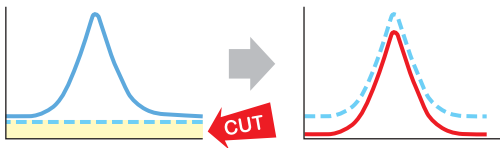
## Peak shift

Shifting the time that machinery is started



## Base cut

Reducing the base load



**Finally, are there  
any recommended  
energy saving methods?**



Yes, it' s elimination of **negative pressure.**

In actual fact, wind that enters through entrances is thought to have a great effect on heating and cooling systems, and on the dryness of the building' s interior itself.

Check the balance of the air supply and exhaust of the entire building, and if the amount of air going out of the building can be suppressed, a positive pressure is created inside the building, enabling the amount of wind that enters to also be suppressed. In the main building of Sapporo City Hall, this resulted in an approximate 10% reduction in heating costs.





# Notes





# Energy-saving Skills Handbook, Sapporo Edition 2015

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