Building and hydrogen energy initiatives for zero carbon city in Sapporo

2022. Mar. 10th
Zero Carbon City International Forum

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Environmental Bureau, City of Sapporo
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1. Overview of Sapporo City
2. Energy measures for buildings
3. Efforts for hydrogen energy
1. Overview of Sapporo City
Sapporo’s Profile

- Capital of Hokkaido, the northernmost of Japan’s 47 prefectures
- The fifth largest city in Japan
- Hosted the 1972 Winter Olympics, the first ever held in Asia

Population: 1,975,065 (as of October 1st, 2020)
Area: 1,121 km² (432 sq mi)

Sister Cities:
- Portland, U.S.A. (since 1959)
- Munich, Germany (since 1972)
- Shenyang, China (since 1980)
- Novosibirsk, Russia (since 1990)
- Daejeon, Korea (since 2010)

Flight Time: 1h 30min (Tokyo ⇔ Sapporo)

Home to the 1972 Winter Olympic Games
Climate Change Measures Action Plan

- Through Climate Change Measures, we will contribute to solving various issues such as securing energy in the event of disaster, revitalizing industrial and economic activities, and extending healthy life expectancy.

- This plan also aims to reduce greenhouse gas emissions by 55% in 2030 compared to 2016.

### Greenhouse gas emissions

- **1990**: 934 t-CO$_2$
- **2010**: 977 t-CO$_2$
- **2016**: 1,193 t-CO$_2$
- **2030**: 537 t-CO$_2$

**Goals for 2050**: Reduce greenhouse gas emissions to virtually zero

55% reduction from 2016
2. Energy measures for buildings
Reducing Heating Energy Consumption

● Detached houses

→ Promoting the spread of the “Sapporo version of next-generation housing”, which is a heat insulation and airtight standard set by the city of Sapporo.

### Insulation and airtightness level of "Sapporo version of next-generation housing"*

<table>
<thead>
<tr>
<th>Nes housing grade</th>
<th>Skin heat performance (UA Value) [W/m·K]</th>
<th>Primary energy consumption</th>
<th>corresponding gap area (C Value) [㎠/㎡]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top runner</td>
<td>0.18 or less</td>
<td>Grade 5</td>
<td>35% or less</td>
</tr>
<tr>
<td>High level</td>
<td>0.22 or less</td>
<td></td>
<td>45% or less</td>
</tr>
<tr>
<td>Standard level</td>
<td>0.28 or less</td>
<td></td>
<td>60% or less</td>
</tr>
<tr>
<td>Basic level</td>
<td>0.36 or less</td>
<td></td>
<td>75% or less</td>
</tr>
<tr>
<td>Minimum level</td>
<td>0.46 or less</td>
<td>Grade 4</td>
<td>90% or less</td>
</tr>
</tbody>
</table>

Ex) High level house

- Wall thickness 205mm
- Triple glass + resin sash
Reducing Heating Energy Consumption

- Apartment houses and buildings
  - Subsidizing the design cost for the construction of apartment houses and buildings that can significantly reduce energy consumption by improving heat insulation performance and introducing solar power generation.

Animal Welfare & Management Center
Current Status of District Heating in Central Sapporo

Sapporo Energy Supply Public Corporation

Energy Center

- Use of Snow Cold
  - Heating 82GJ/h
  - Cooling 51GJ/h

Docho-minami Energy Center

- Gas Engine CGS
  - Heating 38GJ/h
  - Cooling 21GJ/h
  - Power generation 1,270kW

Akarenga-mae Energy Center

- Gas Engine CGS
  - Heating 29GJ/h
  - Cooling 24GJ/h
  - Power generation 700kW

Chuo Energy Center

- Use of Wood Biomass
  - Heating 614J/h

46 Energy Center

- Gas Engine CGS
  - Heating 15GJ/h
  - Cooling 5.5GJ/h
  - Power generation 315kW

Sapporoeki-minami Energy Center

- Gas Turbine CGS
  - Heating 170GJ/h
  - Cooling 154GJ/h
  - Power generation 9,630kW

Sosei Energy Center

- Gas Engine CGS
  - Heating 34GJ/h
  - Cooling 11GJ/h
  - Power generation 1,400kW

Very hot water Pipe
Hot water/steam Pipe
Cold water Pipe
Thermal Pipe network extension: about 45km
3. Efforts for hydrogen energy
Utilization of hydrogen derived from renewable energy

Effectively utilize the potential of renewable energy in Hokkaido

Use hydrogen produced from surplus electricity of renewable energy in Hokkaido and by-product hydrogen at consumption areas

Choosing a transportation system that suits costs and applications

Stable hydrogen production and establishment of supply system

Local energy and economic circulation

Production

Renewable energy power generation area

Utilization of surplus electricity of renewable energy

Hydrogen production utilizing renewable energy

Solar panel

Wind-power generation

Storage

Hydrogen storage base

Transport

Choosing a transportation system that suits costs and applications

Sapporo City

Demand area

FC truck

FC bus

FCV

Building / industrial fuel cells

Household fuel cell

Temporary storage

Hydrogen Station

Fuel Cell Vehicle (FCV)
THANK YOU