District Cooling in Malaysia

16th APEC Workshop on Energy Statistics
Tokyo Prince Hotel, 10-12 July 2018
Contents

- Introduction
- Reasons Why Malaysia Built District Cooling Facilities?
- Number Of District Cooling Facilities In Malaysia
- Are District Cooling Data Available Or If Not, Can It Be Collected From District Cooling Companies?
- Planned Expansion Of District Cooling facilities in Malaysia
Introduction

District Cooling Cools Buildings the Smart Way

District cooling concept begins by chilling water at a centralized plant. Chilled water is then pumped through a long piping network via underground to heat exchangers in different buildings. The heat exchangers are used to transfer the chilling energy from the water (often called Primary Loop) to customers' internal building chilled water loop (often call Secondary Loop).

Cold air then is dissipated within the building via a typical Fan Coil unit and Air Handling Unit. Warm water returns to the heat exchangers for a continuous closed loop cooling process again.
Advantages of District Cooling System (DCS)

A DCS essentially delivers its benefits through economies of scale. Larger and more efficient chillers can be installed in places of the many scattered smaller and less efficient ones required in a conventional system.

A higher efficiency system translates directly into both capital and running cost savings. Similar savings can be achieved for other plant equipment such as cooling towers and pumps.

The district cooling system offers operating flexibility, since each building can use as much or as little cooling as needed, without worrying about chiller size or capacity – and the system produces no noise or vibrations.

A DCS is space saving, allowing more space for other uses since the combined chiller plant is located away from the consumer’s premises.

Operations and maintenance are reasonably simple, offering more convenience, ease and peace of mind in addition to reducing costs and is time saving. Just pay for your usage without having to maintain the system.
Advantages of District Cooling System (DCS)

Thermal Energy Storage capitalises on the cheaper off-peak tariff offered by the electric utility company. The system produces cooling energy at night when the electricity tariff is low.

During the day, when the air-conditioning demand is high, the stored cooling energy is released by circulating chilled water through the storage system and onto the buildings. Only a limited amount of chiller capacity needs to operate during this period.

By adopting this concept, the plant consumes less electricity during the day, when electricity tariff is high. This leads to significant savings in operating costs.

As the electrical power demand for this plant is also low during the day, further cost saving is achieved through reduced maximum (MD) charges.
Number of district cooling facilities in Malaysia and percentage of buildings connected to such facilities

<table>
<thead>
<tr>
<th>Facility Description</th>
<th>Operation</th>
<th>Chiller Plant Capacity</th>
<th>Thermal Storage Capacity</th>
<th>No. of Building Connected to DCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas District Cooling Putrajaya Plant 1, Presint 1, Putrajaya.</td>
<td>2008</td>
<td>12,000 RT</td>
<td>32,700 RTH</td>
<td></td>
</tr>
<tr>
<td>Gas District Cooling Putrajaya Plant 2, Presint 2, Putrajaya.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas District Cooling Putrajaya Plant 3, Presint 5, Putrajaya.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas District Cooling Putrajaya Plant 4, Presint 4, Putrajaya.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas District Cooling Kuala Lumpur City Center (KLCC) Plant, Kuala Lumpur.</td>
<td>2005</td>
<td>12,000 RT</td>
<td>45,000 RTH</td>
<td></td>
</tr>
<tr>
<td>Gas District Cooling Kuala Lumpur International Airport (KLIA) Plant, Sepang, Selangor</td>
<td>1998</td>
<td>30,000 RT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas District Cooling Universiti Teknologi Petronas (UTP) Plant, Tronoh, Perak</td>
<td>2002</td>
<td>6,000 RT</td>
<td>11,000 RTH</td>
<td></td>
</tr>
</tbody>
</table>

Gas District Cooling (M) SB is Malaysia's largest district cooling provider serving Putrajaya, Kuala Lumpur City Centre (KLCC) and Kuala Lumpur International Airport (KLIA) precinct. Their assets encompass 9 co-generation /district cooling plants with total combined capacity of 59 MW electric, 442 ton/hr steam, 147,000 RT & 238,000 RTh chilled water.
Number of district cooling facilities in Malaysia and percentage of buildings connected to such facilities

<table>
<thead>
<tr>
<th>District Cooling System</th>
<th>Operation</th>
<th>Chiller Plant Capacity</th>
<th>Thermal Storage Capacity</th>
<th>No. of Building Connected to DSC</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Tenaga Nasional (UNITEN)</td>
<td>1996</td>
<td>3,500 RT</td>
<td>26,000 RTH</td>
<td>15 buildings</td>
</tr>
<tr>
<td>District Cooling System Bangsar</td>
<td>1997</td>
<td>11,250 RT</td>
<td>30,000 RTH</td>
<td>Few buildings</td>
</tr>
<tr>
<td>Universiti Kebangsaan Malaysia (UKM) Plant</td>
<td>1998</td>
<td>3,700 RT</td>
<td>11,300 RTH</td>
<td>10 faculties</td>
</tr>
<tr>
<td>Megajana Cyberjaya</td>
<td>1999/2012</td>
<td>14,000 RT</td>
<td>95,000 RTH</td>
<td>48 buildings</td>
</tr>
<tr>
<td>Malaysia Institute of Nuclear Technology</td>
<td>2001</td>
<td>1,500 RT</td>
<td>6,000 RTH</td>
<td>NA</td>
</tr>
<tr>
<td>District Cooling System Serdang Hospital</td>
<td>2002</td>
<td>2,800 RT</td>
<td>6,000 RTH</td>
<td>NA</td>
</tr>
<tr>
<td>Universiti Kebangsaan Malaysia (HUKM) Plant</td>
<td>NA</td>
<td>2,800 RT</td>
<td>7,200 RTH</td>
<td>NA</td>
</tr>
<tr>
<td>District Cooling System Amcorp Mall</td>
<td>2005</td>
<td>2,500 RT</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>MBS (Shah Alam Council)</td>
<td>2006</td>
<td>2,400 RT</td>
<td>4,500 RTH</td>
<td>NA</td>
</tr>
<tr>
<td>District Cooling System 1 Borneo Hypermall</td>
<td>2008</td>
<td>5,700 RT</td>
<td>16,800 RTH</td>
<td>NA</td>
</tr>
<tr>
<td>Institut Jantung Negara (National Heart Hospital)</td>
<td>2008</td>
<td>1,930 RT</td>
<td>7,100 RTH</td>
<td>NA</td>
</tr>
<tr>
<td>District Cooling System Solaris, Dutamas</td>
<td>2008</td>
<td>11,000 RT</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Kuala Lumpur International Airport 2 (KLIA2)</td>
<td>2012</td>
<td>25,000 RT</td>
<td>90,000 RTH</td>
<td>NA</td>
</tr>
<tr>
<td>Universiti Kebangsaan Malaysia (UKM) (Loop 2)</td>
<td>2012</td>
<td>4,764 RT</td>
<td>15,795 RTH</td>
<td>10 faculties</td>
</tr>
<tr>
<td>District Cooling System Galleria @ Kotaraya</td>
<td>2012</td>
<td>1,950 RT</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Hotel Selesa, Pasir Gudang, Johor</td>
<td>2012</td>
<td>560 RT</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Pagoh Education Hub, Johor</td>
<td>2015</td>
<td>7,900 RT</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Puteri Harbour, Johor</td>
<td>2015</td>
<td>8,000 RT</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>
A DCS normally incorporates one of a few technological options available, each with its own benefits and advantages. These options can be classified as follows:

- **Thermal Energy Storage (TES)** - can be further divided into ice storage, chilled water storage, ice harvester, etc.

- **Co-Generation** – Electricity is generated from an alternator attached to the gas turbine output shaft. Waste heat from the gas turbine exhaust is channelled to a waste heat boiler to generate steam - which is used as primary energy source to generate chilled water.
Are district cooling data available or if not, can it be collected from district cooling companies?

Since DCS is not regulated in Malaysia, data and information on its development is very limited.


While under the Efficient Management of Electrical Energy Regulations 2008 [P.U.(A)444] any users of electricity that consumed electricity equal or more than 3,000,000 kWh in six consecutive months need to report their data to Energy Commission of Malaysia.

District cooling companies that falls under these two categories need to submit their data to Energy Commission of Malaysia.
6-MONTHLY REPORT OF EFFICIENT MANAGEMENT OF ELECTRICAL ENERGY

FOR

GAS DISTRICT COOLING (KLIA) SDN BHD
- KLIA Plant -


Jan-June 2016

Table of Content

1 Company Information.............................................................. 4
2 EEEM Policy........................................................................... 5
  2.1 Company’s Policy and Objectives......................................... 5
  2.2 Energy Management Committee (Group).............................. 6
  2.3 Energy Technical Committee (KLIA).................................... 6
3 Current and Previous Period of Energy consumption reported.... 7
  3.1 General............................................................................... 7
  3.2 Current Electrical Energy Purchased and Maximum Demand... 8
  3.3 Previous Energy Purchased and Maximum Demand (Jul-Dec’15)... 9
  3.4 Historical electricity purchased and maximum demand trend... 10
4 Production Figures.....................................................................11
  4.1 General...............................................................................11
  4.2 Current Production (Jan-June’16)......................................... 12
  4.3 Previous production (Jul-Dec 2015).................................... 12
5 Specific Energy Consumption (SEC) (kWh/RTH)....................... 13
6 Other Fuel supply and consumption........................................ 15
7 Energy Savings Measures and Implementation Plan..................16
If Data Are Already Collected, Are Data Included In Malaysia's Energy Statistics?

Reported data only related to power sector, such as the input and output from co-generators that involved gas district cooling companies;

These gas district cooling plants are regulated under the co-generation license;

In the National Energy Balance publication the data for input and output of co-generators is reported under the Self-Generation / Autoproducers.
Planned expansion of district cooling facilities in Malaysia

Since DCS is not regulated in Malaysia, information on its development is very limited.

For long term development especially in cities, DCS is the best option to minimize the usage of electricity and mitigate the climate change. DCS is the future trend in large air-conditioning systems and the natural choice for far sighted real estate developer.

According to a 2013 report by the Asian Development Bank, Malaysia could triple the scale of its district cooling industry to a built-up capacity of 575,000 refrigerant tonnes, the equivalent cooling load of up to 12 million square metres of commercial floor space. With the pace of Malaysia’s real estate market growth, and the numerous successful district cooling systems being commissioned across the country, this potential could be even higher.

District energy system could help Malaysia to achieve its Paris Agreement pledge to reduce its greenhouse emission by 45% by 2030 and cut 32 million tonnes of carbon emission by 2020.
Thank You

Malaysia Energy Information Hub

www.meih.st.gov.my