The District Cooling System (DCS) at the Kai Tak Development

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The Kai Tak DCS
District Cooling System (DCS)
The Kai Tak DCS

• First-of-its-kind DCS in HK
• Total area over 320 hectares
• Total AC floor area 1.73 million m²
• 284 megawatt of refrigeration (MWr) AC demand
The Kai Tak DCS

North Plant

Seawater Pump Room & South Plant
The DCS Plants

The North Plant
located at Shing Kai Road

The South Plant
located at underground of former-runway of Kai Tak Airport
Bank of Chillers in DCS Plants

The installed 1.4MWr and 4.3MWr Chillers at the North Plant

The installed 17.5MWr Chiller at the South Plant
Chilled Water Piping Network

3-Pipe System of Underground Chilled Water Piping in Open Trench

DCS Pipes Laying inside the Underground Tunnel
Tunnel Formed by Pipejacking

Intermediate Jack

Slurry Pipes and Electric Cables

Lifting eye / Grout Hole

Tunnel Formed by Precast Concrete Pipes

Condition of Completed Tunnel
Sub-sea Construction

Jacking Pit (-20.5 mPD) at Shing Cheong Road and Cheung Yip Street

2 nos. of DN 2800 Pipejacked Tunnel, each 350m Long

Receiving Pit (-20.5 mPD) at Kai Tak Runway
Sub-sea Construction Sequence

1. Construction of Jacking Pit

2. Construction of 2 nos. of DN2800 tunnels by pipejacking using Tunnel Boring Machine (TBM)

3. Laying of 1xDN1000 and 1xDN900 DCS pipes in each DN2800 tunnel

4. Construction of chamber and pipes connection

5. Backfilling and reinstatement

Kai Tak Approach Channel

Kai Tak Runway (+5mPD) to Cheung Yip Street (+5mPD)

10m - 20.5mPD

Sheet Piles

25m

350m long
DCS Pipes Protection

- Factory-prefabricated insulation with 65mm thick polyurethane and external jacket with high density polyethylene (HDPE)
Consumer Substation

At primary chilled water side:
• Supply Temperature = 5℃
• Return Temperature = 13℃

At secondary chilled water side:
• Supply Temperature = 6℃
• Return Temperature = 14℃
Energy Management and Monitoring

• Automatic computerised system
• District Cooling Instrumentation, Control and Communication Systems (DCICCS)

DCS Control Room
Benefits of the DCS
Benefits of the DCS

Most energy efficient centralized air-conditioning system

- Kai Tak DCS use seawater for heat rejection, consume 35% less electricity
- Annual saving of about 85 million kWh in electricity consumption
Benefits of the DCS

Mitigate Heat Island Effect

• Heat rejection no longer generates from separate air-conditioning systems
Benefits of the DCS

- Reduction in upfront capital cost for chiller plant installation
- More flexible in building design
- Reduce noise, vibration and heat
- More adaptable to varying demand
Current Status of Kai Tak DCS
DCS Services Charges
Charging Principles

- Costs comparable with water-cooled AC systems using cooling towers
- Cost recovery in 30 years
- Price stability
- Simple charging mechanism
District Cooling Services Ordinance & Charging Arrangement

• “District Cooling Services Ordinance (Cap. 624)” was passed by LegCo and enacted in March 2015

• Mainly two charges:

  - Capacity charge: Capital costs and O&M costs
  - Consumption charge: Cost that vary with actual consumption
Adjustment Mechanism

- Capacity charge rate to be adjusted annually based on the Composite Consumer Price Index (CCPI)
- Consumption charge rate to be adjusted annually taking into account change in electricity tariff rate
DCS in New Development Areas (NDAs)

As stated in the 2017 Policy Address, HK Government is considering the provision of DCS in NDAs, such as:

- Topside development at the Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities
- Tung Chung New Town Extension
Conclusion
Conclusion

• DCS is the most energy efficient centralized air-conditioning system suitable to KTD and NDAs
• Annual saving of 85 million kWh in KTD DCS
• Mitigate the heat-island-effect
• Enhance flexibility for building design and reduce noise, vibration and heat
Thank you