

District Cooling Marches on in Dubai

The Emirates Towers Case Study

RETROFITTING
JUMEIRAH EMIRATES TOWERS
with
DISTRICT COOLING

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Empower (Emirates Central Cooling Systems Corporation)

- Established in 2003 by Dubai Ruler's decree
- Set up as a joint venture between Dubai Electricity and Water Authority (DEWA) and TECOM Investments, a member of Dubai Holding.
- Completed 11 years of its operations in December 2014.
- "The World's Largest District Cooling Provider"
- Total cooling Capacity : 1,045,000 RT (2014)
- Number of Plant Rooms : 62 (2014)
- Buildings Served : 746 (2014)
- Number of Customers : 50,000+
- Number of Employees : 700+
- Length of transmission Pipeline : 195+Km (2014)

Empower retrofitted landmark building in Dubai – Jumeirah Emirates Towers, by replacing its chillers with district cooling.

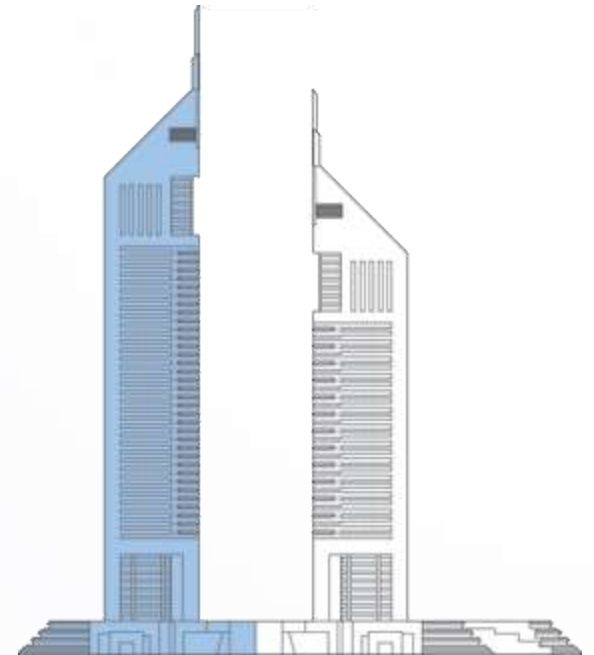
The project consists of 300 metres of chilled water pipe network and an Energy Transfer Station (ETS).

The twin towers are supplied from Empower's DIFC (Dubai International Financial City) plant, which is having a total capacity of 65,000 RT, and primarily supplying to buildings in DIFC district.



Main objectives of this project are replacing the existing conventional cooling system used in the twin towers with district cooling system and thus save on:

- Energy / Electricity efficiency
- Space – to utilize for other commercial purposes
- Overhead cost and maintenance, replacement of equipment etc.
- Reduce Carbon Footprint



Facts

Official Name	- Jumeirah Emirates Tower (JET)
Purpose	- Mixed Use (Offices & Hotel & Retail)
Completion	- 2000

Rankings:

Global Ranking	: #31 Tallest in the World
Regional Ranking	: #11 Tallest in Middle East
National Ranking	: #9 Tallest in United Arab Emirates
City Ranking	: #8 Tallest in Dubai

Source: wikipedia



Existing System Used

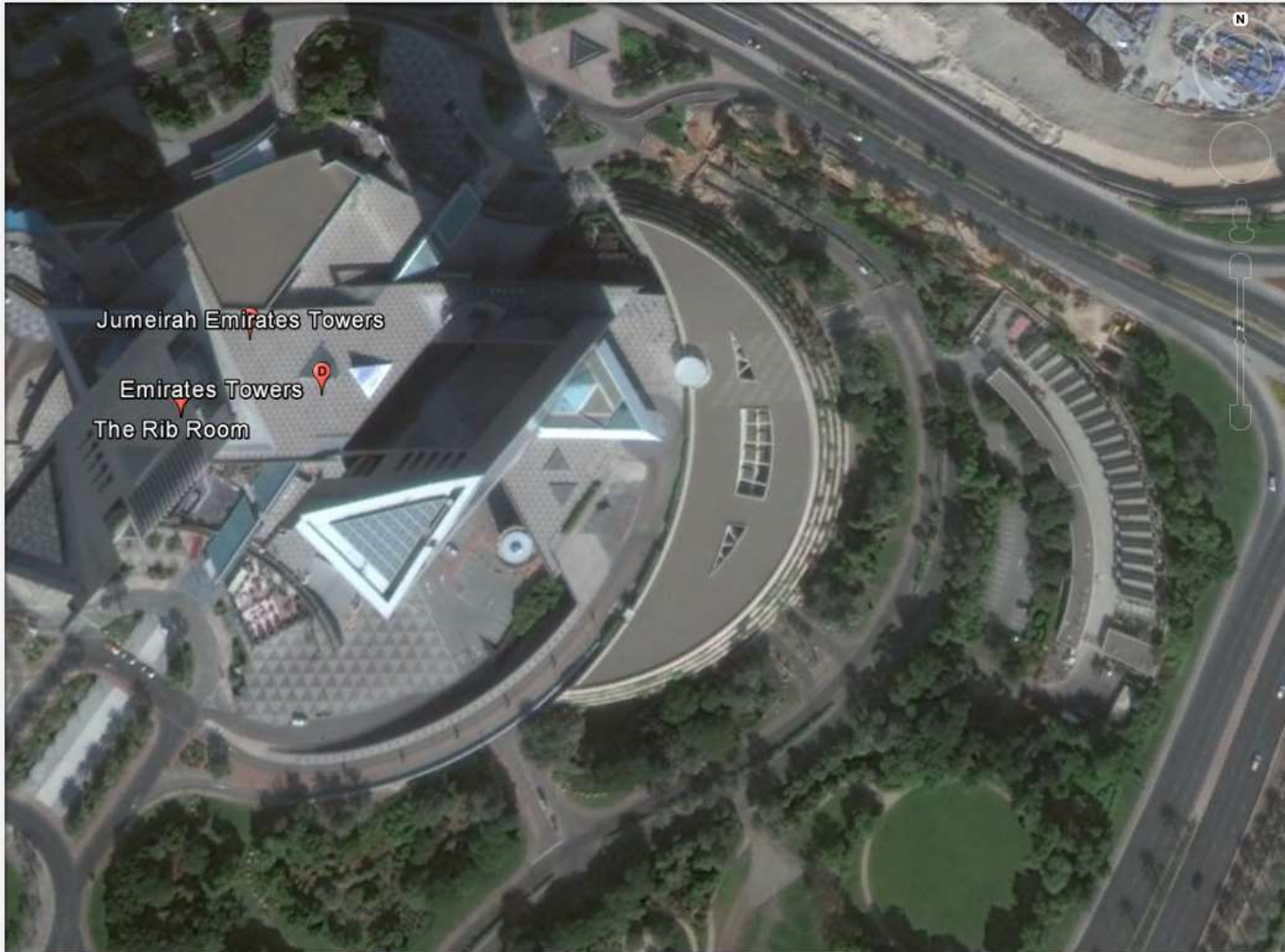
JET used conventional air-cooled chillers, placed adjacent to the towers.

These chillers occupied valuable space of the complex, which can be used for other purposes including building restaurants and other facilities.

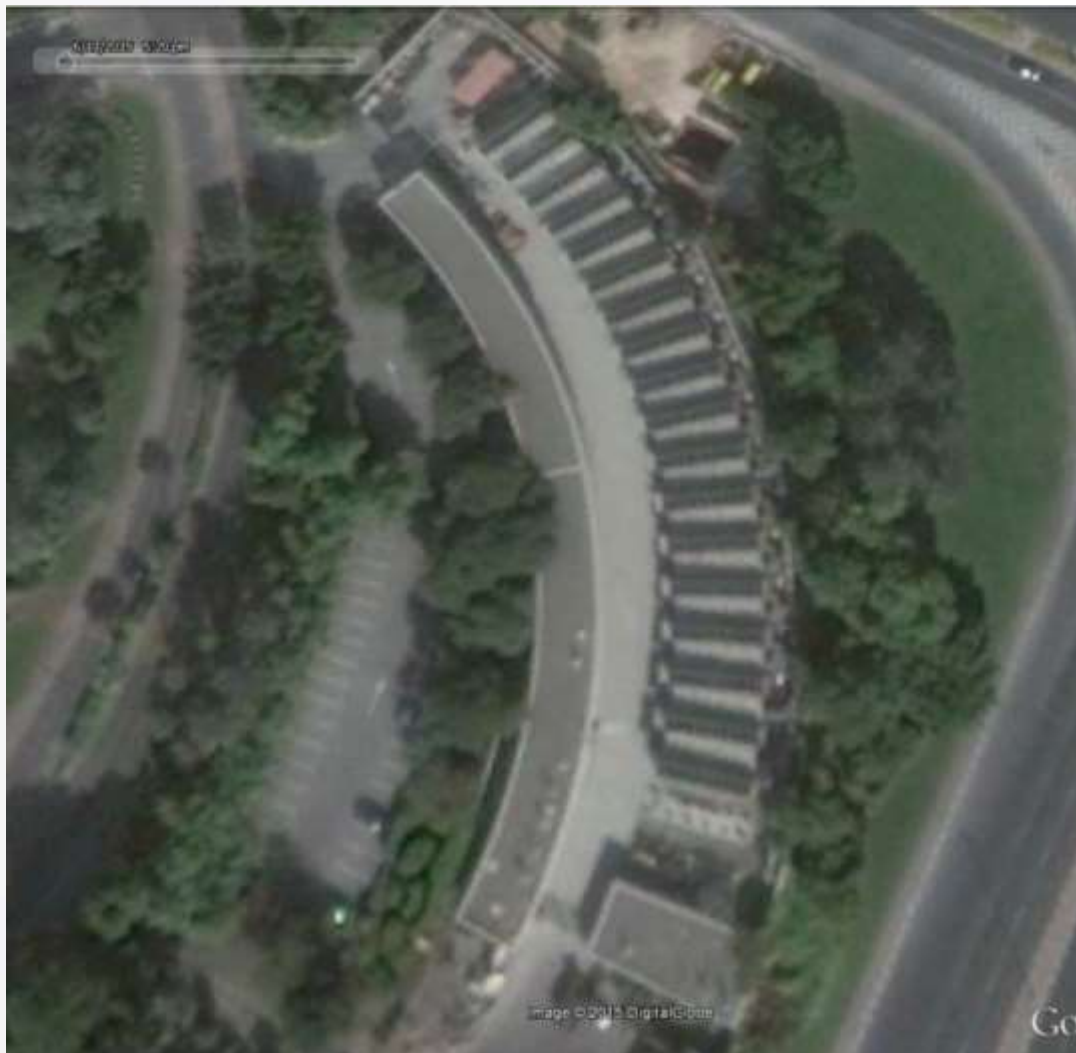
A total of 18 chillers with the capacity of 350RT each (total capacity: 6,300 RT) were working continuously for the towers. These chillers used to consume around 18 MW.



Jumeirah Emirates Towers and old (air-cooled) Chillers



Old (air-cooled) Chillers – sky view



Old (air-cooled) Chillers – inside



Empower's DIFC District Cooling Plant

Empower's district cooling plant in Dubai International Financial Centre (DIFC) was commissioned in 2004 with a total capacity of 65,000RT. The plant serves mainly to buildings in DIFC district.

Empower uses TSE technology at this plant and thus saves huge on potable water.



Challenges in implementing the project

Concept Design

- ❖ JET - building designed for conventional stand-alone system, served air cooled chillers
- ❖ Delta T (DT) of the building system was: 10°F
- ❖ Existing cooling capacity was 6,300 RT. However, Empower re-assessed the required capacity for the buildings and fixed it on 4,000-5,000 RT.
- ❖ The contract is signed as 5,000 RT + 1,000 RT as stand-by for 3 years.
- ❖ Switching over between the stand alone system and the DC system with Zero Downtime considering the elite profile and the importance of the building, given the fact the Ruler of Dubai and Prime Minister of UAE's office is situated in JET.
- ❖ Considering these features, Empower waived Temperature Surcharge.

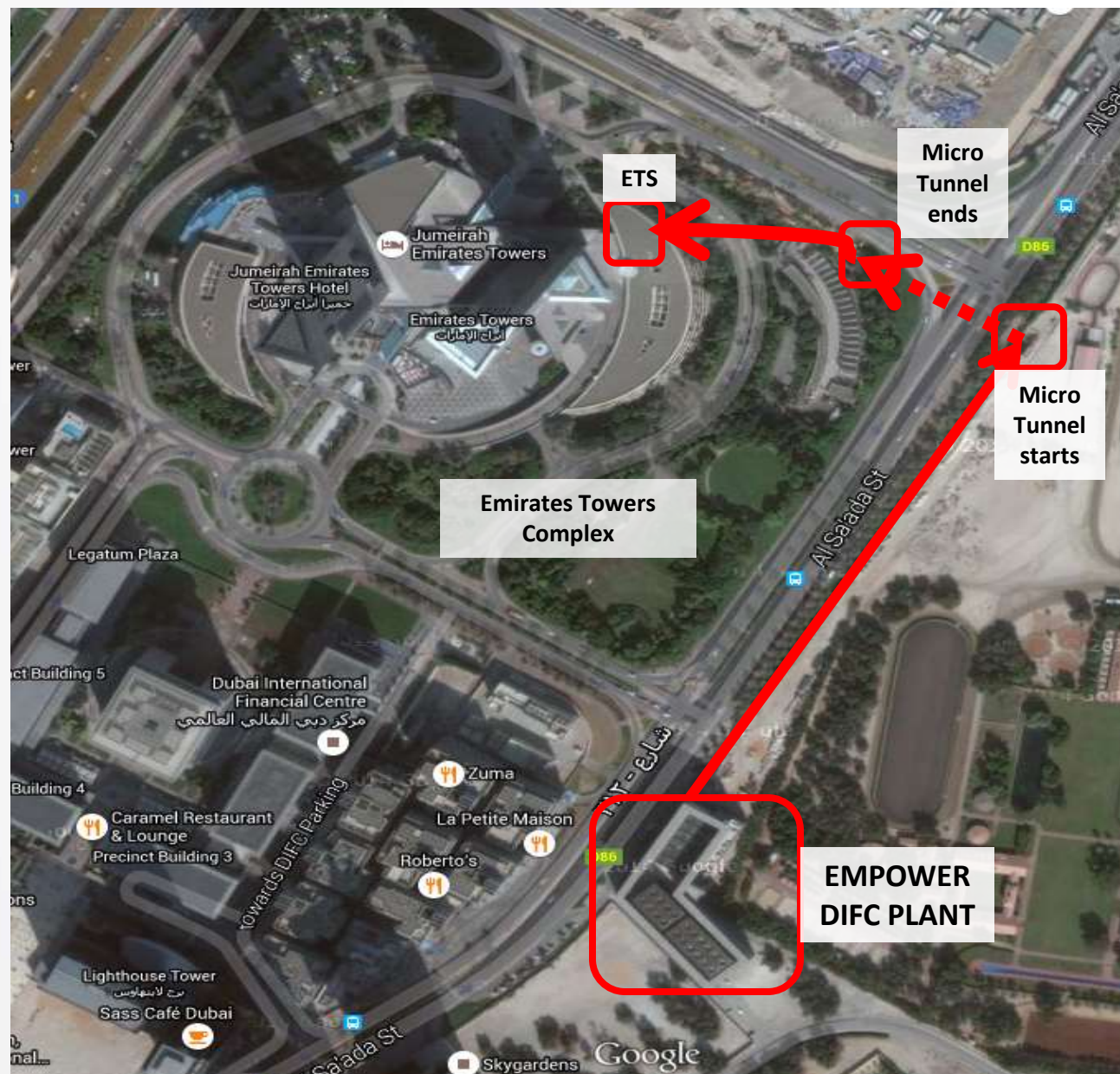
Challenges in implementing the project

Challenges of Connecting

- ❖ Paving the network from DIFC plant to JET, along with important and busy road in Dubai- Road 312. (Road 312 is the key road which provide access to Dubai World Trade Center and World Trade Center Exhibition Halls which hosts international exhibitions throughout the year).
- ❖ The chilled water network was constructed on the opposite side of the Road where JET was located and the challenge was crossing the road to reach JET, without completely closing Road 312, or temporary traffic diversion.
- ❖ Carried out by NDRC (Non Destructive Road Crossing) by means of micro tunneling for a length of approximately 100m.
- ❖ The supply and return pre-insulated pipes of 26" outer diameter each was installed inside one concrete tunnel 2.5m wide at a depth of approximately 10m below the road level



HOW WE CONNECTED

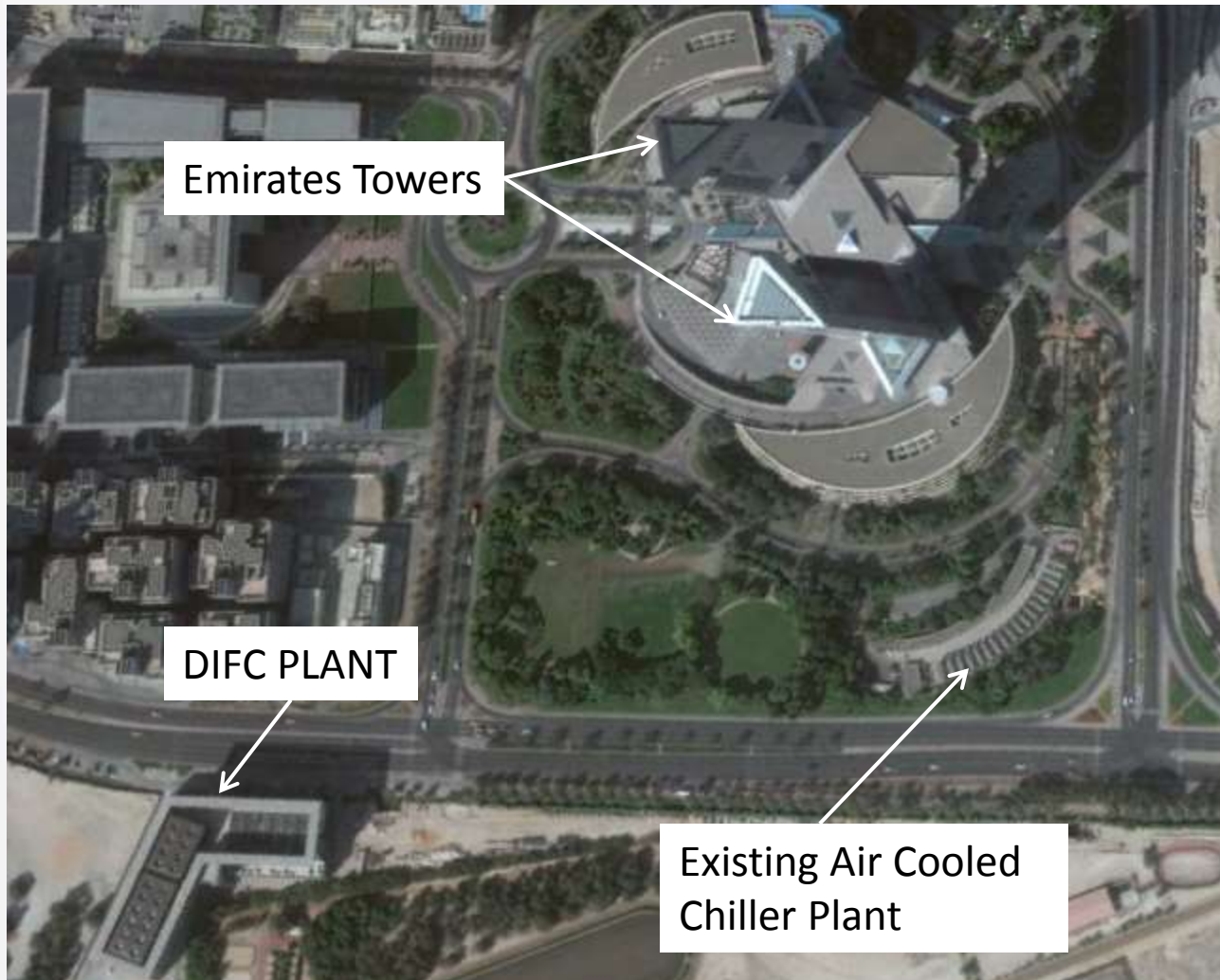


Main determinations required to complete the connection to the Emirates Towers

1. Determining the source of the cooling
2. Determining the Location of the Energy Transfer Station
3. Determining the physical connection including the chilled water pipe route
4. Determining the method of connection considering “No interruption of cooling services” to the buildings

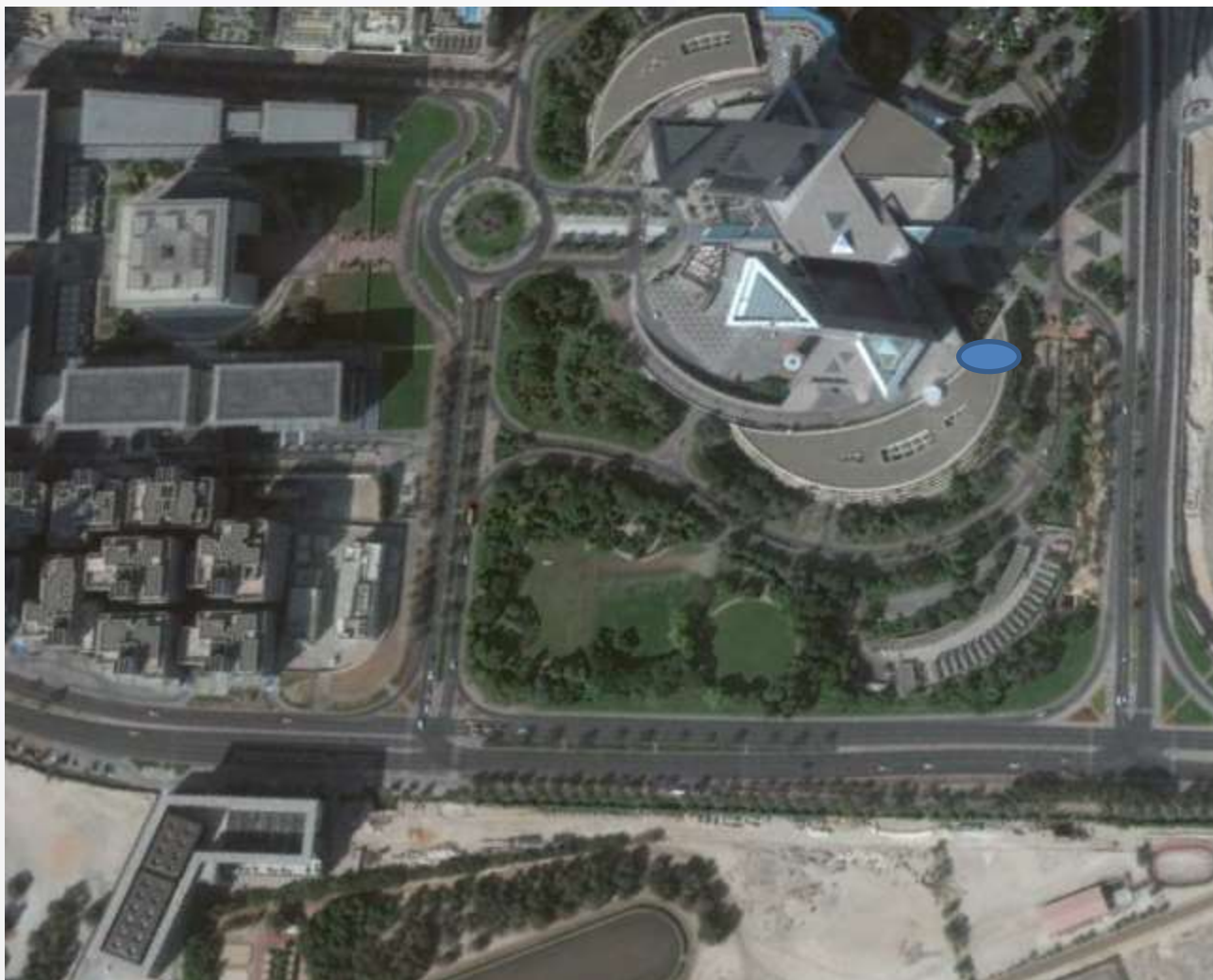
HOW WE CONNECTED

1. Determining the source of the cooling



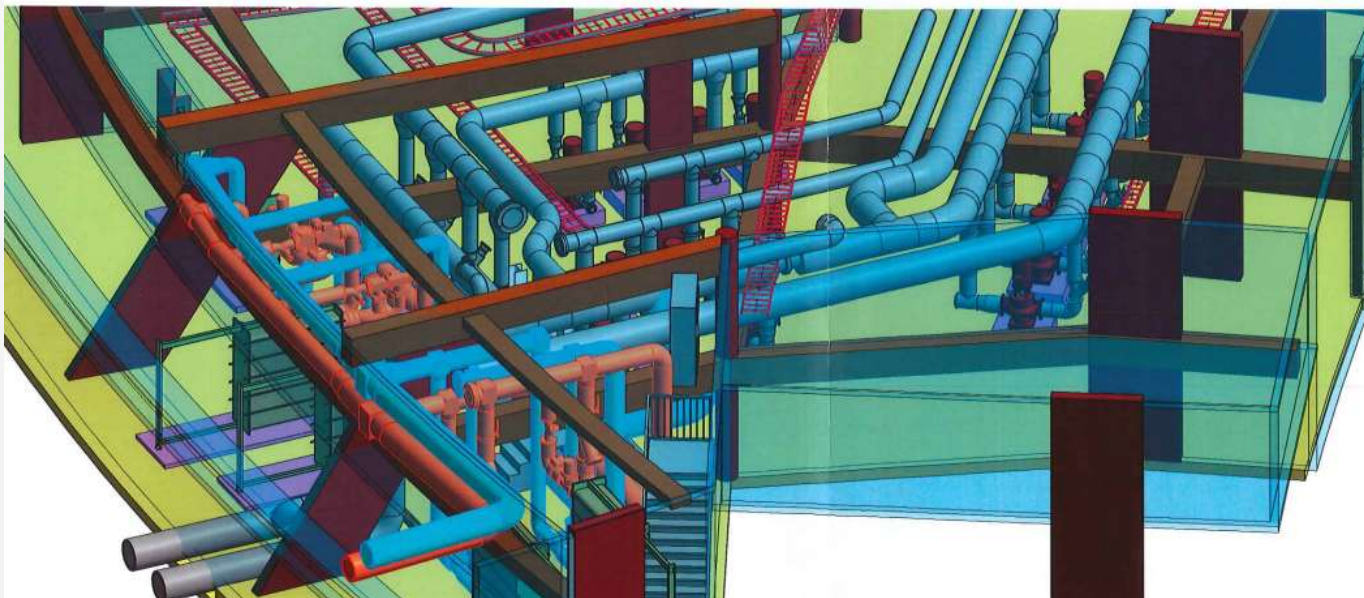
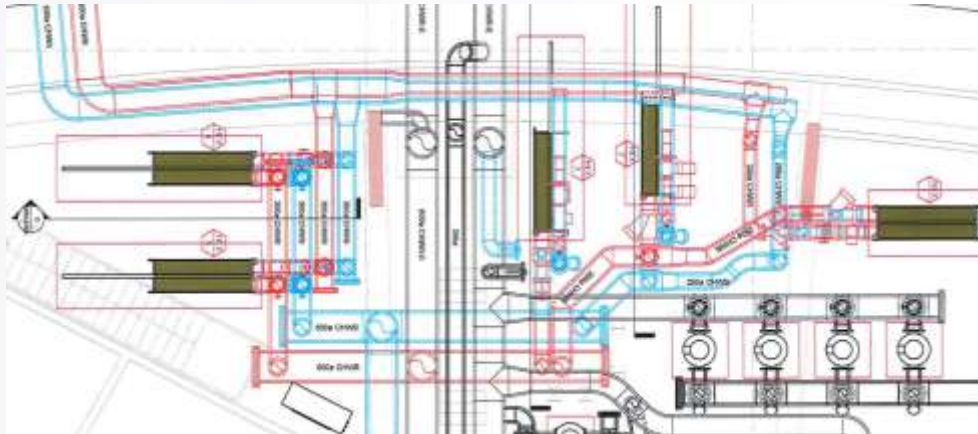
- Considering the available capacity in the DIFC Plant and its near proximity to the towers, it was decided to connect the DIFC Plant to the Emirates Towers

2. Determining the Location of the Energy Transfer Station



- Several locations have been explored and it was decided to locate the ETS within the Mechanical Room where the primary and secondary pumps are located

2. (cont.) Determining the Location of the Energy Transfer Station (Cont.)



- Fitting Heat Exchangers in the available space was a very challenging exercise due to the tight working space and working around existing systems.

3. Determining the physical connection including the chilled water pipe route



Extension of
the main pipe
line

Tapping from
the main line
and crossing
the road
through micro
tunneling
method

Extending the
pipes through
landscape area
to the ETS
Location

3. (cont.) Determining the physical connection including the chilled water pipe route



Excavating for Driving & Receiving Pits



Installation of micro tunneling equipment at Driving Pit



Driving the concrete pipes sleeves



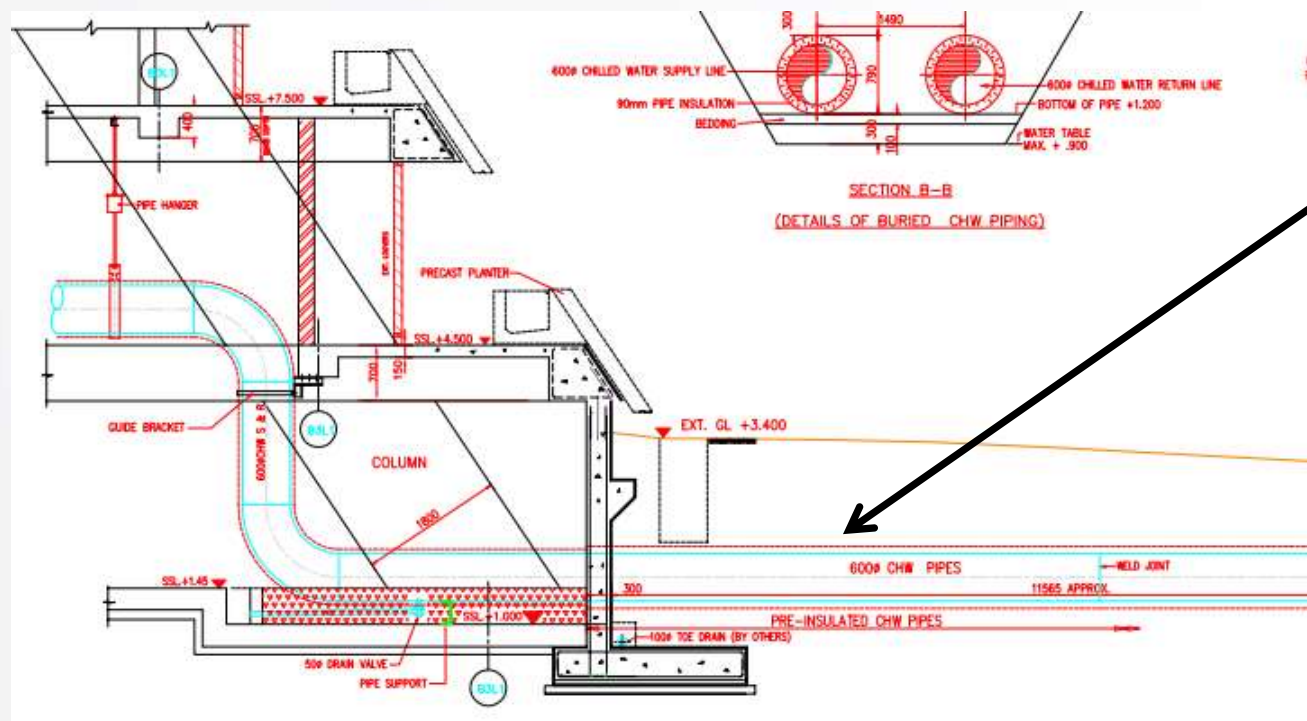
Completion of micro tunneling at Receiving Pit



Installation of chilled water pipes inside the concrete sleeves

4. Determining the method of connection considering “No interruption of cooling services” to the buildings
 - The flow originally oriented to the air cooled chillers plant needed to be diverted toward the heat exchangers located in the ETS
 - A suitable location was determined and Hot Tapping (to avoid shutting down the system) connections were tapped from this location
 - The chilled water flowing towards the air cooled chiller plant needed to be stopped to enable the removal of the plant and the associated pipes

- Determining the method of connection considering “No interruption of cooling services” to the buildings



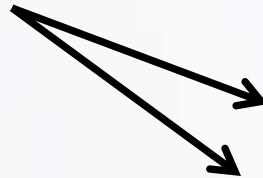
Location for Hot Tapping to divert the flow to the ETS Room

To & From Air Cooled Chillers Plant



4. (cont.) Determining the method of connection considering “No interruption of cooling services” to the buildings

Water Stopping Fitting, all pipes downstream these fittings were removed.

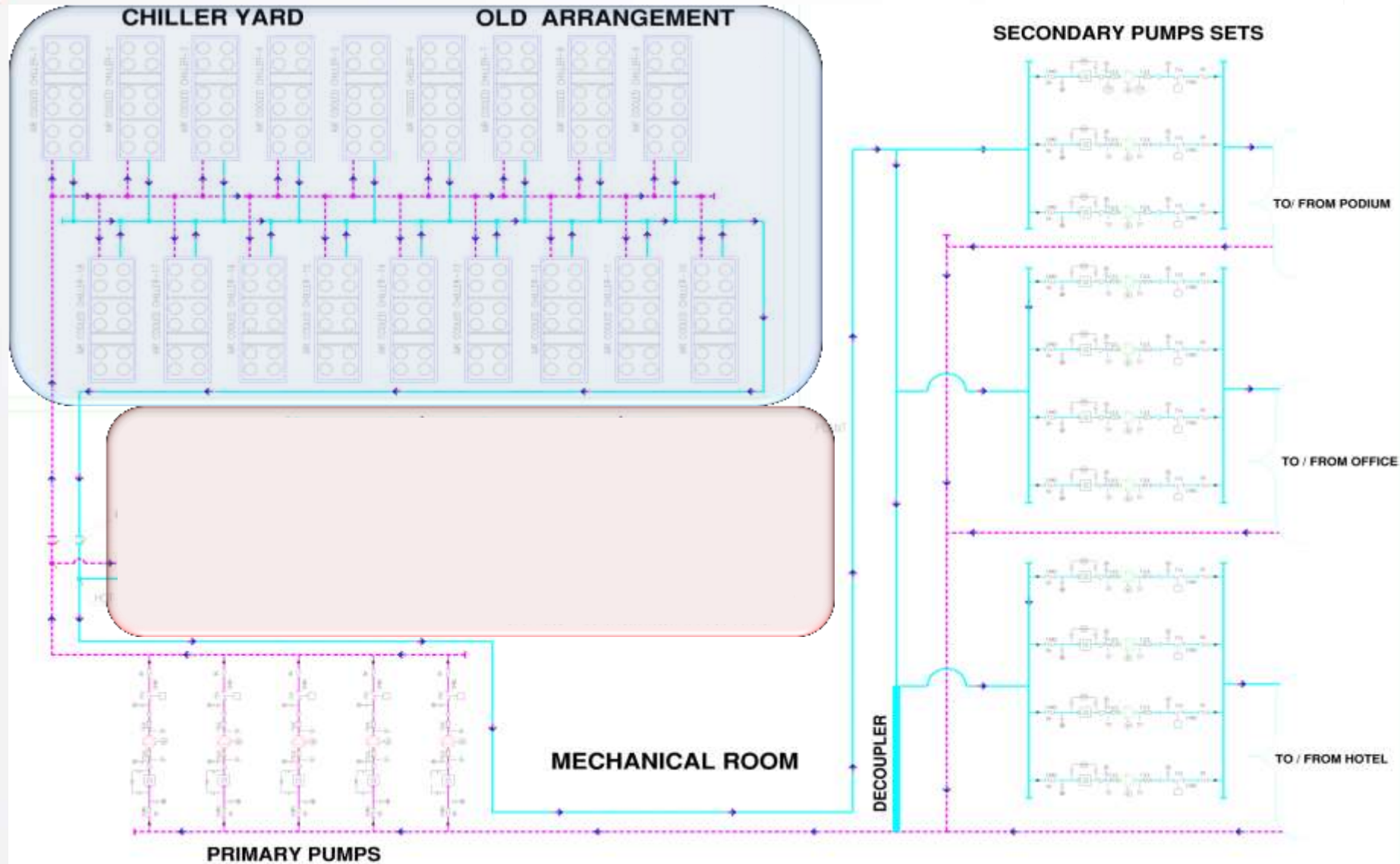


4. (cont.) Determining the method of connection considering “No interruption of cooling services” to the buildings (Cont.)



Chilled Water flows toward s the ETS Room instead of the Air Cooled Chillers Plant

EMIRATES TOWER CHILLED WATER SCHEMATIC DIAGRAM

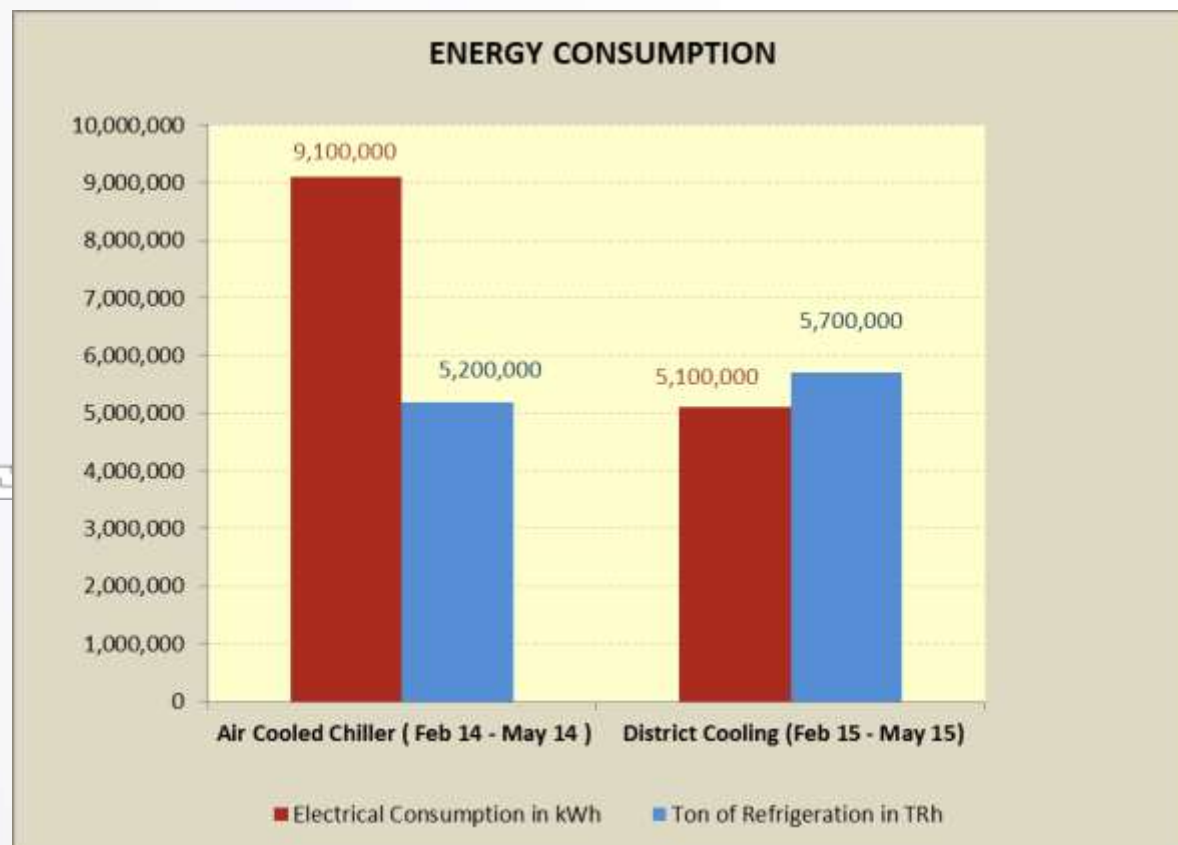
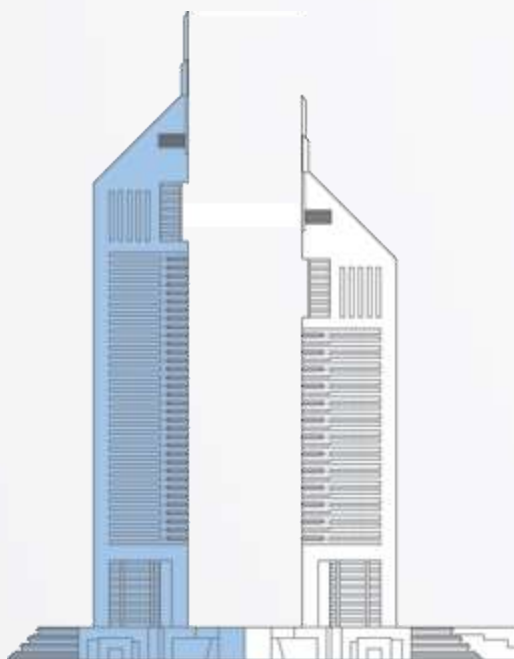


Emirates Towers No Longer need the Air Cooled Chillers Plant




Air Cooled
Chillers Plant
will be removed
for a future a
development to
be constructed

- Significant reduction in Electrical energy consumption.
 - a) Electrical Energy Consumption steeply reduced by 40% in comparison with the same period previous year.
 - b) A Net saving of 4,000,000 kWh realized by Customer.

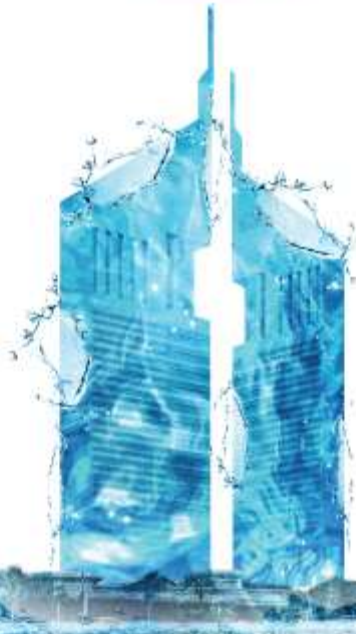


- Elimination of Noise Pollution from Air-Cooled Chillers 95 dBA.
- 30,000 Square Feet. Of Plot available for commercial purpose.
- Demand side management – Peak electrical demand load of 10.8 MW reduction on Power generation.
- We estimate an Annual Electrical energy consumption of 12.8 million kWh.
- Environmental benefit : Annually 6,386 ton of carbon di-oxide emission reduced.

THANK YOU



EMPOWER
ENERGY
SOLUTIONS



The World's Largest District Cooling Provider

EMPOWER, Emirate Central Cooling Systems Corporation, is created with the objective of providing world class District Cooling Services to Dubai and the region. Empower is determined to satisfy the critical needs of its customers and in the process develop its own distinctive competencies.

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