

Emissions Reductions Achieved Through Efficient District Cooling

**International District Energy Association Annual Conference 2014
June 2014**

Agenda

- Our 15 Years Journey
- Company Overview
- What Do the Savings Mean for the UAE?
- Energy Efficiency
 - District Cooling
 - Building Chillers
 - Summary Comparison
 - Environmental Benefits of District Cooling
- Emissions Reductions
 - Carbon Dioxide Emission Reductions by Water Cooled Electric Plants
 - Emission Reductions due to Tabreed
- What is next for Tabreed

Our 15 Year Journey

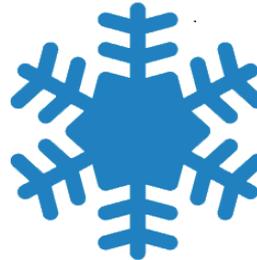
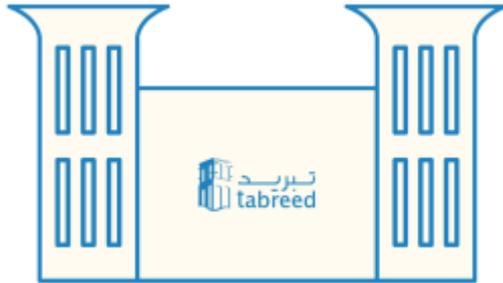
Pioneer Provider of District Cooling Services in GCC

Iconic Projects

66 Plants in the GCC

...delivering 856,000 RT

...equivalent to cooling
85 Burj Khalifa towers



..of
cooling
to our
clients



High Contributor to the Environment

Energy Efficiency

1.2 billion kWh

2013 reduction in energy consumption in the GCC
by using our energy-efficient and environmentally-
friendlier cooling services



40,000



Enough energy to power up to 40,000
homes in the UAE every year

Elimination of

570,000 tons

Of CO₂ eliminated in 2013



110,000



The equivalent of removing 110,000
cars from our streets every year



Company Overview

Strong focus on Core Business

- 60 district cooling plants across the UAE and an additional 6 district cooling plants across the GCC
- Total connected capacity of 856,000 RT
- Over 23,000 shareholders including Mubadala, ACWA and the Retirement fund

Operational Excellence & Reliability

- Provides energy efficient district cooling systems with highest reliability
- Continuous operational improvements; (e.g. 10% electricity and 13% water efficiency gains over last 4 years)

O&M Excellence

- Experienced and committed O&M employees guaranteeing the availability and reliability of continuous chilled water supply to all the customers
- Operate 11 third party plants
- Center of excellence training for all JV and subsidiaries O&M employees

Track Record

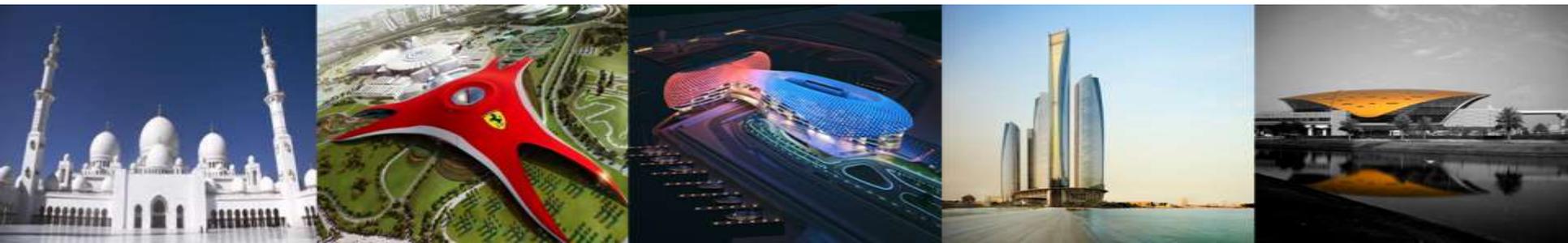
- Providing critical cooling infrastructure to government, commercial, residential and private organizations in the GCC since 1998
- Historically high levels of reliability

Regional Presence

- Owns and operates DC plants in the GCC, including Bahrain, Oman, Saudi Arabia, and Qatar
- 600 employees in the UAE.

Partner of Choice

- Some of the high profile projects include Yas Island, Sheikh Zayed Grand Mosque, Dubai Metro, Etihad Towers, The Pearl Qatar, Bahrain Financial Harbor and Saudi Aramco
- District cooling partner for leading developers (example, Al Dar)



What Do the Savings Mean for the UAE?

Over **570,844 RT** delivered to customers



259 Sheikh Zayed Grand Mosques



Energy

Reduction from the electric
water cooled plants

633,353,259 Kwh



24,000 homes



Environment

Cutting CO₂ Emissions by

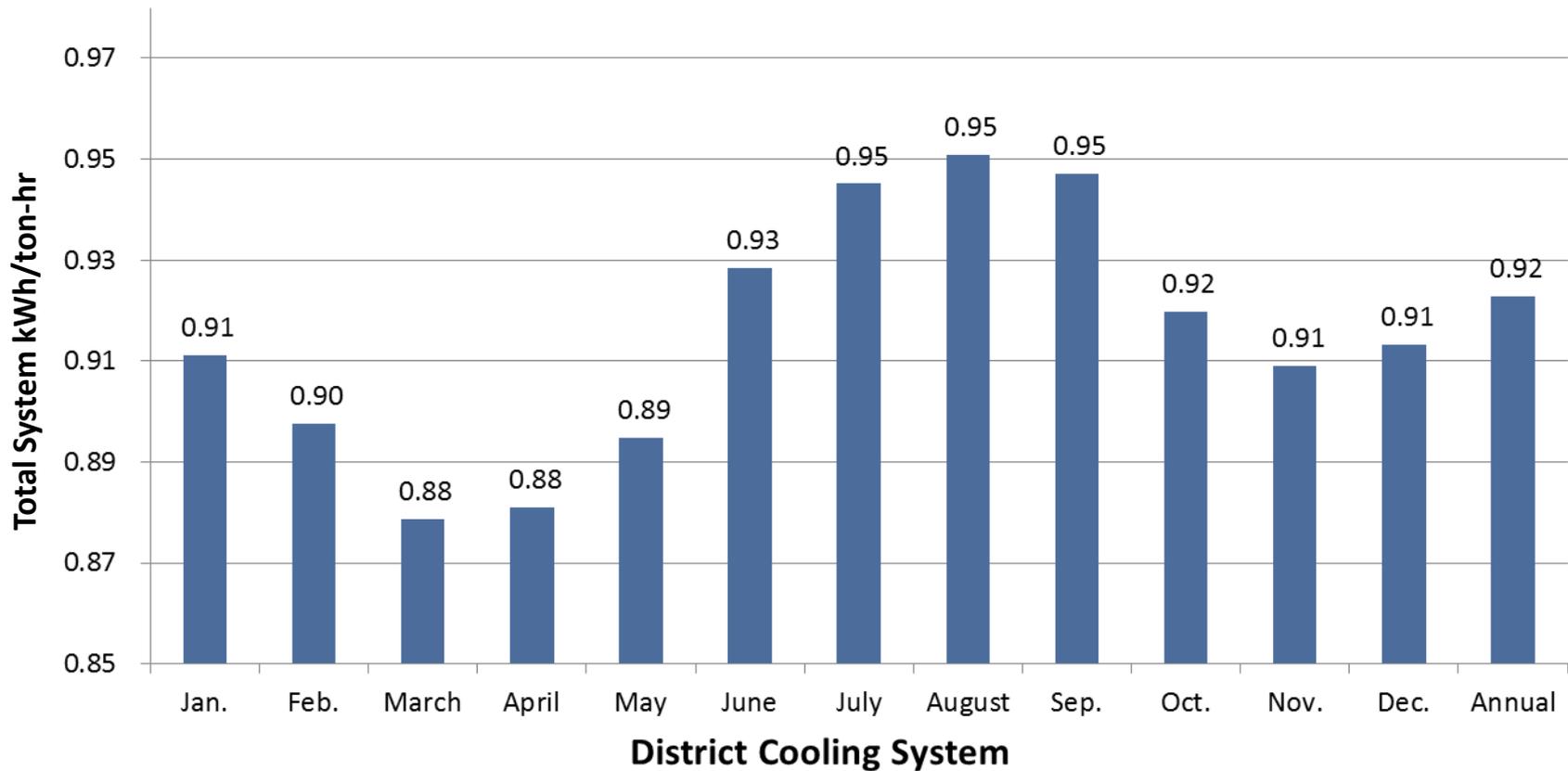
298,509 Tons



59,000 cars

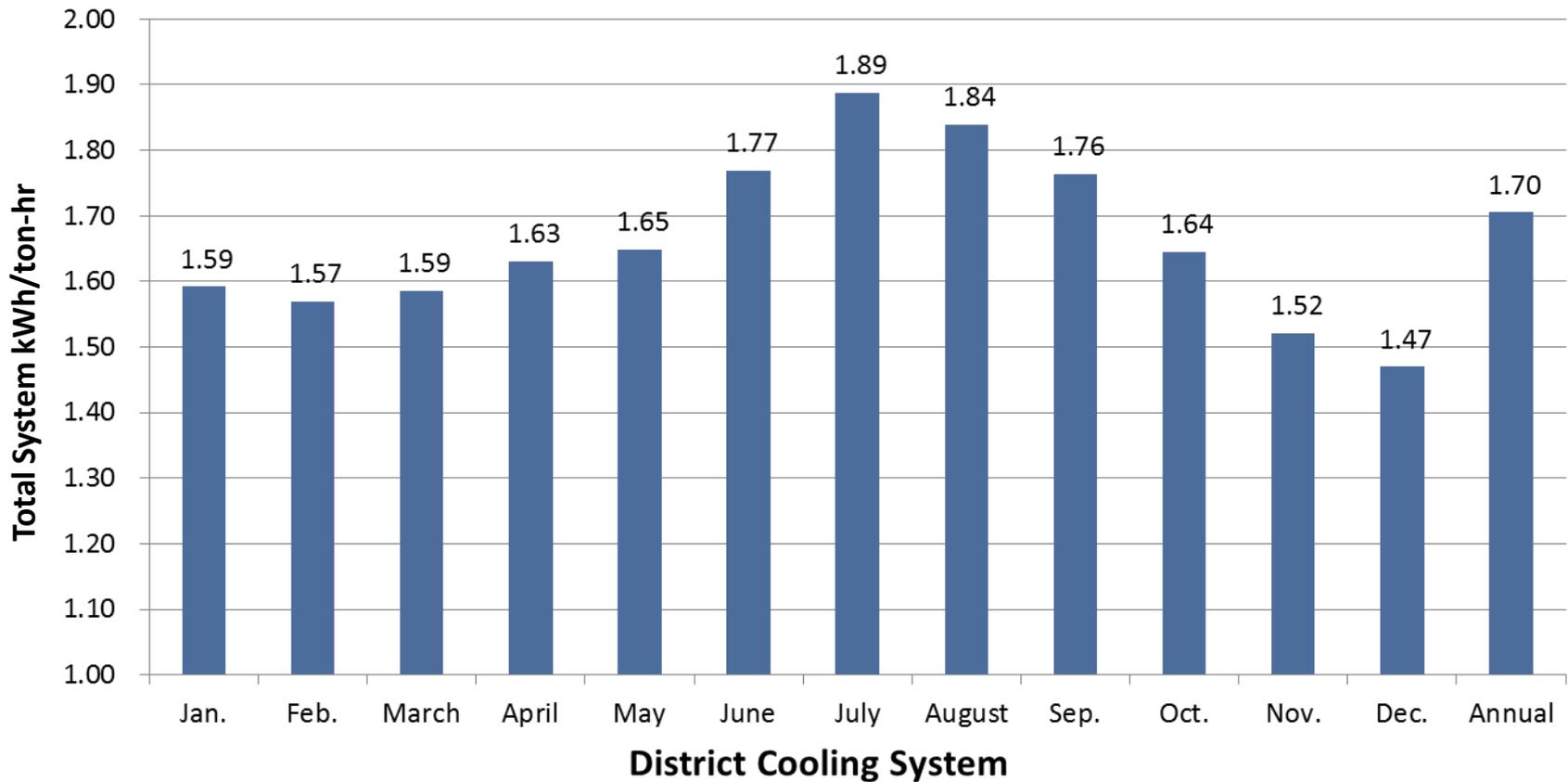
District Cooling Efficiency

Total Annual System Efficiency for All Tabreed 43 Water Cooled Plants



Building Chillers Efficiency

Real-World Data on Monitored Air-Cooled Chillers

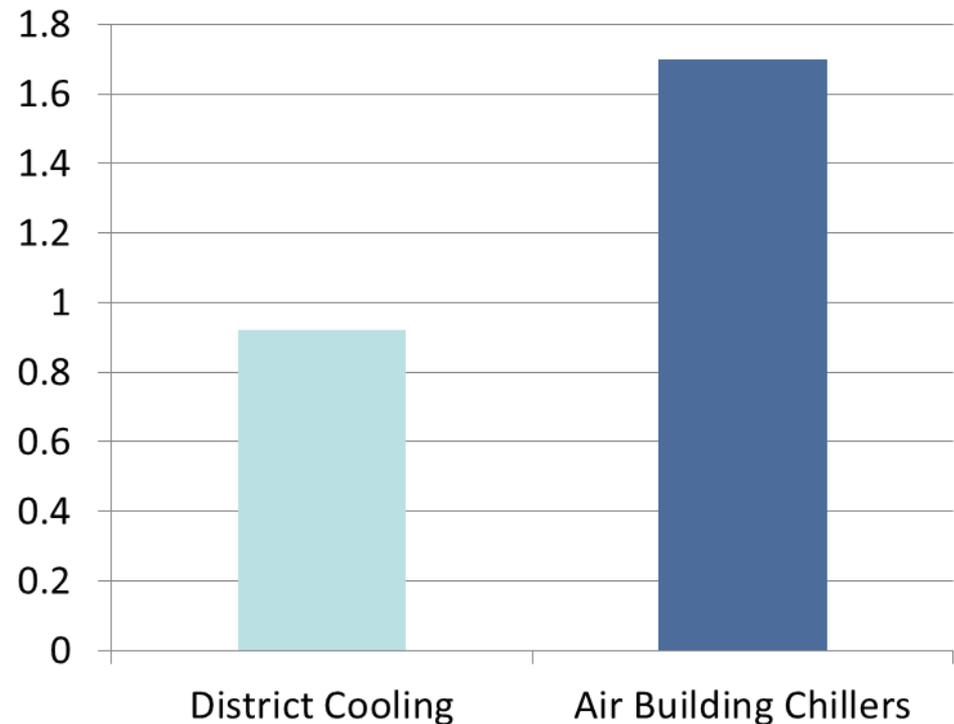


Summary Comparison

District Cooling Electricity Use is 32% Lower than Air-Cooled Building Chillers

District Cooling	0.92 kWh/Ton-Hour
Air-Cooled Building Chillers	1.70 kWh/ton-hour
Reduction	0.78 kWh/ton-hour
% of Reduction	46%

Cooling System Comparison

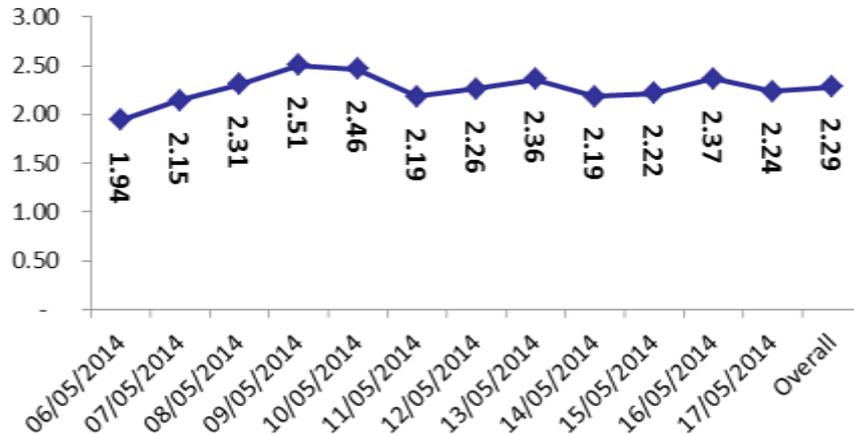


- Water constraints and cooling towers installation make it increasingly difficult for buildings to install water-cooled chillers
- District cooling plant is design to utilize Treated Sewage Effluent (TSE) by installing Polishing plant once it is available.
- Air-cooled building chillers are inefficient (range 1.7 kw/ton to over 2.0 kw/ton)
- Assumptions for building systems are based on theoretical values or equipment ratings based on static laboratory conditions rather than “real world” data
- Real world performance is affected by:
 - Part load operations
 - Lack of monitoring equipment/ instruments (control system)
 - Poor maintenance practices
 - Harsh weather conditions (sand, sun, heat)

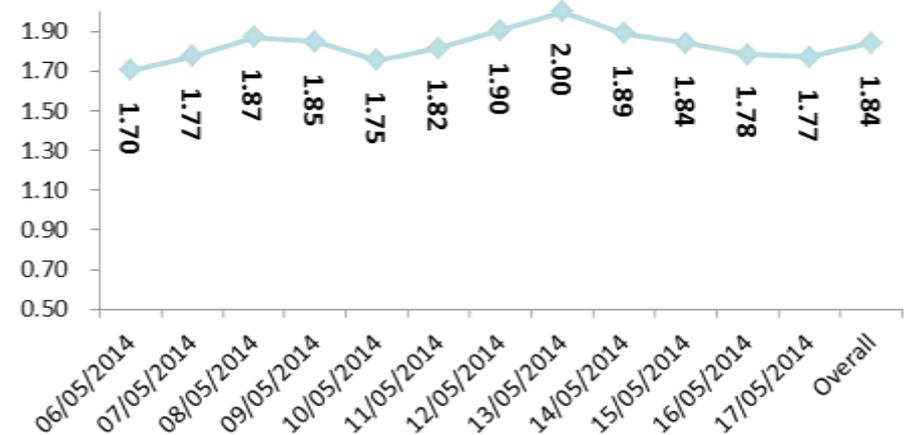
- All Building's chiller systems are not being monitor and minimum maintenance is being done to the chillers and to the building's A/C system.
- R-22 refrigerant still used in the majority of buildings air cooled chillers.
- A lot of leaks is not being repaired which have huge impact on chiller efficiency and Environment.
- DSM program is being evaluated to address all the above concern.
- Almost all the buildings have designed with three way valves and constant speed pumping system which makes the system inefficient and consumes higher KWH.
- Below is the actual data collected after the installation of BTU meters and power meters which shows how much inefficient air cooled chillers were.

Electrical Performance of Buildings Air Cooled Chillers

Electrical Performance of Offices Building



Electrical Performance of Residential Building



- Increased energy efficiency means;
 - Reduction air pollution
 - Reduction carbon dioxide (CO₂)
- Reduction emissions of ozone-destroying refrigerants



Carbon Dioxide Emission Reductions by Water Cooled Electric Plants

0.78 KW/Ton

- Tabreed's Efficient Chiller Plants VS Air Cooled Chillers Results an Annual Reductions of .78 kw/ton

928m Tons-Hrs

- Tabreed's Total Cooling Load Produced by Water Cooled Electric Plants is 928,394,203 Tons-Hrs in 2013.

850m Kwh

- Total Annual Electrical Consumption in 2013 is 850,452,896 Kilowatt Hours

633m Kwh

- Total Annual Electrical Consumption Saved Due to Efficient Operations of DC plants VS Air Cooled Chillers plants is 663,353,259 Kwh

298 tons of CO2

- Total Reduction of Carbon Dioxide 298,509 Tons (0.45 kg of CO2 per KWH).

Emission Reductions due to Tabreed



- Tabreed annually delivers of 928,394,203 ton-hours
- Tabreed's efficient chiller plants result in annual reductions of:
 - 663,353,259 Kwh electricity consumption
 - 298,509 metric tonnes of CO2 emissions

What is next for Tabreed

- Continuous focus on delivering the most efficient chilled water supply to all customers by optimizing the operations philosophy & delta T.
- Continuous education to all our customers of what does it mean to have an efficient DC system (primary and secondary) to them and to the country.
- Continuous evaluation of different technology related to electrical efficiency and water consumption as part of Tabreed R&D program.
- Continuous support to all government sector to promote energy efficiency by engaging in different program such as DSM and quality of HVAC manpower.

Thanks for your attention!!

James Kassim

Phone

Email