District Cooling
An Optimal Solution for Kingdom’s Growing Cooling Demand

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District Cooling

What is DC?

Building upon the economies of scale.

Production and distribution of chilled water from a central facility.

Widely used various Applications.

Buildings no longer need to own and operate their own chillers.
District Cooling

Kingdom’s Cooling Demand

- Saudi Arabia is located in a region where solar heat can be as extreme as compared to other parts of the world and meanwhile this causes the Kingdom the high demand in Air-conditioning.
- **Economic and Environment friendly comfort cooling solution** is the only target in this field and Government has already started initiative to reduce energy consumption and increase the energy efficiency in all systems.
- District Cooling is going to thrive the market demand in terms of effective cooling solution.

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Saudi Arabia uses 70% of its electricity on air conditioning

- **Air conditioning** 70%
- **Desalinating water** 20%
- **Everything else** 10%

Cooling capacity growth in the GCC may triple by 2030

Kingdom’s Consumption and Impact

- **Percentage of Total Production of Petroleum and Gas Products Consumed Locally:** 26.1%
- **Average crude oil demand 2017:** 2.6 Million Barrels/Day
- **Green House Gas Emissions as of 2014:** 583.37 Million (MtCO2e)

**Electricity Consumption:**
- Residential: 50%
- Commercial: 17%
- Industrial: 16%
- Agricultural: 2%
- *Others: 4%
- Governmental: 11%

Source: KAPSARC Data Portal
System Modules

- **Central Chiller Plant** includes groups of water-cooled chillers generating Chilled Water.
- **Cooling Towers** are used to reject waste heat from central chillers.
- **Thermal Energy Storage** stores chilled water which is cooled during off-peak hours and utilized during peak hours.
- **Chilled Water Network** carries cold water to customer buildings.
Major Equipment

**Electric and Absorption**

**Centrifugal**

**Counter Flow and Parallel Flow**

**2000 TR to 5000 TR Chillers**

**FRP FIELD ERECTED**

**TSE RAW WATER**

**Induced Draft Counter Flow**

**Cooling Tower**
Energy and Cost Saving with DC Outsourcing

**Conventional Cooling**
- 240 MW
- 838 MM Kwh
- 523,000 tons of CO2

**District Cooling with TES**
- 90 MW
- 315 MM Kwh
- 197,000 tons of CO2

**Every 100,000 TR of District Cooling Capacity**
- Saves 150 MW of power plant infrastructure and
- Lower 523 MM Kwh in electricity consumption,
- Savings 326,000 barrels of oil, which
- Eliminates 140,000 tons of CO2 from the environment,

**Utilizes**
- 2,500,000 m³ of TSE water every year

**Reduces**
- SAR 500 MM capital investment in power sector

**Enough to power up**
- 16,000 houses in KSA every year

**Enough to fuel**
- 22,000 cars per year

**Equivalent to**
- Carbon absorbed by 6,500,000 trees

*Due to Diversity Factor, District Cooling Plant with 100,000 TR of Plant Capacity is able to provide 140,000 TR of cooling services*
Key Benefits of DC Systems

**GREATER RELIABILITY**
Due to high use of standard industrial equipment.

**ANNUAL MAINTENANCE COSTS ARE SUBSTANTIALLY LOWER**

**50% LESS ENERGY**
Protects the environment by reducing CO₂ emissions due to lower energy consumption.

**DECREASES INITIAL CAPITAL INVESTMENT**
And spreads costs over a longer period of time.

**EQUIPMENT NEEDS TO BE REPLACED ONLY EVERY 30 YEARS**
As compared to 15 years for traditional air conditioning.

**LOCATED REMOTELY AND THEREFORE ENHANCES REAL ESTATE VALUE**
By freeing up space for other uses.
Green & Brown Field Projects

Green Field Projects:

❖ Implementation of DC is more optimum, since Building side systems can be designed with DC in mind.

❖ Developer/Owner can use the land and Spaces more Efficiently.

❖ More marketability for Real Estate and Business Growths

Brown Field Projects

❖ Converting existing buildings and infrastructure projects from traditional air conditioning systems into district cooling. Thus enabling the customers to achieve key energy, economic and environmental benefits.

❖ Developer and District Cooling Utility provider need to work together to avoid and or reduce the any impact of low del.T syndrome.

❖ Increase in Energy efficiency and reduced responsibility on Facility management for Developer.

❖ Reliability of the Air-conditioning will be greater than before.
Renewable Energy and District Cooling

❖ National Renewable Energy Program (NREP)

❖ National Transformation Program (NTP)

❖ 9.5 GW by 2023.

❖ $320m 300MW Sakaka solar project offsetting over 430,000 tonnes CO2

❖ District Cooling will play a dual role inline with vision 2030 by increased energy efficiency and by adopting Renewable Energy Programs with in the District Cooling Schemes.

❖ Using solar heat for district cooling has seen increased interest as the need for cooling is expected to grow as the climate heats up, not only in Saudi Arabia, but in many regions.
Renewable Energy and District Cooling

- Solar absorption chillers are one of the most effective and efficient.

- The solar collectors collect thermal energy from the sun and transfer it using a glycol-water solution, along with a system of pipes, pumps and controllers.

- Solar Electric Chillers are also viable if more land area is available and or the DC projects can enroll into Green power programs where direct Renewable Energy Supply is not available.

- Smaller equipment like Pumps and Cooling Tower Fans can be operated.

- Renewable-based DC brings a range of benefits, including increased energy security, improved health and reduced climate impact.
LEED & District Energy

❖ Supports Fundamental & Enhanced Refrigerant Management (Zero use of CFCs)

❖ Supports EA Prerequisite Fundamental Commissioning: Buildings no longer to commission chillers.

❖ Supports the Prerequisite: Minimum Energy Performance

❖ Possible to gain most of the 18 points under EA Credit Optimize Energy Performance

❖ Additional credits can be gained if onsite renewable energy or Green Power is used along with District Energy
Saudi Arabia is considered to be the strongest district cooling market in the region.

Saudi Arabia, achieved a compound annual growth rate of 22% in 2014 and is expected to reach up to 25.97% by 2020.

With the efforts by the Government of the Kingdom to move towards sustainability and curb energy consumption, DC will become a preferred choice for cooling needs.

The Kingdom’s rapidly expanding industrial base and population have increased the demands for water, power and cooling.
Saudi Tabreed
LEADING DISTRICT COOLING PROVIDER IN THE REGION

<table>
<thead>
<tr>
<th>KEY HIGHLIGHTS</th>
<th>ICONIC PROJECTS</th>
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<tbody>
<tr>
<td>373,000 TR</td>
<td>1st</td>
</tr>
<tr>
<td>District Cooling Services provided in KSA</td>
<td>Company to finance DC on non-recourse in Middle east</td>
</tr>
<tr>
<td>1,400,000 TR</td>
<td></td>
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<tr>
<td>District Cooling Services provided in GCC *Abu Dhabi, Dubai, Bahrain, Oman and KSA</td>
<td></td>
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<tr>
<td>72 plants</td>
<td></td>
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<tr>
<td>Total number of District Cooling Plants in the GCC</td>
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Saudi Tabreed has been working in close collaboration with government entities to streamline the cooling demand requirements, facilitated by the development of mega-projects in an efficient manner. Also under innovative frameworks of BOO/BOT’s as well as EPC-O’s for government centres, and mixed-use developments.
KEY GCC PROJECTS

✓ Dubai Metro
✓ Sheikh Zayed Road -Dubai
✓ Sheikh Zayed Mosque
✓ Ferrari World – Abu Dhabi
✓ AL DAR H.Q – Abu Dhabi
✓ Etihad Towers – Abu Dhabi
✓ Cleveland Clinic – Abu Dhabi
✓ Reem Island – Abu Dhabi
✓ Bahrain Financial Harbor
✓ Reef Island - Bahrain
✓ Bahrain Trade Center
✓ Knowledge Oasis – Oman
To Conclude

❖ Initial capital savings, lower the total operating costs, lower maintenance and repair cost and industrial levels of reliability all indicate District Cooling is a better solution to your cooling needs.

❖ Lower carbon footprint and reduced capital and operating cost makes district cooling a viable system.

❖ More real estate value, better land usage, aesthetic improvement for buildings.

❖ Reduced customer initial investment related to building HVAC systems.

❖ The unexpected expense of a sudden accidental failure of critical cooling equipment is not present with District Cooling.

❖ Associated downtime is avoided and even scheduled shutdowns become unnecessary.
Energy Well Spent

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Thank You

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