

District Cooling Workshop

Wednesday 18/6/2014

Towards Cooperative District Cooling Society

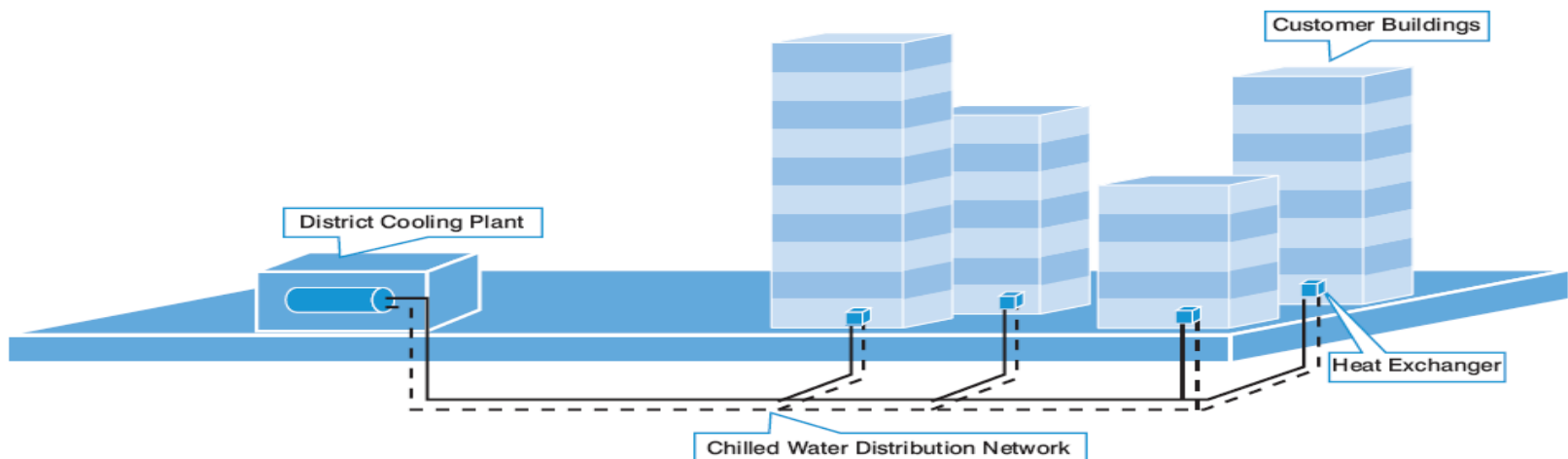
Role of District Cooling Services Department- Opportunities of DC in Qatar

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Manager, District Cooling Services Department.
KAHRAMAA



District Cooling System

- District Cooling is very important and beneficial technology and a business practice that help in saving energy and reducing the impact on the environment.
- District cooling involves the provision of air conditioning from a large central cooling plant via a closed network of insulated pipes.
- The system is highly robust and customizable since the water used can be either regular water/ TSE or seawater and the plants may be either electricity or gas driven.
- District Cooling is considered as an important practice, in new modern cities, to ensure the sustainability of natural resources.



Advantages Of District Cooling-*Benefits to Government*

- **Natural Gas Savings/Electricity:** District Cooling Plant is having 30 -40 % less power demand over Conventional cooling technologies.
- **Reduction in Peak Load demand :** In D.C. Thermal Energy Storage (TES) makes flatter demand curve and bringing down peak demand of power-(the demand can be used at less peak hour)
- **Reduction in Water Demand:** Use of TSE water to DC promotes sustainability and reduces desalinated water consumption.
- **Reduction in capital Investment & recurrent cost :** Help to reduce new power plant and smaller power distribution network /substation & associated infrastructure.
- **Reduction in Carbon footprint :** Around 50 % less CO₂ emission reduction due to DC over conventional cooling technologies.

Advantages Of District Cooling-Benefits to End users & Developers

- **Reduction in Building Construction Cost by 8 -10 % due to Outsourcing AC requirements.**
- **Reduced Building Maintenance Cost.**
- **Increased Revenue generating potential due to More building usable areas.**
- **Elimination of noise due to conventional system.**
- **Increased cooling system reliability .**
- **Monitoring cooling consumption independently from other utilities-Better energy conservation.**

Disadvantages Of District Cooling

- **High Cooling Load density** :It could be implemented only in areas with high cooling load density
- **Current Tariff structure** is very high
- **Make Up water shortage** :It is worth noting that while D.C. promote saving energy consumption by 30-40%, But it consumes 50-80 % Extra Water, due to the type of technology used.

As in Qatar, D. C. technology used consumes huge volume of potable water, bearing in mind that Qatar potable water is 100% from desalinated water, which means negative impact on the environment & miss use of water resources.

Our concern in KAHRAMAA is to encourage D.C. business leaders to invest in a new technology that does not use fresh water.

Alternative make up Water sources for district cooling are TSE water & Sea Water

District Cooling Services Department(CD)

Duties and Responsibilities

The District Cooling Services Department came into existence with the resolution from council of ministry vide reference 825 dated 2nd May 2012.

Duties & Responsibilities

1. Suggest general policies for District Cooling.
- 2 Set up rules and regulations for DC and ensuring that they are being complied with.
- 3 Set up DC standards and specifications and ensure that they are being complied with.
- 4 Decide on areas to be served by DC as per priorities and visibility (economically) in coordination with Concerned Authorities in the country.
- 5 Suggest tariff structures for customers.
- 6 Approve DC activities.
- 7 Develop Integrated Programs of whatever related to District Cooling.
- 8 Coordinate with the concerned authorities with regards to District Cooling.

D.C. S. and Qatar Master Plan:

District Cooling Service can line up with Qatar Master Plan by focuses on sustainable uses of Electricity & Water, effectively hinges on Qatar National Vision (QNV) 2030 Pillars of :

Economic development - whereby promoting & ensuring reduction in Qatar's Electricity and Water consumptions .

Environmental Development - reflecting reduced utilization of Qatar's Natural Resources leading to protection the environment thru conservation & less impact on climate change.

D.C. and QNDS 2011 - 2016

District Cooling aspect also addresses the fifth challenge of Qatar National Development Strategy 2011 – 2016, which is aligning economic growth with social development and environmental management.

Water Resources Management in Qatar

Also the need for Water to serve the Master Development Plan for the country (up to 2030), that force us to implementing integrated plan for all sources of water including TSE and Grey water ,which are to be used wisely and optimally

District Cooling in Qatar

District Cooling in Qatar served by two major District Cooling services providers



Qatar Cool

- Established & Operated In 2003.
- Central Plant in West Bay area(67,000 TR) & Pearl Qatar(74,000TR – will be 130,000TR by 2016) Capacity .



Marafeq Qatar

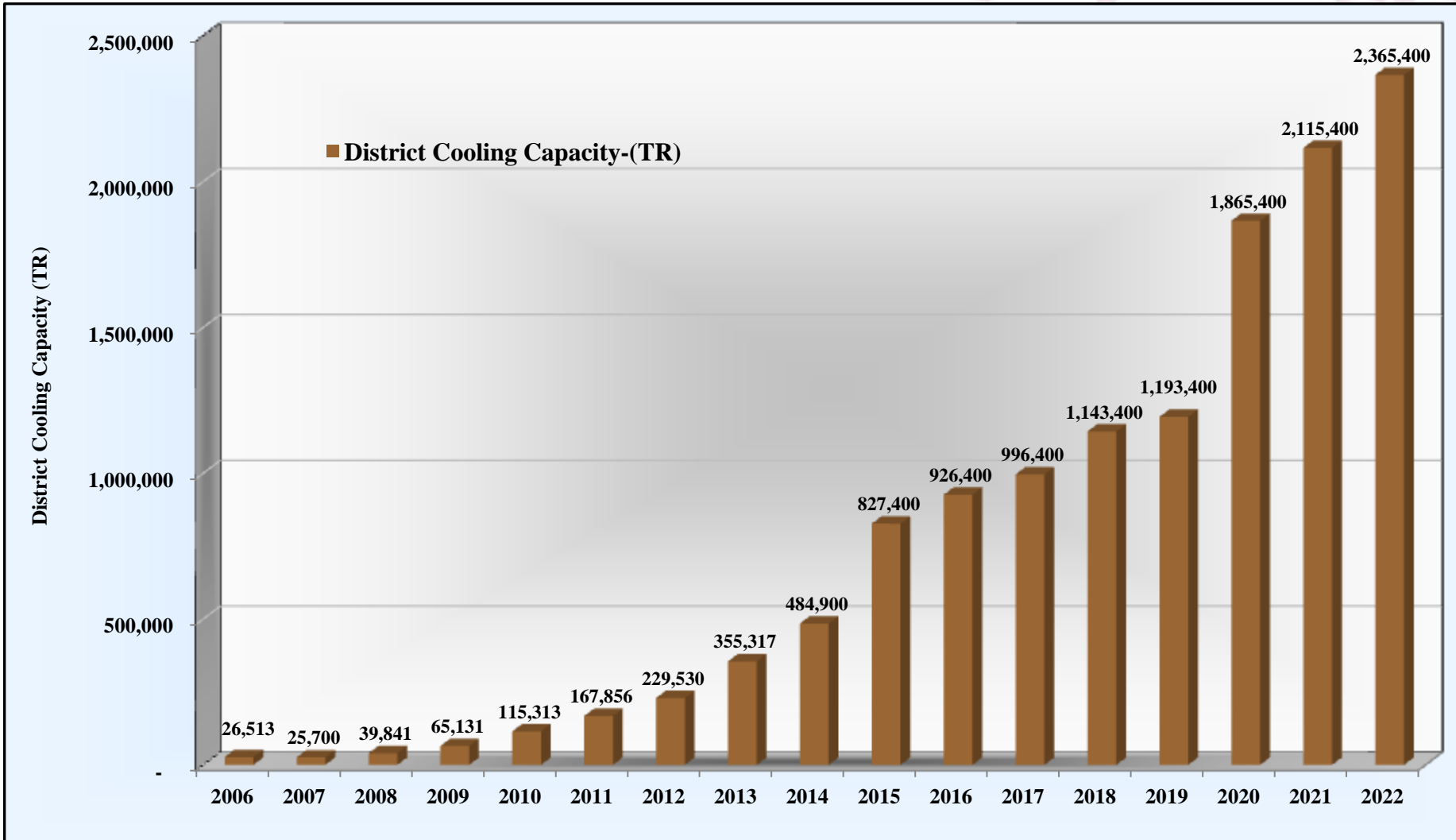
- Established & Operated recently -2012
- Central Plant in Lusail City (5,000 TR- by 2022 will be 300,000 TR) and Barwa City (37,000 TR by 2014).



Number of Private District Cooling Systems

- Like Qatar Foundation ,Cultural Village (Katara),Al Gassar Development, four season hotel, etc

District Cooling- Growth in Qatar



Definitions

TR-Ton Of Refrigeration

A measure of Cooling Capacity or demand equal to removal of 12,000 British thermal units per hour.

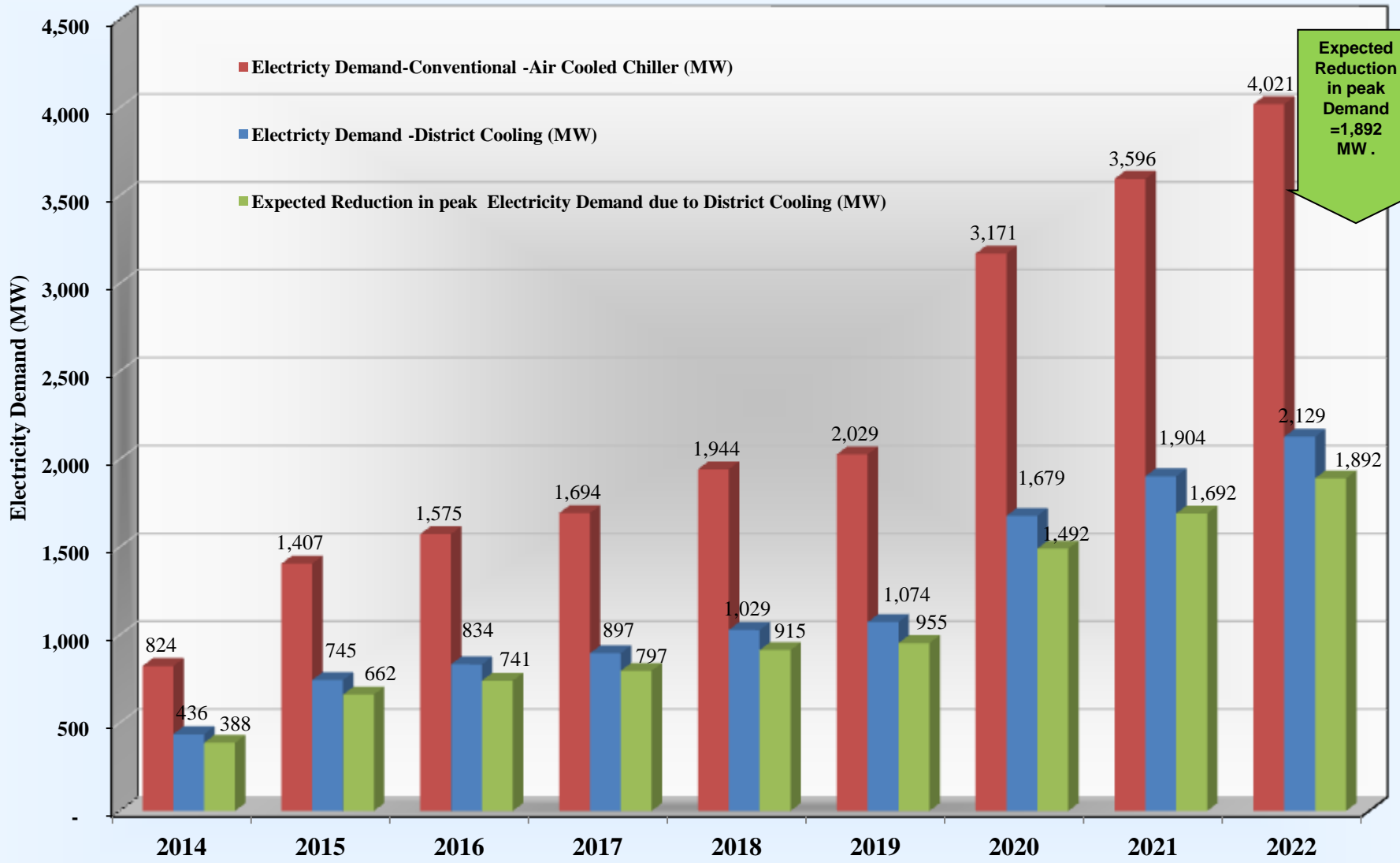
TR Hr- Ton hour

A measure of Cooling energy consumption equal to one ton over a one hour period.

Electricity Consumption for 1 TR hour Cooling

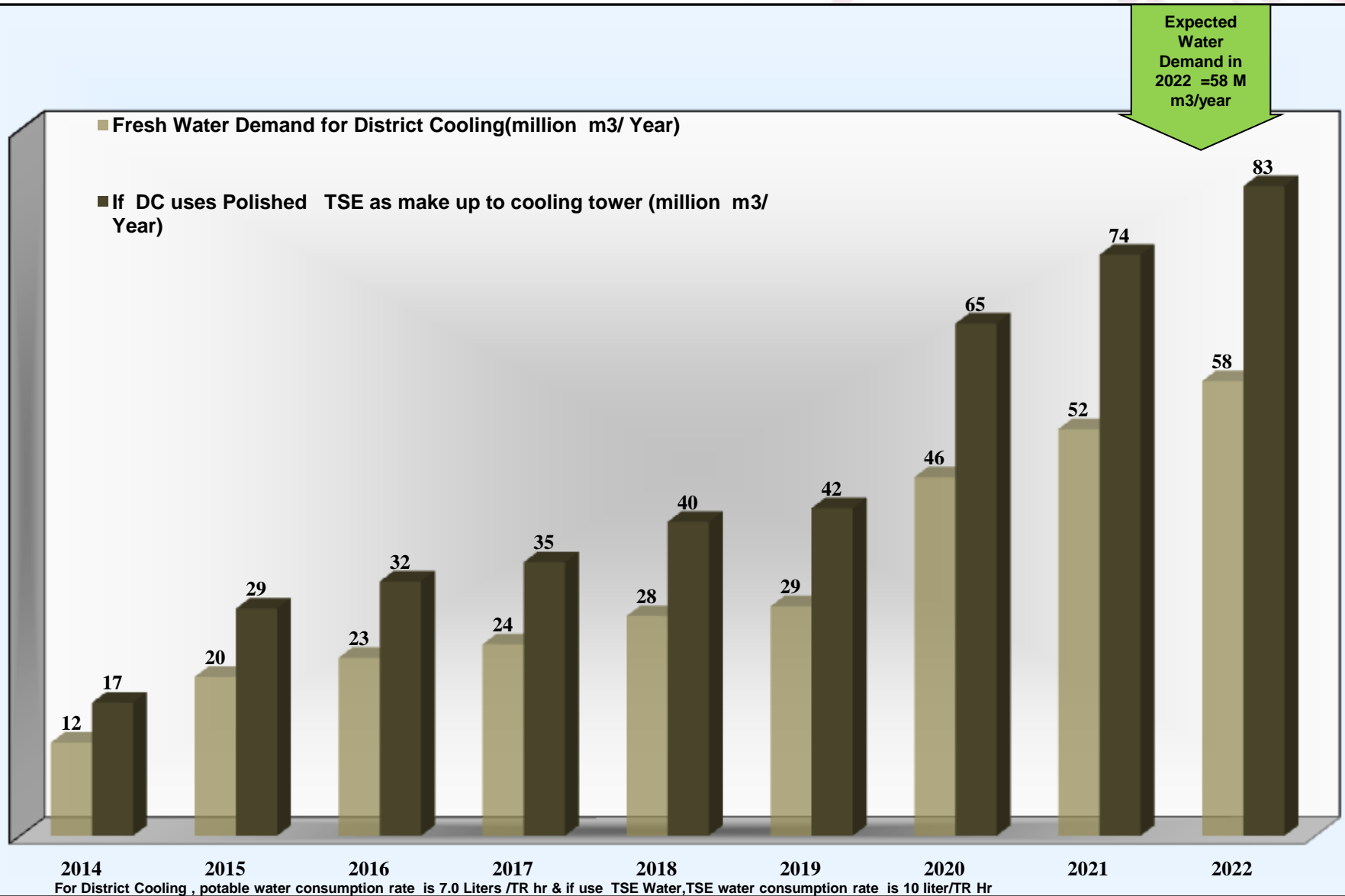
- Conventional System – Air Cooled chillers – 1.7 kW hr
- Conventional System -Split/window Air conditioners – 2.0 kW hr
- District Cooling System - 0.9 kW hr

Estimated Electricity Peak Demand Saving Due to DC



Note: Calculations Based on District Cooling Electricity Demand of 0.9 kW/TR & Conventional Cooling Electric Demand (Air cooled Chiller) of 1.7 kW/TR

Estimated Makeup Water Demand due to District Cooling



Benefits Due to District Cooling

		2014	2015	2016	2017	2018	2019	2020	2021	2022
Electricity	Saving in Annual Electricity Consumption due to District Cooling (Gwh)	2,317	2,594	2,790	3,202	3,342	5,223	5,923	6,623	6,515
Water	Saving in Annual Water Consumption -If District Cooling uses Treated Sewage Effluent (Million M3)	12	20	23	24	28	29	46	52	58
Environment	CO2 emission Reduction due to Electricity & Water Saving in District Cooling (Million Ton of CO2)	1.41	1.58	1.70	1.96	2.04	3.19	3.62	4.05	3.57
Fuel	Natural Gas Saving (million Cubic Feet)	36,406	40,762	43,842	50,310	52,510	82,078	93,078	104,078	92,092
	Generation side Gas Price Savings in(Million Qatari Riyals)	5,315	5,951	6,401	7,345	7,666	11,983	13,589	15,195	13,445

**Note: 1. Calculations Based on District Cooling Electricity Demand of 0.9 kW/TR & Conventional Cooling Electric Demand of 1.7 kW/TR
2.Effective Full load Annual operation hours is 3500.(for DC and Conventional Cooling.)**

District Cooling & Regulatory Frame work

Ministerial Directive on the Prohibition of Potable Water For Cooling Purposes

Existing DC Plants

1. All Existing District Cooling Plant Operators should contact ASHGHAL For TSE Supply Connection.
2. Detailed TSE Conversion Plan should Submit to KAHRAMAA District Cooling Services Department.

New DC Plants

1. Contact ASHGHAL For TSE Supply Connection .
2. If TSE Network is Available ,the DC plant should operate with TSE.
3. For Future Availability of TSE Network, Cooling plant shall be functionally ready for TSE operation.

Ref: 93/2013 - 5735/16
Date: 01/16/2013

M/s. Hamad Medical Corporation

Project: Al Wakrah Hospital
Subject: Prohibition of Potable Water Usage for Cooling Purposes

With reference to the above subject, we would like to inform that use of potable water for Central Cooling Plant is strictly prohibited by a decision from Permanent Water Resources Committee.

All Potable water usage for cooling plant application shall be replaced with Treated Sewage Effluent (TSE).

Thus, you are kindly requested to coordinate with ASHGHAL for further information or any query on the availability of TSE for this purpose.

Also we request you to send us the detailed execution plan with time schedule for the above considering that the replacement of makeup water supply from potable water to TSE shall be completed by the end of 2013.

For any clarifications, contact Eng. Ibrahim Mohammed Ashada, Manager District Cooling Services Department on: Tel. 44846865 - Fax. 44846864.

We appreciate your urgent action on this regard to preserve the environment and the efficient utilization of our valuable resources.

With our best regards,



Eng. Essa Bin Hilal Al Kuwari
President, Qatar General
Electricity & Water Corp.

Eng. D.C. Manager - CD (District Cooling)

Regulatory Frame Work – Next Steps

1.Undertaking Letter for DC plant TSE Conversion.

2.Separate Meter for Cooling tower Make up water.

3.Design Guidelines for District Cooling.

4.D C plant Monitoring for Efficiency & Environmental Compliance.

Challenges For District Cooling System

Challenges For Using TSE in DC system

- TSE availability Fluctuations(Quantity, Quality & Pressure at the right time)
- TSE discharge Content limit set by Ashghal and MOE.

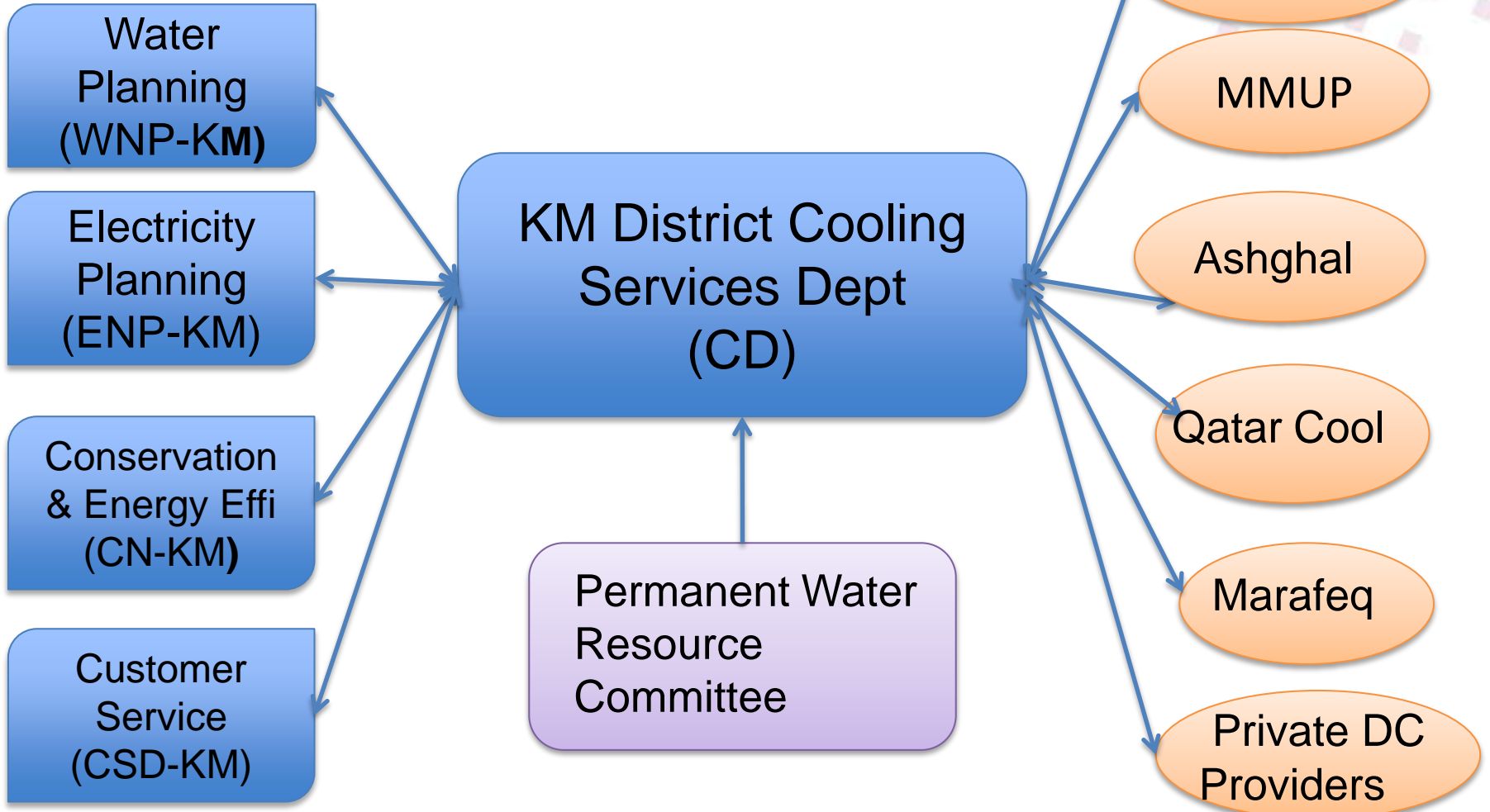
Handling of the discharge content is a challenge due to stringent regulation set by Ashghal and MOE.

Economic Risk For District Cooling System

Challenges	Solutions
<p>Inconsistent Cost recovery Models. Due to the varying allocation of connection, capacity, and consumption costs among developers, owners, and individual tenants from project to project.</p>	<p>A proper regulatory framework that protects developers, providers, tenants, and the broader economy.</p>
<p>Tariff Structure. Lack of clarity on tariff structure for tenants and perception of high tariff against conventional cooling system.</p>	<p>Establish a consistent national tariff framework for district cooling.</p>

Strategic Partners to regulate the DC market

KM Departments



Recommendations for District Cooling Penetration

District Cooling in Qatar can be promoted **only if we don't** use fresh water.

شكراً لاستماعكم
و
توجيهاتكم الكريمة