

District Cooling Workshop

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Towards Cooperative District Cooling Society



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District Cooling in Qatar: Challenges & Opportunities

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Background

- As a rapidly growing nation, Qatar faces unique challenges related to sustainable solutions for water, energy supply for major national projects to be completed by 2024; QNFSP, Qatar 2022, 1 GW of PV deployment, Strategic Water Reserves
- QEER plays key roles in supporting Qatar's Energy & Water sustainability and food security self-sufficiency in collaboration with all stakeholders
- In this context, QEERI tries to look at these issues from a holistic approach and a perspective of integrated resources management to create innovative solutions through multidisciplinary and interdisciplinary R&D

Issues for the future of Qatar's Energy, Water and Food Supply

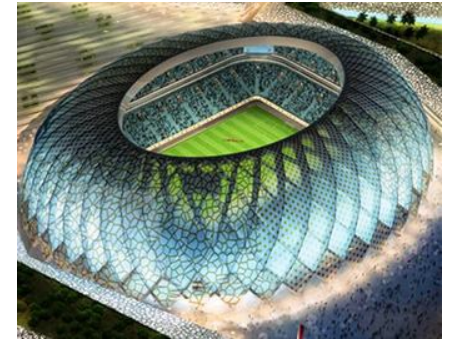
QNFSP:

- Food supply is not a challenge on its own but rather in conjunction with two other critical resources, water and energy
- Water demand for the QNFSP & aquifer recharge is estimated at 1.8 - 3.1 Mm³/day, almost 3 x the national production level today has to be secured using renewable energy & green innovation.
- Renewable energy is estimated at 700-1000 MW capacity (mainly derived from PV) for RO desalination plants
- Use of the existing electric power grid: grid stabilization and protection against renewables fluctuations is crucial



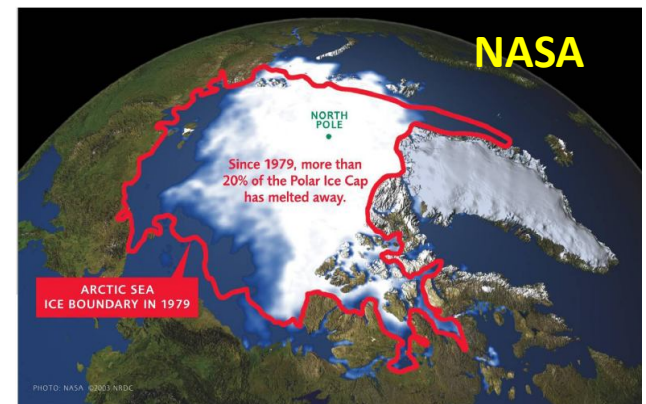
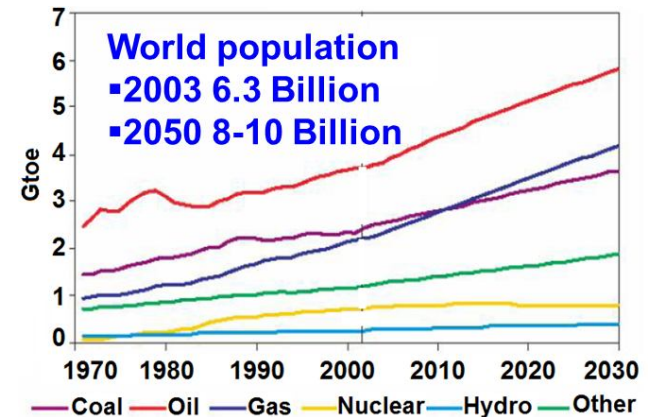
Qatar 2022 Stadia

- Housing technologies that provide maximum comfort for players and fans, but in an environmentally friendly, sustainable way (power supply, cooling, water desalination all driven by RE)
- Air cooling systems and cool storage areas with air handling systems to re-circulate air throughout the stadia
- Existing number of hotel rooms is 45000, extra number of hotel rooms to be built is 54530 + 6000 in floating hotels



Global Challenges & Qatar Commitment in Combating Climate Change

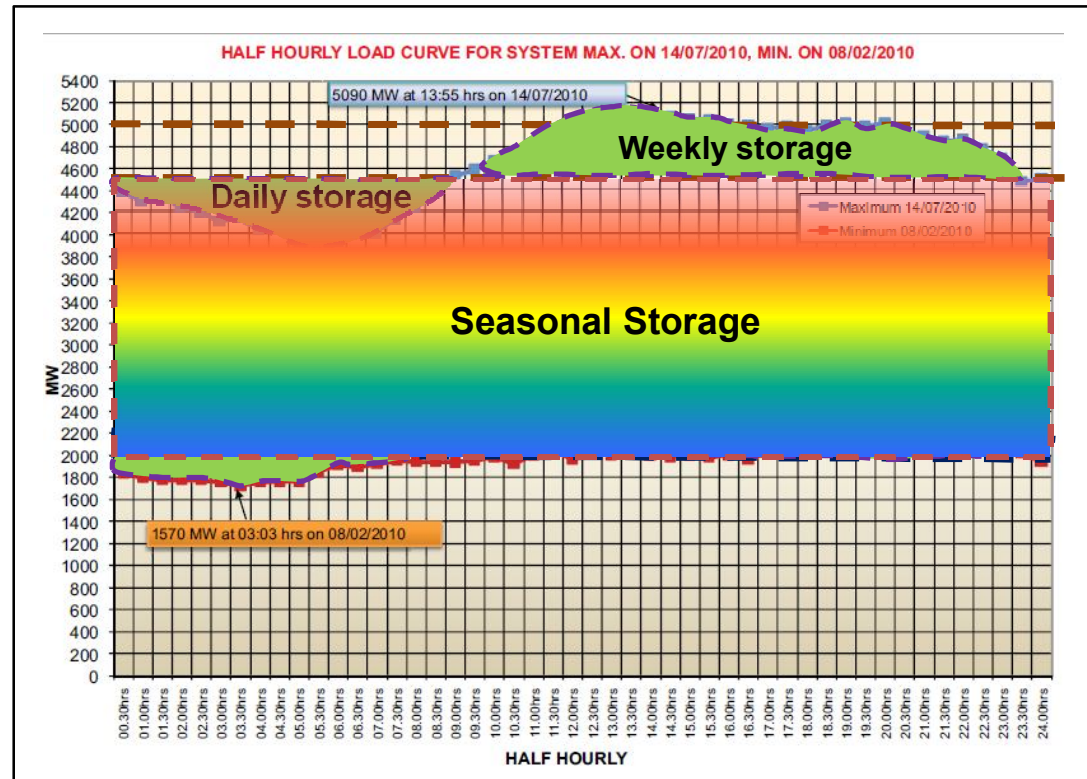
- World energy demand is expected to increase by 40% by 2050
- The challenge: half CO₂ emissions and twice the energy by 2050
- Qatar has set an estimated target to reduce 3.5 Million Tones of CO₂ emissions by 2022
- 500 thousand tones have been reduced so far through introducing district cooling (DC) systems in the country
- Qatar population is expected to be 8 folds by 2050, planning and working on securing sustainable resources have to be started from now



3-4 °C global warming by 2050

Potential of energy saving through DC & Cool Storage

- A/C consumes between 60-70% of the total electricity demand
- Using daily or weekly cool storage would save considerable amount of energy & CO2 emissions
- Using seasonal cool storage or very large scale EES would save huge amounts of energy, CO2 emissions & money
- Detailed techno-economic study would be needed to develop the business case



Qatar EP hourly load variation during days of maximum and minimum load in year 2010

Challenges

- Spatial distribution of TSE plants and adaptation
- Environmental Issues (Evaporation rates from cooling towers & brine disposal of RO polishing plants)
- Heat rejection system and water consumption of cooling towers
- Integration challenges

Opportunities

- Clear vision, well defined targets and strong political and governmental support to secure sustainability of energy, water and food while protecting the environment
- Well established frameworks to support the national programs; e.g. Q22 & QNFSP in close cooperation with and full support of governmental authorities (e.g. KAHRAMAA, ASHGHAL, QWEC, MoE,..etc) and other stakeholders
- Good communication and strong interest in joining efforts between key stakeholders, universities and research centers in Qatar for adopting unique solutions
- 1.08 Mm³/day TSE capacity, valuable and sustainable water resource
- Excellent match in terms of time & technology:
 - all projects should be realized within the next 8-10 years
 - all projects require solar energy, solar desalination, and solar cooling

QEERI Support

☐ Authorized Scientists & Leading Experts:

- Desalination & Water Treatment
- Energy & Sustainability
- Energy Storage & Smart Grids
- Environment
- Computation

☐ World Class & State of the Art Labs

Thank You



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