First National Workshop

"Renewable Energy and Energy Efficiency in Buildings and Cities: Assessing Potential for District Energy Systems in Indian Cities"

Date: 9th May 2016

Venue: Hotel Fortune Park JPS Grand, Rajkot, Gujarat

PROCEEDINGS OF WORKSHOP

"Renewable Energy and Energy Efficiency in Buildings and Cities: Assessing Potential for District Energy Systems in Indian Cities"

Proceedings of First National Workshop

The first technical workshop of the DES Initiative in India was held on 09th May 2016 in the city of Rajkot. The main objective of this workshop was to bring together the larger stakeholder groups related to the development of District Energy Systems (DES), and particularly District Cooling Systems (DCS), in the Indian context. The workshop discussed DCS technology options, implementation barriers, regulatory & policy incentives, and appropriate financing and business models, applicable in the Indian context. The findings of DC rapid assessments, which assessed the potential for deploying DCS systems in five selected cities (Rajkot, Thane, Pune, Coimbatore and Bhopal),were also presented and discussed in this workshop.

This project is undertaken by the United Nations Environment Programme's (UNEP) District Energy in Cities Initiative as part of the "Sustainable Energy for All" Initiative. In India, ICLEI South Asia, together with other partners- Danfoss, Empower and the International District Energy Association- isresponsible for conducting rapid assessments and for establishing the feasibility of developing a pilot project in one of the five cities based on findings of the rapid assessments.

The DES Initiative aims to provide technical assistance and build capacities of local governments and stakeholders in India to develop replicable policy frameworks and business models for modern district energy systems, focusing on district cooling, that can be scaled up across the country.

This workshop was organized with support from UNEP, Empower, the Indo-German Energy Forum (IGEF), and Danfoss (by order of significance –i.e. money contributed).

The Inaugural Session (9:30 am to 10:40 am)

Mr. Emani Kumar, Deputy Secretary General, ICLEI Global and Executive Director, South Asia, welcomed the participants and briefly introduced the objectives and key activities of the DES Initiative in India.

Mr. Vijay Nehra, Commissioner, Rajkot Municipal Corporation (RMC) welcomed the guests on behalf of Rajkot city. He noted that climate change impacts are increasingly evident in Rajkot and highlighted the work done by RMC to mitigate these impacts by promoting renewable energy and energy efficiency measures, through participation in all major Government of India's schemes and programmes. Under the able leadership of Shri. Govind Bhai Patel, the Honorable Minister of State for Energy & Power Science and Technology and the guidance of it Honorable Mayor, Rajkot is looking forward to develop and implement a DCS pilot project and will provide all of the necessary support that is needed for effective implementation and further scaling-up of the technology. In his opinion, this workshop was definitely a step forward in assessing the potential for DCS and promoting DCS in Indian cities.

Dr. Jaimanbhai Upadhyay, Mayor, Rajkot Municipal Corporation emphasized that the human impulse to demand and consume more than what is necessary has led to the shortage of already limited natural

resources It is therefore crucial to adopt technology approaches like DES that will reduce of the consumption ofresources. The Mayor underlined that the RMC will provide its full cooperation for sustainable development and is happy to support an initiative that builds a better future for Rajkot.

Mr. Christoph Ernesti, Co-Director, Indo-German Energy Forum (IGEF - SO), welcomed the delegates and explained the role of IGEF and its long standing relationship with India since it was created in 2006. He highlighted IGEF's four core areas of work (a) the Indo- German Solar Partnership, (b) Energy Efficiency, (c) Renewable Energy, and (d) Low carbon growth strategies.

The establishment of IGEF has facilitated high level political dialogue between the German and the Indian Governments,which has further promoted cooperation in the field of energy security,and has encouraged collaborative research and development and investment in energy projects. He mentioned that IGEF-SO works closely with GIZ, KfW and the Indian Bureau of Energy Efficiency and engages with other industry associations and private businesses. He stressed that IGEF will extend its support and assistance to further explore the potential for DCS in India.

Mr. Tariq Al Yasi, Chief Operations & Maintenance Officer, Empower gave a brief introduction about Empower, the largest District Cooling Systems provider in Dubai, owning 70% of Dubai's District Cooling business. He mentioned the long term commitments of Dubai to reduce energy demand and the enabling policies of UAE to promote district cooling. He noted that the visionary policies of UAE and Dubai have provided a conducive economic environment for providers of large district cooling systems. Ambitious targets for energy and resource conservation in Dubai and achievements of Empower in this regard were highlighted:

- The Supreme Council of Dubai is committed to implementing an Integrated Energy Strategy to reduce demand for water and power by 30% by 2030.
- 40% of this target will be met through DCS and Dubai has already achieved 17% of this target.
- Empower was established in 2003 and has a capacity of 1 million tonnes of refrigeration (TR) produced through 65 district cooling plants supplied to 810 buildings which include residential, commercial, hotels, malls and serving over 55,000 consumers. The pipe length of DCS system is approximately 220 km.
- Empower uses treated sewage water (TSE) water in its system which has helped in saving 263 million empirical gallons in 2015.
- Thermal Energy Storage (TES) saved 900 MW electricity in 2015; equivalent to a reduction of emissions from 533 cars in a year.

He stressed Empower's willingness to share its knowledge and experience on district cooling with Indian cities.

Mr. Nagahari Krishna, Director, Danfoss India indicated that DCS is not a new technology that needs to be established but has been successfully implemented across the world and is indeed a proven and future-proof technology. In the Indian context, DCS is highly favorable due to the weather conditions, and type and scale of development.Danfoss is keen to work further to promote this technology in India.

In his opinion, the main constraints in establishing DCS at present In India are the high upfront capital expenditure and the long payback periods. Thus it is critical to establish appropriate financial models that will work in the Indian market. He also mentioned that the findings in the five cities that were assessed for district cooling potential make a case for themselves, and that many other cities in India have similar conditions to adopt district cooling systems which is a positive indication of the market potential.

Ms. Lily Riahi, Advisor on Sustainable Energy in Cities, UNEP introduced the concept of district energy and highlighted its benefits through practical cases of DCS implementation around the globe. In her presentation, Ms. Riahi highlighted the fact that the heating and cooling sectors are often ignored when it comes to dealing with energy efficiency. She noted that the cooling sector is expected to grow by 625% by 2050 in Asia and Latin America and that approximately 60% of the global energy consumption in buildings is for heating,cooling and hot water, much of which is ultimately met through fossil fuel. She highlighted the need to address sustainable cooling in India, citing that cooling demand in India is expected to grow 18 fold by 2050 and that it contributes to a significant amount of peak load in cities – such as Delhi, where 40 to 60% of peak electricity consumption is for cooling. The cost effectiveness of DCS was emphasized by comparing costs for DCS with other stand-alone cooling technologies such as chillers and air-conditioners for the commercial and domestic sectors.

Mr. Riahi gave a brief introduction on UNEP's Global District Energy Initiative, outlining the following key objectives in India:

- increase th knowledge base on district cooling systems;
- demonstrate its commercial viability;
- scale up by implementing best practices;
- create an environment that enables investment in DCS.

Ms. Riahi provided an overview of the global process in the four countries and elaborated on the project activities in India. Opportunities offered by national initiatives such as the Smart Cities Mission to accelerate adoption of technologies such as DCS were noted.

Shri. Govindbhai Patel, Honorable Minister, Energy and Technology, State Government of Gujarat welcomed all the delegates and thanked ICLEI and UNEP for choosing Rajkot city as one of the project cities. He reflected that while energy is an essential part of our life, there is limit to it and hence a need to conserve energy and look at alternate energy sources. In this regard, Gujarat State is focusing on solar, wind energy, waste to energy and energy efficient technology solutions. He noted that using centralized cooling facilities to distribute cooling across buildings will help achieve effective cooling and reduce power demand. Participants were urged to use the workshop to exchange ideas and to come out with solutions which can be used for efficient cooling and help in sustaining future generations. He extended his support to the project and expressed his hope to see DCS being implemented in Rajkot city, under the leadership of the Mayor and able guidance of the Commissioner.

Mr. Emani Kumar thanked Mr. Govindbhai Patel for his encouraging speech and grateful leadership under which the city is striving towards sustainable development. He also thanked all the speakers for sharing their valuable thoughts.

Session I: International Perspective and Relevance for India (11:00 am to 1:00 PM)

Chair: Mr. Vijay Nehra, Commissioner, RMC
Co-Chair: Dr. Winfried Damm, GIZ
Moderator: Dr. Parimita Mohanty, UNEP

Dr. Parimita Mohanty, in her introductory note, indicated that the technical session would focus on the concept of DES, successful international case studies and the technologies available for DCS. She stressed on the need to think about the applicability of existing DCS technologies in the Indian content and integrated approaches for the same.

The key excerpts from the session have been summarized below.

Ms. Lily Riahi, UNEP presented international best practices on strategic planning and enabling incentives for DCS from cities such as Hong Kong, Tokyo, Singapore, Seattle, Milan and others from UNEP's technical guidebook for District Energy in Cities, which includes case studies from 45 cities across the world. She also highlighted how these best practices could be applied for each of the 5 project cities in India. The key points of the presentation were:

- Cooling demand is growing exponentially in India and is a key driver for DCS.
- Proportion of electricity demand for cooling in the 5 project cities is 25%-40% and the peak load contribution is approximately 30% - 45%.
- The main challenges for DCS implementation in India are stakeholder coordination, unproven commercial viability, lack of awareness on the technology front, absence of regulatory mechanisms and institutional framework at local and other levels of Governance and lack of data on cooling consumption. These barriers need to be addressed.
- The role of Local Governments (LG) as a planner and regulator is very significant to promote DCS at local level. The LG can set targets and facilitate the uptake of DCS.
- A key step towards kick-starting a DCS network is to identify anchor loads, which are publicly owned/regulated buildings or new high density mixed use developments with high constant cooling demand existing within the city. Identifying areas having mixed use and compact development would enable combining peak cooling demands and help achieve better system efficiency and improve energy savings.
- To promote DCS there is a need to integrate energy into land use and infrastructure planning, provide incentives such as density bonuses, develop enabling policies in the identified area initially and then replicate these to other areas upon successful implementation

Dr. Christoph Steffan, Research Associate, Institute of Air Handling and Refrigeration (ILK), Dresden presented on the use of thermal storage technology, especially ice slurry storage to achieve higher capacities and increased storage capabilities.

The key points of the presentation were:

- In Europe, various policy directives are in place to promote efficient cooling through DCS. The Energy Efficiency Directives (EED-2020), targeting 20% CO_2 reduction and 20% renewables by 2020, emphasizes on using DCS to meet the energy efficiency target. The EU F-Gas regulations mandate that only natural refrigerants be used for producing chilled water for cooling.
- Using a combination of energy and heat or using renewable energy or waste heat in DCS can help achieve multiple long term benefits.
- Using thermal storage technology in cooling applications provides the possibility to directly store usable energy for cooling and help achieve improved efficiency.
- Among the thermal storage media, ice slurry is one of the most efficient thermal storage medium as compared to chilled water storages. A demonstration project based on vacuum ice generation and storage at the University of Applied Sciences in Zwickau, Germany, has helped to cater to additional peak capacity in the cooling network

Mr. Samer Khoudier, Empower, Dubai shared Empower's experience of implementing DCS projects such as Dubai Health Care Centre, International Financial Center, Business Bay in Dubai and highlighted actual energy savings and benefits realized through DCS.

The key points of the presentation were:

- Empower serves 30 large district/projects with over 1,115,000 TR capacity and is the largest end-to-end provider of DCS in Dubai, dealing with all aspects of DCS including operation and maintenance.
- DCS achieves 50% reduction in power requirement, has longer life spans, and high reliability and a number of other benefits as compared to traditional cooling systems.
- Treated sewage water (TSE) can efficiently for chilled water production in DCS, leading to saving of fresh water. Empower has used TSE in many of its DCS projects.
- To track and collect data on cooling demand and DCS operation on real time basis, Empower is operating a first of its kind, state-of-the-art Command Control Center (CCC). The CCC can be linked to more than 100 projects with more than 1000 buildings.

Mr. Oddgeir Gudmundsson, Director -Projects, Danfoss through his presentation highlighted the multiple benefits of DCS, citing cases from Paris, Barcelona, London Olympic park, Sweden and Finland.

The key points of the presentation were:

- There is no minimum size for a DCS plant. The crucial aspect is diversification of the land use/building type so that one DCS plant can be linked with multiple buildings with different cooling demand and peak loads e.g. residential complexes, institutions, commercial buildings.
- To demonstrate the benefits of DCS it is best to start with a smaller project in an area with concentrated high cooling demand and then gradually expand to connect surrounding areas.
- In Helsinki, Finland, the DC production capacity was developed in a planned manner with gradual capacity addition, with the intent to attract more business and assure sales once the system gets operational and was successful.

- DCS is much more energy efficient as compared to conventional cooling solutions at the individual building level.

Mr. Annaraj Ponpandi, GIFT city, Gujarat shared experiences from implementing the first DC system in India at GIFT city.

The key points of the presentation were:

- The Gujarat International Finance Tech-city (GIFT) is being developed as State-of-the-art financial hub provided with all modern facilities and state of the art technologies. The total built up area planned for GIFT city is 62 million sq. ft., of which commercial building area accounts for 67%, residential covers 22% and 11% area is reserved for social development.
- A DCS is being adopted to cater to around 180,000 TR of load for the entire GIFT City site. During DC design, anchor loads were defined clearly and three areas identified for DC Plant that will serve 60,000 TR load each.
- About 20,000 TR of DCS capacity is already in place with the rest at various stages of completion. A pre-insulated twin pipeline network with a state of art leak detection system has been constructed for efficient distribution of chilled water to the end users. The system is operating successfully and efficiently and the energy savings realized from this DC system are at par with international benchmarks.
- Many city authorities and State Government officials from India have been visiting the DCS at GIFT city, with an interest to implement DCS under schemes such as Smart Cities Mission.

Open Discussion

What kind of policies should be developed to promote DCS in India?

Ms. Lily Riahi responded that to start with, the local government can frame a DCS connection policy either for the areas identified for pilot implementation in the five cities in this project or broadly for the areas identified under the Smart Cities Mission. The local government can also put in place town/land-use planning policies to promote densification, provide incentives such as increased FAR for buildings with a DCS connection, and provide land and other facilities for DCS plant.

Is it beneficial to opt for DCS in green field development or to retrofit DCS in existing buildings?

Mr. Annaraj Ponpandi noted that it is always better to start with DCS for new development (green field) and subsequently connect existing areas to the DCS network.

Samer Khoudier agreed that it is better to start with green field development but mentioned that retrofits are possible, noting that Empower has retrofitted about 30,000 TR of traditional cooling capacity with district cooling. **Mr. Gudmundsson** added that in Europe a lot of existing buildings have been retrofitted with DCS.

Is it safe to deploy DCS, specifically if deployed for a school or hospital?

Mr. Samer Khoudeir stated that in Dubai Empower has executed two DCS projects for schools and one for a 250 bedded hospital. An environmental impact assessments (EIA) conducted found no risk associated with DCS. DCS is safer as compared to conventional air conditioners.

What kind of policies can be adopted in Rajkot to promote DCS in the present context?

Mr. Vijay Nehra responded that DCS can be integrated into land use planning. A mixed use and compact transit oriented development planning area can identified to pilot DCS. Local Government can play a major role in any DCS related permissions such as network layout approval, right of way etc. He further indicated that from a buyer's perspective the environmental benefits and the regulatory aspects may not work and the economic benefits of the DCS needs to be communicated for ensuring buy-in. The Rajkot Municipal Corporation can work on these aspects based on the local context while the State Government can address the broader policy aspects to promote DCS.

In a power starved country like India, how can irregular supply of grid energy be overcome for operation and what possible models could work?

Mr. Samer Khoudeir noted that DCS can be customized as per the local requirement and could make use of local renewables and available waste heat, thus ultimately resulting in net saving of energy.

Dr. Winfried Damm added that there is a need for a committed set of stakeholders in India who can work together and develop a workable implementation and business model. A strategy to ensure customer satisfaction and creating a profitable business to serve local neighborhoods with DCS is crucial for its success India.

Session II: Rapid Assessments in India (2:00 pm to 3:40 pm)

Chair: Ms. Lily Riahi, UNEP

Co-Chair: Dr. Usha Rao, KfW

Moderator: Mr. Emani Kumar, ICLEI

Panel:

- Mr. Tariq Al Yasi, Empower
- Mr. Krishna Nagahari,Danfoss
- Dr. Satish Kumar, Alliance for an Energy Efficient Economy (AEEE)
- Mr. Markus Wypior, GIZ
- Dr Aala Olama, Consultant-UNEP

Session II of the workshop focused mainly on the findings of the district cooling rapid assessments conducted in five Indien cities. Technical presentations on the key findings of the rapid assessments by ICLEI and UNEP was f followed by a panel session on enabling DCS in India with representatives from Empower, Danfoss, AEEE, GIZ and UNEP.

Key excerpts from the session have been summarized below.

Ms. Soumya Chaturvedula, ICLEI elaborated on the overall approach adopted to carry out the rapid assessments for district cooling in five cities namely – Bhopal, Coimbatore, Rajkot, Thane and Pune. She

gave a brief overview of the profiles and key characteristics of each of the participating cities. Specific data points for the assessment such as weather data, energy consumption, cooling degree days, Floor Space Index (FSI), land use patterns for which information was collected were highlighted. Profiles of the sites identified in the five cities and their suitability for potential DCS deployment were presented.

Dr. Alaa Olama, Consultant-UNEP presented the findings of the rapid assessment, which were based on a comprehensive study of the data collected from each of these cities. He briefly explained the process adopted for the assessment to derive parameters such as the Net Present Value, Internal Rate of Return and payback period for assessing financial viability. He also mentioned that calculation of Effective Full Load Hour (EFLH) for cooling is an important criterion in the assessment. An overview of the different contractual models for DCS was provided. DC tariff components such as the connection charge, capacity charge and consumption charge to be received from the end user/ consumer and their relevance to the DC service provider's business model was explained.

Cost benefit analysis for potential DC sites in the five project cities revealed that IRR ranged from 10.6% to 14.9%, thus indicating that DCS systems are close to achieving financial viability with requisite support from Government, donor or concessional financing. Dr. Olama stressed that to gain maximum energy savings and improve financial viability for the DCS, it is important that the cooling demand should be sufficiently high and that there should inclusion of commercial and institutional buildings for continuous near full load operation of the DCS.

Panel Discussion on Findings of Rapid Assessments and Enabling District Cooling in India

Dr. Satish Kumar, Alliance for Enhanced Energy Efficiency commented that data availability is a big challenge in the Indian context. With regard to the assessment he added that it is critical to select appropriate values of the parameters and baseline data to assess cooling demand. Most of the cooling is usually designed considering cooling degree days relative to 23^0C. However, if the design is made considering cooling degree days relative to 26^0C, there is 30% additional saving in energy. He also emphasized the need for next generation Energy Conservation Building Code to be developed for cities based on prevailing conditions and the type of development taking place.

With reference to policy, he mentioned that for comparison of the energy performance of buildings, a single criterion such as the Energy Performance Index (EPI) could be set and should be made mandatory for building design. He also highlighted that ECBC or building efficiency codes/standards have not been implemented to the extent envisaged. ESCO models in the building sector and successful Public Private Partnership (PPP) models will be critical for encouraging DCS uptake. A focus on appropriate

Dr. Markus Wypior, GIZ stressed on policy level reforms, noting that there is no widely accepted standard for building design in India as yet. Further, he mentioned that the Government of India's Smart Cities Mission is an initiative which provides a platform to introduce innovative urban planning tools. He added that while DC is a proven technology to achieve energy efficiency in buildings, policy level reforms and support at the local and national level are required to ensure considerable uptake. Additionally, better planning to make DC technology affordable and accrue benefits is essential to achieve desired outcomes with regards to DCS.

Mr. Emani Kumar added that in India, local planning has already started to integrate DCS through initiatives such as GIFT and the DES project. He reiterated that taking action in terms of initiating policy reforms is critical to the viability and wide-spread adoption of the DCS technology.

With regard to the rapid assessment, **Mr. Tariq Al Yasi**, Empower commented that it is critical to ensure that the data used for analysis is reliable and accurate. Data on diversity of cooling load needs to be measured and collected to arrive at a logical and concrete conclusion about the technologies and scale to be adopted for district cooling solutions. Engaging a specialized technical expert in the early stages of project implementation will help immensely in minimizing technology related risks. He cited cases in Dubai where DCS plants have been oversized, leading to significant losses. During DCS design, it is vital to target mixed-use development and critically study load profiles. Assessing availability of resources and infrastructure such as water and electricity during design and planning are of utmost importance since these have direct financial implications on the revenue model. In order to connect low cooling demand entities in locations distant from the DC plant; Empower has come up with the concept of connecting such entities to smaller scale temporary movable plants. To mitigate the risk of locking-in large investment, he emphasized that it is better to plan for phase-wise construction, which can be subsequently expanded and integrated with the larger DC network as and when required in the future, based on cooling demand. Best practices adopted across the world in district cooling can be studied and replicated in the Indian context., to ensure viability.

Mr. Krishna Nagahari, Danfoss highlighted that while planning for development in India cities, industrial zones are developed separately, with Memorandum of Understanding (MOUs) signed with industries interested in occupying the industrial zones. However, development doesn't happen at the planned pace and takes much more time as compared to the commitment in the MOUs. Hence, adopting a phase wise approach is necessary in designing DCS.

On the policy front **Mr. Krishna** opined that additional FSI be allotted to buildings adopting Energy Efficiency measures such as DC. A policy to promote adoption of DCS needs to be in place and he added that while many types of chillers are available in the market, the manufacturing of chillers needs to be brought under a unified code.

Dr. Olama highlighted to need for a District Cooling Code to ensure best practices are adopted in DCS. A well thought and well-designed DCS will be a win-win situation for all. He added that it is necessary to take steps to encourage funding by lending institutions for DCS. **Dr. Olama** suggested that instead of considering only electric chillers, possibility of using cogeneration systems to generate cooling should also be explored.

Open Discussion

Consumer buy-in and acceptance of DCS is a market-risk in India, since no one is aware as to how market will react to DCS.

Mr. Tariq Al Yasi concurred that currently limited information and awareness exists on DCS in the market. It is critical that targeted programmes for awareness are conducted and dissemination of the

benefits is done by the Government and other stakeholders to build awareness. Demonstration of the technology will go a long way in ensuring market buy-in.

Mr. Vijay Nehra, Commissioner, RMC commented that rather than going for a pilot implementation, the project can look at a full-scale model and focus on risk management. He suggested that a joint venture between DC service provider and the local government can be explored, wherein the Municipal Corporation will ensure availability of land and treated water, right of way, and address local regulation to mitigate market risk, though it is also important that the district cooling service provider should be able to deliver performance.

Dr. Usha Rao, KfW mentioned that there is a need for awareness and information flow, need for incentives to promote DCS uptake and a need for an enabling policy and regulatory framework.

Ms. Lily Riahi in her concluding remark emphasized that to mitigate the risks there is a need for a phase wise approach, robust database and securing interest of stakeholders in implementing DCS.

Session III – Way forward for financing district cooling deployment in India (4:00 pm to 5:00 pm)

Chair and Moderator: Mr. Stefan Hediger, KfW

Co-Chair: Ms. Parimita Mohanty, UNEP

Panel:

- Mr. Ramesh Ramadurai, Empower
- Mr. Mangesh Dakhore, (rep) IFC
- Dr. Alaa Olama, UNEP
- Mr. C. K. Nandani, Deputy Commissioner, Rajkot Municipal Corporation
- Mr. Sunil D. Pote, Thane Municipal Corporation

For Session III of the workshop focused on financing of district cooling in India and commenced with a presentation by KfW on the way forward for financing of DCS. This was followed by a panel discussion including representatives from Empower, IFC, UNEP, Rajkot Municipal Corporation and Thane Municipal Corporation.

The key excerpts from the session have been summarized below.

Dr. Usha Rao gave a brief introduction about KfW's activities in India and the suite of financing options and project-related advisory services offered. She indicated how district cooling can be promoted through financing programmes and instruments across residential buildings, industrial parks, public buildings and Smart Cities. Possible business models for DC involving public and private agencies along with financial intermediaries were also highlighted. Key financing framework criteria in relation to the institutional capacity, technological and market maturity, investment size, policy and incentive framework were laid out.

Mr. Ramesh Ramadurai, Empower mentioned that DCS is a relatively new technology and until a decade ago there was little awareness on DCS across the world, resulting in limited confidence in the technology. In his experience, there is a need to engage multi-level and multi sectoral stakeholders in the process of development of district cooling projects which will enable a favorable environment for the technology. It is important to build confidence in the financing institutions to seek their support in facilitating finance for cost intensive DCS projects. Demonstrating stable cash flows in DCS projects will help financiers gain confidence to fund these projects.

Dr. Alaa Olama presented a case study of smart village in Egypt, wherein a 4 pipe DC system was implemented at the cost of USD 900 per TR as against the benchmark cost of USD 2700-3700 USD per TR. Initially 6 buildings were connected to DCS which increased to 62 buildings. He highlighted that as in this case, well thought out and planned implementation can bring down capital costs. He emphasized that the while borrowing, the feasibility study should make sure that the cooling load diversity is not reduced after 3-4 years of commencement of system operation.

Mr. Sunil Pote, Thane Municipal Corporation was of the opinion that Municipal Corporation should take the lead and act as a facilitator for DCS. His concerns related to the identification of entities responsible for selection of the technology provider, determination of tariffs and to processes and safe guards that will ensure O&M of DCS systems, both at the service provider's end and at the individual building level. He noted that securing buy-in from end-users for DCS is difficult in the absence of a regulatory framework. Depending on the type of end user (i.e. consumer category), the tariff structure is expected to vary as in the case of electricity, which will impact revenues and savings. Hence it is crucial to set the right tariffs and target the right consumer mix. The need for a dispute redressal mechanism was also indicated.

He further suggested that while developing new norms and regulations, district cooling can be made mandatory under the Township Development Act. The DC project can be implemented through ESCO model and subsequently a regulatory framework can be adopted.

Mr. C.K. Nandani, Rajkot Municipal Corporation noted that the general belief that Municipal Corporations are cash stricken is not always true and many Municipal Corporations have a positive cash flow. However, the basic strategy of local governments is not to invest in CAPEX in order to minimize financial risk.

Mr. Mangesh Dhakore, Tata Capital expressed that energy efficiency has been a key area that financiers are looking at currently and noted that market risk is a key parameter for evaluation. The capital investment is much higher in district cooling systems as compared to other technologies. However, the market transformation for solar PV in India in the recent years stands as a positive indication for DCS, if similar key enablers are addressed and coordinated efforts are taken.

The Closing Session: Way Forward (5:00 pm to 5:30 pm)

Dr. Usha Rao noted that the design and performance of DCS will vary with climate, local context, and development pattern and hence these aspects need to be considered while making decisions to take district cooling forward in the country. She indicated that KfW and IGEF are willing to finance and support in-depth studies related to the planning and implementation of DCS in Indian cities.

Mr. Emani Kumar added that Dr. Olama will further refine and finalize the rapid assessment analysis, based on additional data requested from project cities. A pre-feasibility study and analysis will be carried out for pilot DCS implementation in atleast one city.

Dr. Parimita Mohanty acknowledged the efforts taken by the team in collecting data and also thanked the attendees for sharing their valuable inputs and making the workshop a success. She further added that this workshop should be considered an interim workshop and pushing for a National District cooling policy/code to promote adoption of DCS is a key next step.

Mr. C. K. Nandani closed the workshop by thanking all the participants.

Annexure 1: List of Participants

Workshop
District Energy Systems under
Renewable Energy and Energy Efficiency in Buildings & Cities: Assessing Potential
for District Energy Systems (DES) in Indian Cities

43 + 9 = 52

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DISTRICT ENERGY IN CITIES

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DISTRICT ENERGY IN CITIES

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31	V.P.Vaishnav	Chamber of Commerce, Rajkot			
32	Shivlalbhai Barasiya	Chamber of Commerce, Rajkot			
33	P. N. Gandhi	Office of the Chief Electrical Inspector, Gandhinagar			
34	Mr. Bharadwaj	Deputy Commissioner - Industries, Rajkot			
35	J. J. Gandhi	Paschim Gujarat Vij Company Ltd, Rajkot			
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41	Vivek Taneja	Thermax			
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