Asia Pacific Urban Energy Association

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APUEA Magazine

SUSTAINABLE URBAN ENERGY

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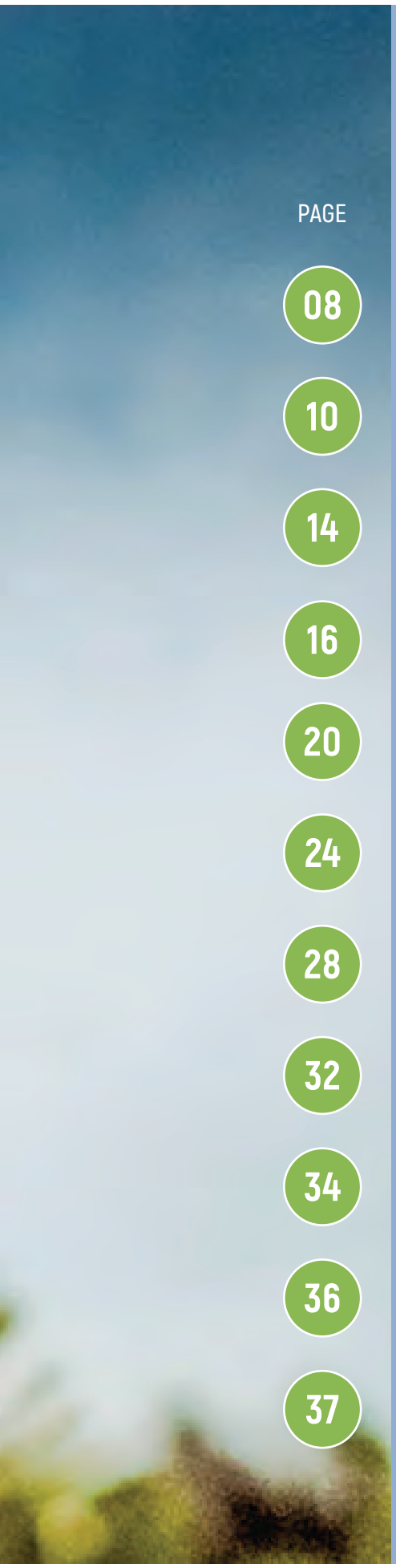
APUEA
Asia Pacific Urban Energy Association

Promoting Sustainable Urban Energy in Asia Pacific



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Editorial

The movement to combat climate change and develop livable cities has never been stronger. Despite occasional political setbacks, the tremendous efforts around the world to find ways to power cities more sustainably have developed momentum of their own. Public and private sector initiatives continually raise the bar for performance, enabling increasingly sustainable urbanization. The introduction of new and innovative energy solutions is providing cheaper opportunities for our cities to become cleaner and smarter.

The International Institute for Energy Conservation (IIEC) established **the Asia Pacific Urban Energy Association (APUEA)** to connect stakeholders and accelerate access to sustainable urban energy in the Asia Pacific region. We are truly excited to undertake this role and serve the Asia Pacific urban energy sector through our activities. In order to structure our activities and publications, we have defined six APUEA tracks: i) District Energy, ii) Smart Grid, iii) Energy Storage, iv) Energy Efficiency and Renewable Energy, v) Consumers and Prosumers, and vi) Policies, Finance and Regulatory Frameworks.

Rapid urbanization in the Asia Pacific region creates a need for comprehensive energy efficiency improvements to enable local governments to meet their energy needs, save money, improve air quality and public health, and boost their economic prosperity. One of the key solutions for improving urban efficiency is district energy, including both district cooling and district heating. In recent decades, innovative technical solutions, including optimized temperature levels and digitalization, have made district energy one of the most important solutions for sustainable urban areas. District heating systems enable overall improvement of urban energy efficiency through heat recovery from power plants, industries and sewage water plants; and district cooling schemes – in combination with increased efficiency of air-conditioners and phase-down of HFCs – are critical for meeting the rising cooling demand in the Asia Pacific while capping greenhouse gas emissions.

In this first issue of the APUEA Magazine, we provide insights into the important role of local governments in urban energy innovation, overviews of district energy solutions, discussions of the challenges of promoting district cooling, and introductions to successful district cooling projects in the region.

Finally, we would like to take this opportunity to express our appreciation to Founding Members ABB, Engie and Johnson Controls, who are both supporting APUEA and taking the lead in the development of sustainable urban energy systems globally.

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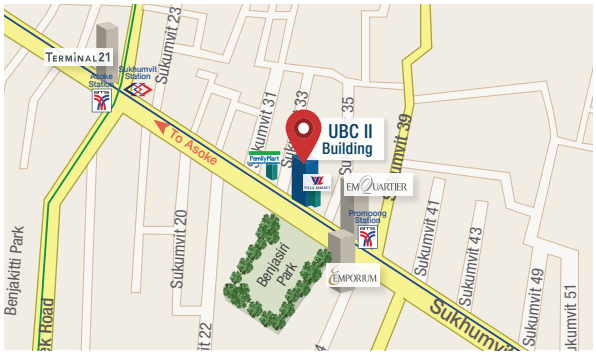

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ASIA PACIFIC URBAN ENERGY ASSOCIATION MEMBERSHIP

The Asia Pacific Urban Energy Association (APUEA) is a platform to collect and disseminate knowledge, best practices, and tools related to the development of sustainable urban energy systems, and thereby support the development of livable cities in the Asia Pacific region.

APUEA serves a broad range of members including but not limited to utilities, manufacturers, investors, engineering companies, donor agencies and sector associations that are active in the urban energy sector. Members can choose among several membership categories, depending on their sector and level of engagement in APUEA.

APUEA Membership categories are:

ACTIVE MEMBER

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ALLIED MEMBER

Member that benefits from the Association and chooses not to take an active role in the Association in terms of its governance and operation.

AFFILIATE MEMBER (Invitation only)

Individual or agency invited by the Association to participate as an individual member; and entities such as regional NGOs, development agencies, and utility organisations. An Affiliate Member benefits from the Association but does not take an active role in the Association in terms of its governance and operation.

The annual membership fee depends on the membership category and organization size:

Member Category	Employees		
	≤ 49	50 - 249	≥ 250
Active Member	USD 4,000	USD 5,500	USD 7,000
Allied Member	USD 3,000	USD 4,500	USD 6,000
Affiliate Member	N/A		

BENEFITS

- Regional Urban Energy Systems Database
- Online Portal (www.apuea.org)
- Regular Newsletters
- APUEA Quarterly Magazine
- Annual Publication - "Asia Pacific Urban Energy Outlook"
- Annual Meeting and Trade Exhibition
- Direct Assistance

Energy Efficiency for Sustainable Cities

By Benoit Lebot, Executive Director, and Jurei Yada, Policy Advisor, IPEEC

> ***If like me you live in a city, your average day may look much like mine: I wake up in the morning, commute to work, spend a day at the office, return home, and switch off the lights to sleep. At each step, I interact with services powered by energy. From transport and street lighting to heating and cooling in buildings, what supports my day-to-day life are energy services accessed locally. My most immediate relationship with energy is therefore at the city level, and this is precisely why cities are so vital in the global push for sustainability.***

Between now and 2030, the number of city dwellers is projected to rise from roughly 3.5 billion to 5 billion. In much of the world – including the Asia-Pacific region – more than 50 percent of the population lives in cities. Urbanization at this rate has led to the growth of "megacities" – or urban areas with more than 10 million inhabitants. There are already 15 megacities in the Asia-Pacific region, and this number will approach 20 in the next decade. This rate of urban growth will require significantly more energy to support greater economic activity, expanded infrastructure, and the rising need for municipal services. This is especially true for developing countries, which will account for 90% of urban growth in the next fifteen years. In order to ensure that such growth is sustainable, cities around the world need to become more energy efficient.

Energy efficiency reduces the amount of energy required to deliver a product or service. At the same time, it offers a range of other benefits including improved economic performance and competitiveness, job growth, energy security, and better health, to name a few. It is also a critical measure to mitigate climate change. Up to a third of the global greenhouse gas emissions reductions required to achieve the goal of the Paris Agreement on climate change can come from energy efficiency. For these reasons, SDG 7 calls for a doubling of the rate of energy efficiency globally by 2030 (target 7.3).

For cities, energy efficiency is both a long-term necessity and an opportunity. Cities are uniquely placed to encourage and deploy energy efficiency measures, given their multifaceted nature as energy consumers, managers of energy networks, and potential energy producers. City administrators can be effective communicators vis-à-vis their citizens, since they are the closest level of government to the people. To enable municipal authorities to deliver on energy efficiency's vast potential, several elements are required.

1. City governments must develop the right policy framework for implementation. This means integrating energy efficiency into local priorities and strategies, including implementing national energy efficiency policies and programmes at the local level and ensuring that such measures are part of the long-term urban development plan. Multiple stakeholders should be consulted to maximize buy-in and create a shared sense of ownership. Energy efficiency is cross-cutting and involves a range of actors, from policymakers and investors to service providers and consumers. These diverse interests need to be taken into account to establish a successful basis for long-term action on urban energy efficiency. Wider priorities and targets must also be aligned with these requirements, so that local and central governments can work jointly towards realizing national or international energy efficiency and sustainability goals.

2. Energy efficiency needs investment. Local budgets must be set aside or reallocated towards energy efficiency projects to support implementation. For cities this could be renovating public buildings or putting in place more efficient public transport. Municipal budgets however are often limited. Other sources of finance need to complement the gaps. These can come from central government, multilateral development banks, or the private sector. But to identify and mobilize financing, city authorities often require assistance and training, and this is where capacity building comes into play.

3. Municipalities do not always have the capacity, awareness, or knowledge to identify energy efficiency opportunities, shape policies, and leverage investments. Local capacity building is therefore key to successfully deploying and scaling-up urban energy efficiency. To this end, city authorities should make the most of inter-municipal collaboration networks to share tools and experiences. A number of such initiatives exist: the Covenant of Mayors for Climate and Energy, Energy Cities, C40 Cities, the OECD Inclusive Growth in Cities Campaign, and the Sustainable Cities and Eco-Energy Towns Initiative announced by the Clean Energy Ministerial in June 2017. These platforms have the added benefit of bringing cities' voices to national and international debates, helping with the integrated policy-setting dimension. In addition, municipalities in developing economies could tap into technical assistance programmes like the World Bank's **Energy Sector Management Assistance Program (ESMAP)**, which provides training in identifying energy efficiency opportunities and financing, among others. We should not forget however that national governments and the international community must continue to support and reinforce resources to local governments for change to take hold. Good policies must be set and shared nationally and internationally, and initiatives and forums like IPEEC and the G20 can contribute significantly to wider energy efficiency cooperation.

4. Finally, awareness-raising is critical to improving energy efficiency in cities. From creating multi-stakeholder partnerships to financing and citizen behavior in the local context, the municipal community must be made aware of the opportunity energy efficiency represents. Local governments have a vital role to play in educating these numerous actors. At the level of citizens, communication campaigns and education programmes could establish the basis for long-term transformation towards an energy efficient society.

All these elements are interactive and complementary, and all are necessary for cities to realize their energy efficiency potential and contribute to sustainable growth. That is why cities are fundamental to achieving SDG 7, and why energy efficiency is part and parcel of SDG 11 – the goal to make cities in the Asia-Pacific and around the world inclusive, safe, resilient and sustainable.

* This article is based on an editorial previously published by the SDG Knowledge Hub.

IPEEC is an autonomous partnership of nations founded in 2009 by the G8 to promote collaboration on energy efficiency. Its membership now includes 17 of the G20 economies, which represent over 80% of global energy use and over 80% of global greenhouse gas emissions. Through IPEEC, members work together and partner with other international and private entities to identify and implement policies that hasten the deployment of energy efficient technologies and best practices. In 2014, IPEEC was designated the lead coordinating agency for the G20's collaborative activities on energy efficiency.

Accelerating District Cooling in Asia – Advancing Carbon Emissions Reductions in Hottest Energy Markets

By UN Environment

UN environment

DISTRICT ENERGY IN CITIES INITIATIVE

> ***District energy systems, a more sustainable way of heating and cooling buildings, have been around for more than 120 years, however, they are only now getting their day in the sun. From Paris and Copenhagen to Singapore and Dubai, more cities are deploying the tried-and-tested technology to reduce their energy use and carbon emissions.***

According to UN Environment, a United Nations agency, a transition to these systems can help cities to reduce their primary energy consumption for heating and cooling by up to 50 percent. They also form the central infrastructure for many cities' 100 percent renewables or carbon neutral targets. Unlike conventional air-conditioning and heating systems, district energy systems consist of a network of underground pipes that pump hot or cold water to multiple buildings in a district, neighbourhood or city. They are able to use larger sources of heating and cooling, such as waste heat from power stations, which cannot be connected to a single building. District cooling (DC) provides reliable cooling services, energy savings, emission reductions, financing gains, all in an integrated, scalable system that provides incentives for all stakeholders.

Today, DC projects are becoming more prominent in Asia Pacific and other regions as their energy saving and price stabilizing performance is increasingly recognized. UN Environment-led global District Energy in Cities (DES) Initiative, through collaborations with 43 global energy leaders, is working to enhance the region's carbon cutting capacity further with DC systems through sparking investment and offering technical assistance for cities interested in strengthening and stabilizing their energy supply while reducing their carbon footprint. The Initiative has been helping the cities and countries unlock investments, such as those from European Bank for Reconstruction and

Development, International Finance Corporation and the private sector, by preparing the markets and building a pipeline of bankable district energy projects. Three of the Initiative's twelve partner countries are in Asia Pacific: India, Malaysia and China.

In the coming decades, **India** will experience the fastest growth in building energy consumption out of all regions of the world and more than two-thirds of this energy will be from grid-based electricity, predominantly from coal power. The environmental implications of such growth are significant and low-cost and sustainable measures to reduce demand and shift supply to sustainable sources are urgently required. A fundamental driver of this growth will be from demand for space cooling which is accelerating dramatically due to improving lifestyles, rapid urbanization and India's often hot and humid climate. Such growth is straining India's electricity system with grid stress particularly felt in Indian cities, where 40 percent of electricity demand can be for cooling and some utilities struggle to meet summer peak electricity demand.

The DES Initiative is working with the pilot city of Thane and four additional cities to demonstrate a city-led approach to delivering investments in district cooling with supportive local policies and local government engagement. Assessments of the five cities have identified at least $600 million of DC opportunities in the next decade as cities expand with new commercial townships and smart city areas. In Thane, the Initiative is undertaking feasibility assessments of two high potential projects, one in the city's main commercial district and another in an upcoming integrated township on Thane's periphery. Due to high electricity prices and demand for cooling in Thane, initial findings indicate that DC can deliver financial returns that will attract private investment while delivering cost savings to consumers. The Initiative has teamed up with the publicly-owned ESCO, Energy Efficiency Services Limited (EESL) which has already revolutionized India's energy efficiency sector, to help transform these studies into investments.

However, without local government support, DC could never reach its full potential. For that matter, the local government in Thane is highly engaged, rallying potential consumers and raising awareness on the possibilities of DC. At the same time, the city is making land available for a DC plant and exploring possibilities to guarantee low-cost solar power to the DC network in recognition of the superior efficiency of DC. By demonstrating a city-led approach to DC in Thane the Initiative hopes that DC can move into the mainstream in India and ensure the country's inevitable cooling demand growth can be delivered as sustainably as possible.

Malaysia has teamed up with UN Environment to boost the use of district energy in Iskandar, a growing metropolitan region in southern Malaysia, as well as around the nation, helping 30 million people gain better access to energy. Malaysia now has several DC systems, including its largest one in Cyberjaya, a town with a science park in the west coast state of Selangor. That system, the Megajana District Cooling System, was built by ENGIE and Malaysia's subsidiary of the tech hub enabler Cyberview.

Megajana Cyberjaya District Cooling Plant


Hiranandani Estate in Thane

Since 2012, when the system's second DC plant was completed, it has helped the town to reap the equivalent of 8.2 gigawatt hours in electricity savings and avoid 4,100 tonnes of carbon dioxide emissions.

Experts from the DES Initiative are contributing with expertise in barrier and opportunity analysis, technical assessment, identification of regulatory gaps and development of initial strategies to unlock Iskandar and Malaysia's district energy market and outline the technology's potential use. The DES Initiative also helps the Iskandar Regional Development Authority (IRDA) to explore international funding opportunities to finance and support local DC studies, energy master planning and policy development.

One high potential project identified in Iskandar is the Medini development which will consist of a variety of facilities, including a hospital, malls, hotels and residential blocks. In Medini, DC development could reduce electricity consumption over 35%, while reducing bills and delivering a more reliable service.

According to a 2013 report by the Asian Development Bank, Malaysia could triple the scale of its DC industry to a built-up capacity of 575,000 refrigerant tonnes, the equivalent cooling load of up to 12 million square metres of commercial floor space. With the pace of Malaysia's real estate market growth, and the numerous successful DC systems being commissioned across the country, this potential could be even higher.

Furthermore, district energy systems could help Malaysia to achieve its Paris Agreement pledge to reduce its greenhouse emissions by 45 percent by 2030, and cut 32 million tonnes of carbon emissions by 2020.

In **China**, DES Initiative is partnering with one of the leading educational institutions, the South China University of Technology (SCUT), to set up a joint centre for district energy technical research and engineering applications.

SCUT is public research-intensive university directly governed by the Chinese Ministry of Education. As one of the top Chinese universities in the fields of architecture and engineering, SCUT has the State Key laboratory of Subtropical Building Science for academic research and the A-level Architectural Design Institute for engineering applications.

The district energy studio under the Institute has been active in China and nearby surrounding regions and countries since 2002. Since their founding they have developed, consulted and designed more than 40 district heating/cooling or combined cooling, heating and power (CCHP) projects in China, which supply energy for over 100 million square meters of different kinds of buildings of diverse urban environments.

The joint centre will work closely with the Initiative to support the further development of district energy systems, including but not limited to district heating and cooling, green building and building energy efficiency in China and neighbouring regions. The joint centre will be formed by a joint team of SCUT researchers and experts of UN Environment's DES Initiative.

District energy projects developed by district energy studio of SCUT, Zhuhai

The Initiative is also developing several case studies in China on DC, in areas like Zhuhai, Zhengzhou and Qianhai. In Qianhai, highly efficient district energy systems are integrated in the development, construction and operation of the whole region. The chilled water from DC systems is part of the public services package, together with water and electricity supply, demonstrating the regions commitment to these technologies in their development.

As measured in the year of 2017, comparing to label-1 standalone cooling systems in buildings, the district energy system in Qianhai can save up to 130 GWh electricity annually, which accounts for 12% of energy saving. In other words, DC can save up to 16,000 tons of coal used for electricity and reduce CO_2 emission of 130,000 tons.

District energy is not a new idea, but it has found new relevance in a world seeking practical solutions for the transition to clean energy and climate change, by simultaneously reducing emissions and boosting the uptake of renewables, while developing local economies, providing green jobs, and making urban air cleaner. DES Initiative works to assist developing countries and cities to accelerate their transition to lower-carbon and climate resilient societies through promoting modern district energy. The Initiative's work is done through a network of partners including manufacturers, operators, academia, NGOs, international organisations and finance institutions that have committed to provide international expertise. More information about the UN Environment's District Energy in Cities Initiative and its work can be found on http://www.districtenergyincities.org/. The District Energy in Cities Initaitive is proudly supported by the Global Environment Facility (GEF), the Danish International Development Agency (DANIDA), and the Italian Ministry of the Environment and Protection of Land and Sea.

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Asia Pacific Urban Energy Association (APUEA)

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Johnson Controls Provides Green Heating Solutions by Recovering Waste Heat

By author Terry Deng, Global Product Manager – Thermally Driven Chillers and Heat Pumps, Johnson Controls

> ***In 2015, China's Northern region district heating reached 8.5 billion square meters and consumed heating energy of 185 million metric tons of standard coal equivalent, which almost doubled from 2005 and is still increasing. Coal represents about 90% of the district heating energy consumed in Northern China, or approximately 166 million tons per year, contributing to the serious air pollution in the region.***

China's central government identified sustainability as a long term national agenda and strategy to promote waste heat recovery solutions. Northern China has a large industrial base where waste heat energy from these processes could be repurposed to provide usable heat and offset approximately 0.3 billion tons of coal consumption. According to the "Implementation Plan of Providing Residential Heating by Waste Heat" issued by the National Development and Reform Commission, coal based heating systems serving 2 billion square meters will be replaced with low-grade waste heat recovery solutions by the end of 2020. This energy restructuring will reduce coal consumption by more than 50 million tons and is key to improving China's air quality.

Johnson Controls manufactures the most comprehensive range of heat pumps in China, providing waste heat recovery systems with capacities ranging from 1 to 100 megawatts and offering optimized solutions for diverse operating conditions.

- In coal fired combined heating and power (CHP) plants, steam from power turbines is used to drive heat pumps to recover "waste" heat from power plant cooling water and to produce hot water for district heating. The YORK YDST (steam turbine driven centrifugal heat pump) is specially designed

for large heating capacity applications like CHPs with unit heating capacity range of 20 to 40 megawatts. Absorption heat pumps driven by steam, hot water or direct fired, provide heating capacities from 1 to 40 megawatts.

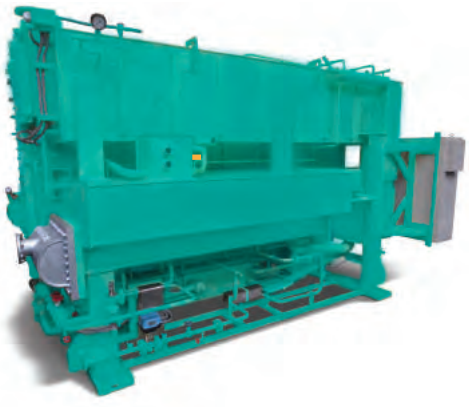
- In treated sewage water plant and ground surface water (such as river source) applications, heat pumps can absorb low temperature thermal energy from water and provide a heating supply for district energy stations. Compared to traditional gas heating, YORK CYK and YORK OM centrifugal heat pumps and YHAP absorption heat pump can reduce heating operation cost by more than 30% by using low temperature source water, such as 9°C, and providing hot water temperature above 70°C.

- Industries like petro-chemical use cooling towers to produce cooling water for production process cooling. By recovering the thermal energy contained in the cooling water, YORK heat pump solutions can achieve more than 50% heating operation cost savings compared to gas heating solutions (remarks: based on heating COP of 5.7).

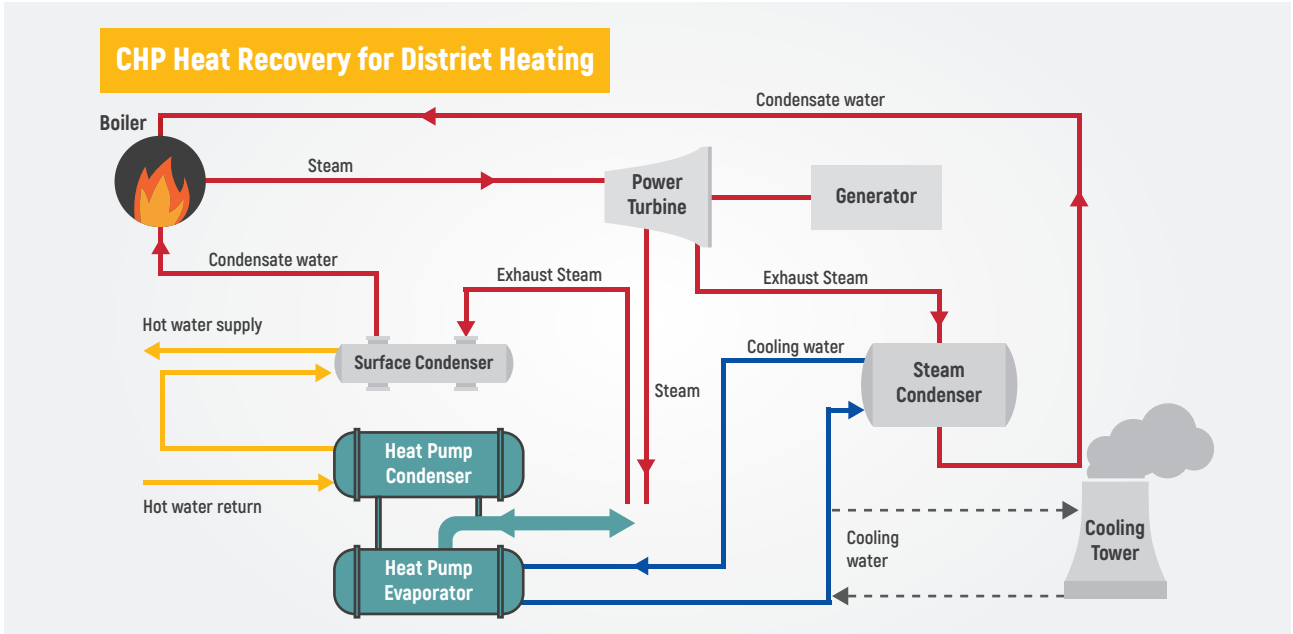
The China Resources Group Tangshan Fengrun Power Plant heat recovery project: The China Resources Group Tangshan Fengrun Power Plant (350 megawatts power turbines) has been in operation since 2014. In 2016, Johnson Controls provided two YORK YDST steam turbine driven heat pumps to recover "waste" heat from the power plant cooling water (22°C) and produce hot water of 64.3°C. The heating COP is 4.74 and the single heat pump unit recovers 21 megawatts of "waste" heat from cooling water. With two YDST units in full operation, Johnson Controls green heating solutions provides 42 megawatts of free heating through heat recovery, which equates to 0.84 Million m^2 heating area in Tangshan city, Hebei province, China. The YORK solution saves 14.8 thousand tons of coal consumption and reduces CO_2 emissions by 39.1 thousand tons per heating season.

Johnson Controls provides the most complete product offerings for China's large scale district heating market, including both mechanical and absorption heat pumps. For mechanical heat pumps, motor driven and steam turbine driven solutions are available, depending on the customer's need. For absorption heat pumps, both type I (heat amplifier) and type II (heat transformer) products are available with unique design and outstanding performance.

The YORK YDST Heat Pump



The YORK YHAP Heat Pump



HFC Phase-down Makes District Cooling "Hotter"

By DEVCCO

> ***As agreed and formalized in October 2016 in the Kigali Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, the production and consumption of hydroflourocarbons (HFCs) used as refrigerants in air conditioners and chillers will be phased down. This is not only important for fighting climate change, but it also provides a great opportunity to promote district cooling.***

As greenhouse gases (GHGs), HFCs can be thousands of times more powerful than carbon dioxide (CO_2). The Kigali Amendment, which will enter in into force on January 1, 2019, requires the HFC phase-down for two groups of Article 5 Parties and two groups of non-Article 5 Parties according to the graphs beside.

The UN Framework Convention on Climate Change (UNFCCC) Paris agreement sets the target of limiting global warming this century to well below 2°C. Actions undertaken to comply with the Kigali amendment can get us a remarkable 25 percent of the way toward this target or 0,5°C. It should also be noted that more countries have committed to the Montreal protocol than the Paris agreement.

District cooling offers numerous benefits - financial, economic and environmental. Due to its economies of scale, a district cooling system has lower per-user investment cost than individual solutions. In addition, since local peak demands occur at different times, the installed capacity can be reduced through the use of district cooling, which lowers investment costs still further. The efficiency of a district cooling system can be up to 20 percent higher than the efficiency of local solutions; 10 percent of this efficiency increase results from avoiding the urban heat island effect induced by split-type air-conditioners. Utilization of local

resources such as sea-water and integration with district heating systems also can create flexible and more environmentally friendly cooling solutions.

There are, of course, challenges with district cooling. These include front-loaded investments, institutional challenges related to urban planning, and the need to develop feasible business models. However, international experience is increasingly providing examples of how these issues can be overcome, as projects are being implemented successfully in a wide range of business environments.

In recent years, the development of district cooling schemes in Europe has been relatively slow - with the exception of projects in Sweden, Denmark, Finland and in larger cities like Paris and Amsterdam. The commitment to the Kigali Amendment can help unlock the potential of district cooling in Europe in the coming years. It also can help accelerate district cooling development globally by promoting dialogue among stakeholders developing district cooling schemes.

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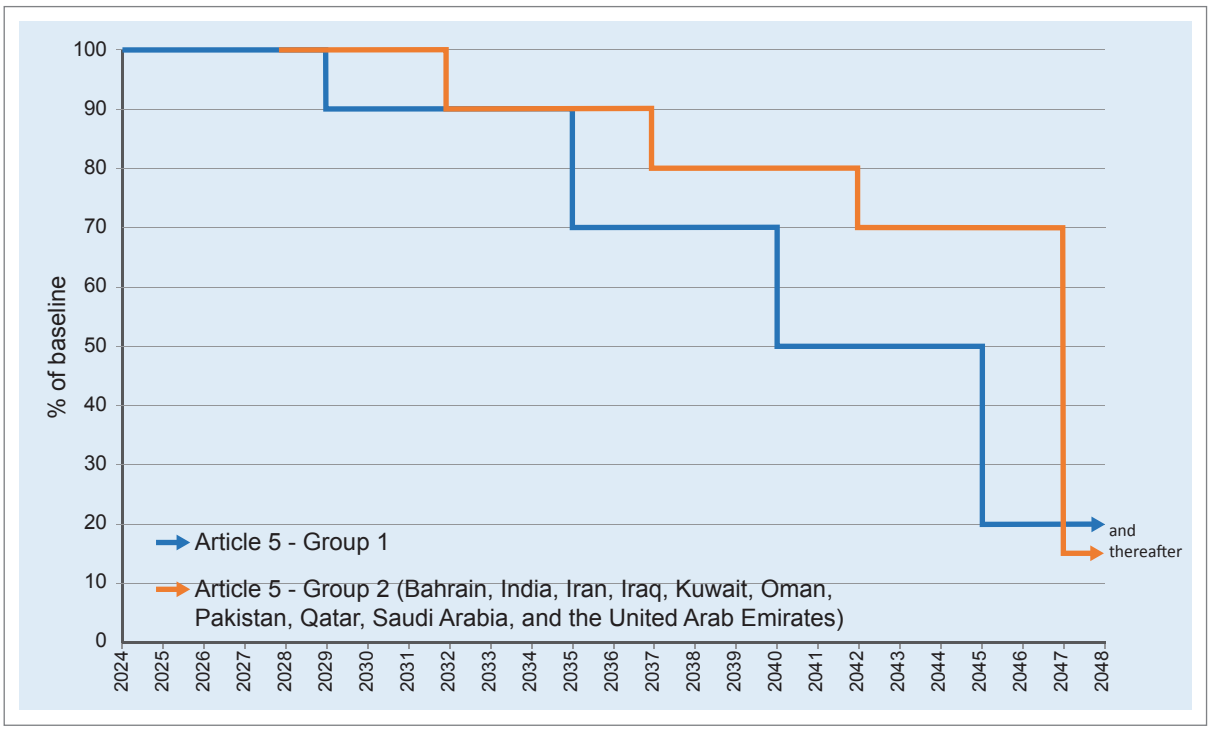
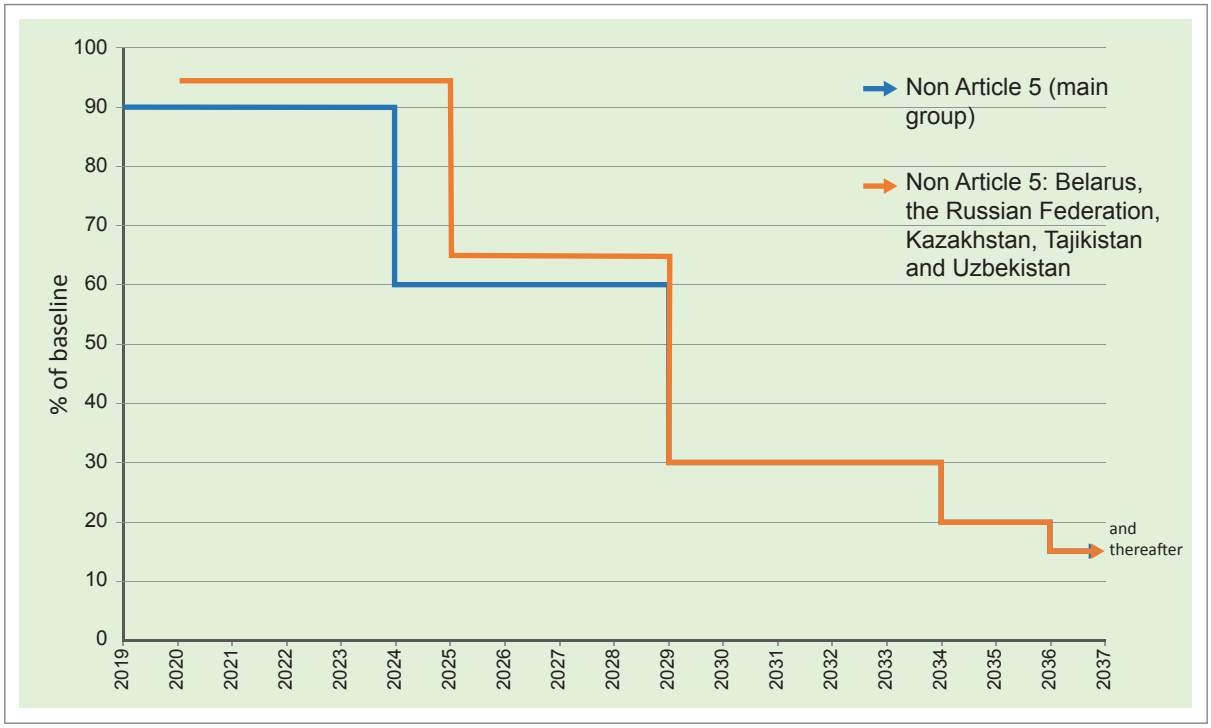
Phase-down Schedule



Source: UN Environment

Phase-down Schedule



Source: UN Environment

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Pathways & Success Strategies for Developing Sustainable Thermal Grids - This two-segment workshop will offer practical insights and lessons learned from real-world projects and explore the impacts of emerging energy and building codes and policy innovations

District Energy for Warmer Climates: District Cooling, CHP and Microgrids for Cities, Communities and Campuses - Organized with the United Nations Environment District Energy in Cities Initiative and Asia Pacific Urban Energy Association (APUEA), this workshop will focus on practical approaches to deployment of district cooling and resilient microgrids for dense urban settings, especially in Asia Pacific.

Tour local district energy systems using low-carbon solutions like sewage heat recovery, biomass, biofuels, geo-exchange and heat pumps. Learn how Canadian municipalities manage these investments. Tours will visit University of British Columbia's Bioenery Research and Demonstration Facility and Campus Energy Centre Corix; Alexandra District Energy Utility; Southeast False Creek Neighborhood Energy Utility; Creative Energy Central Plant; Corix TEC East and West.

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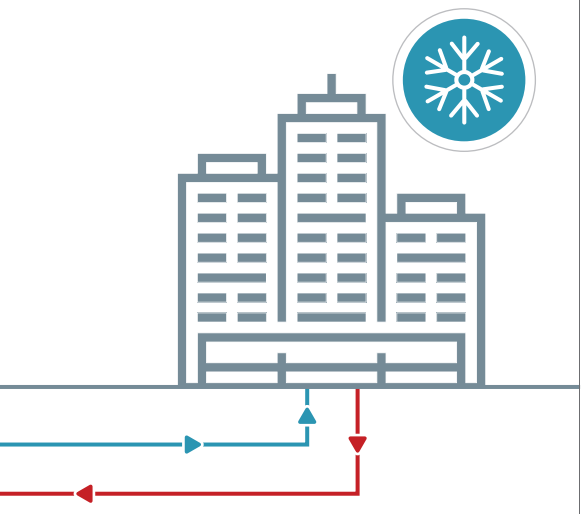
Taking Sustainable Cooling to the Next Level

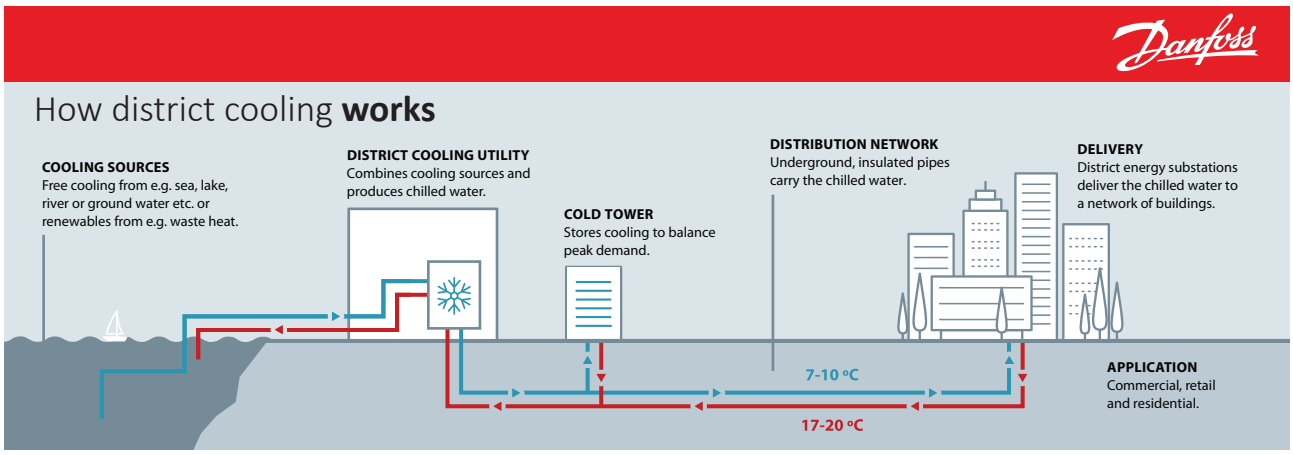
By Soren Kvorning, Regional President, Asia Pacific Region, Danfoss



Cooling has become an essential part of human needs: we need it to cool our buildings, our food, our medicine. At the same time, covering the rising cooling demand while also keeping our planet cool is becoming a challenge. Already today, refrigeration and comfort cooling consume staggering amounts of energy and cause 10% of global CO_2 emissions[1]. And the demand for cooling is rising exponentially as the world population grows and more people get access to cooling services. Global energy demand for comfort cooling alone is estimated to grow 33-fold by 2100 to more than 10,000 TWh, which is about half the total electricity generated worldwide in 2010.[1]

How can we meet the rising demand for cooling in a sustainable and affordable way without bringing the energy system down? We can turn the problem into the solution. Sustainable solutions for comfort cooling and refrigeration exist. What is more, they can even help stabilize the wider energy system and support the transition to renewables. How? By implementing them in a smart way and using the synergies between cooling, heating and electricity.

[1] University of Birmingham/IPCC:
https://www.birmingham.ac.uk/Documents/college-eps/energy/Publications/Clean-Cold-and-the-Global-Goals.pdf.



One of the solutions that enables this development is district cooling. District cooling is emerging as one of the most resource-efficient and affordable solutions to meet space cooling demand without straining the power system and compromising the environment. It is also a reliable and highly secure source of cooling.

How does it work? In a district cooling system, chilled water is supplied from a central cooling utility to buildings through pipelines. The chilled water is fed into the individual buildings' own cooling systems through a heat exchanger. Sounds rather simple. But the benefits are significant: District cooling uses less energy than traditional decentralized cooling systems – in fact, it can be more than twice as efficient as decentralized systems, as existing networks in cities such as Paris, Dubai, Copenhagen and Port Louis show.

District cooling can tap in any available energy source. The cold water for district cooling is supplied by natural water resources, such as lakes, rivers or underground water reservoirs, or produced from excess heat or via central electric chillers. In Paris, the river Seine delivers free cooling to more than 500 buildings. In some countries, such a Singapore, there is potential to recover the cold released during the LNG regasification process.[2]

A district cooling system can as well utilize excess heat. Excess heat from power production, industry and commercial activities can be used to produce chilled water with the help of absorption heat pumps. This heat would otherwise go to waste – or even worse, heat up the space you want to keep cool.

Turning excess heat into a resource for cooling is an attractive solution in countries with a hot climate. Possible sources are the excess heat from industry, steam from existing power plants, existing air-condition as well as energy from waste incineration plants. Even your local supermarket can provide the excess heat that its refrigeration system is producing constantly as a by-product.

Using free cooling sources and excess heat for absorption technology to produce chilled water saves valuable electricity and reduces the pressure on the power grid. Combined with energy efficient central electric chillers and cold towers for thermal storage, district cooling even adds flexibility to the grid and helps balance peak electricity demand: the cold water can be produced outside of peak hours, such as during the night and then used for cooling during the day. Some district cooling systems, such as the one in Cyberjaya, Malaysia, use this solution to reduce cost, as power tariffs outside of peak-times are often lower.[3]

Digital solutions enable us to optimize the operation of district cooling systems and make them as energy efficient as possible. Thanks to concepts such as IoT (Internet of Things) and AI (Artificial Intelligence) we have new means to gather and evaluate data, predict energy consumption, and match it with energy supply. This allows us to optimize temperatures in the network, shift loads in buildings, and utilize storage capacities of the district energy infrastructure. This can be a real game changer in an energy system that needs to integrate ever increasing volumes of volatile renewable energy.

[2] DTU paper Potential Of Waste Heat And Waste Cold Energy Recovery In Singapore For District Cooling Applications: Impacts On Energy System

[3] UNEP report on district energy: http://www.districtenergyinitiative.org/publications

The district cooling network in Copenhagen, Denmark, was established in 2009. The bank Sydbank calculated it saved **45%** on operational cost by opting for district cooling instead of a traditional cooling system. Danfoss supplied the substation that transfers the cold from the distribution network to the building.

In the Asia-Pacific region, district cooling can make a real difference. Rising incomes in the region translate into higher ownership of appliances and an increasing demand for cooling, while warmer temperatures, including more frequent and intense heat waves, will increase cooling demand during the summer months even more. The IEA expects that by 2040, cooling and appliances will account for more than 70% of residential electricity demand in Southeast Asia.[4]

District cooling can help meet this rising cooling demand in a sustainable way. To illustrate: The Danish Technical University has compared two scenarios for Singapore's energy system, one with and one without district cooling. In the scenario that included district cooling, carried out for the year 2030, CO_2 emissions were 11.5% lower and primary energy supply was 12.2% lower, while total socio-economic costs were 4.6% lower than in the scenario that did not include district cooling.[5]

By integrating natural and waste sources, reducing electricity use for cooling and utilizing thermal storage, district cooling networks provide affordable and sustainable cooling. They address even wider issues, such as how to integrate fluctuating renewable electricity, balance peak loads and achieve optimal efficiency of the energy system.

The good news is that technology to make this vision reality already exists, and we are continuously striving to develop new innovative and energy efficient solutions to do more with less.

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[4] IEA South East Asia Energy Outlook: https://www.iea.org/southeastasia/

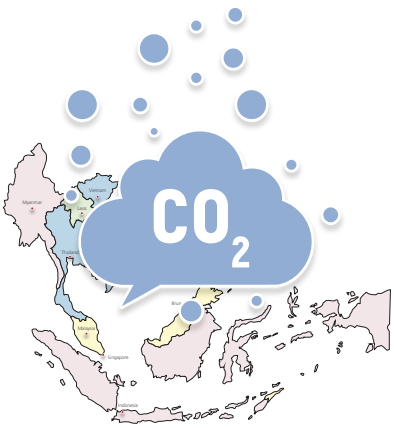
[5] DTU paper Potential Of Waste Heat And Waste Cold Energy Recovery In Singapore For District Cooling Applications: Impacts On Energy System

Photo by Chris Barbalis on Unsplash

Freezing in the tropics: Asean's Air-con Conundrum

Executive Summary

By author Tim Hill for Eco-Business Research



"The rapid rise in Asean's electricity demand in recent years has led to a surge in CO_2 emissions and pollutants that threaten to create an environmental crisis for a region already vulnerable to the impact of extreme weather and poor air quality."

Primary energy demand has increased by 70% in the region, collectively known as the Association of Southeast Asian Nations (Asean), from 2000 to 2016 with a further rise of 70% predicted up to 2040. Coal accounts for the largest share of the growth.

Electricity demand is expected to more than double to 2,000 tera-watt hours (TWH) up to 2040. Most of this growth comes from residential and commercial buildings, mostly for cooling, such that by 2040, air-conditioning could account for up to 40% of Asean's overall electricity demand.

This crisis can be avoided if the region adopts more efficient technologies and supports a culture change in cooling consumption.

A survey of 424 respondents from Indonesia, Malaysia, Singapore, Thailand, The Philippines and Vietnam, conducted in November and December of 2017, highlighted the problems of over-consumption and lack of awareness of the cooling challenge but also identified several opportunities.

They are:

- Manufacturers and suppliers need to focus on producing more energy-efficient AC systems and better educating their customers
- Poor energy management systems in public buildings need to be rectified by commercial operators and systems designers to avoid excessive cooling
- Public awareness campaigns should be considered to help consumers better understand the energy labelling systems as well as the financial and environmental benefits of more efficient AC systems and to build a culture of energy sustainability
- Stricter government legislation throughout the region should be used to ensure the uptake of more efficient AC products and for better design and management practices in commercial buildings
- A wider array of financial options could be used to ensure consumers install the most efficient AC systems for home use
- Consumers, businesses and governments need to work together and regionally to manage the demand for electricity, reduce emissions and pollutants, and move away from the reliance on coal-fired power stations

The context of Asean's electricity demand and supply as well as the differing economic situations of the member states should also be considered when formulating a strategy to avert the cooling crisis.

Economic growth has risen along with fossil fuel based electricity consumption

Asean's economic success story over the first 50 years of its existence can be tracked alongside its thirst for energy. Energy demand has expanded by two and a half times from 1990 to 2013, and its rate of growth is one of the fastest in the world.

Electricity consumption to power home appliances such as air-conditioning (AC) in the tropical Southeast Asian region has increased at a rate of around 7.5% annually from 155.3 TWh in 1990 to 821.1 TWh in 2013. Over 80% of this electricity came from fossil fuels, with coal-powered stations being particularly dominant in the region. Hence overall carbon dioxide emissions for the region have grown at similar rates. Cooling consumes an increasing amount of this growth.

Energy efficient appliances can substantially reduce power demand

The upward trajectory of electricity consumption and CO_2 emissions can be significantly reduced through the adoption of better technologies. If Asean countries switch to energy efficient products and lighting, they can reduce their consumption of electricity by 100 TWH at a saving of US$12 billion annually. This is the equivalent to the annual production of 50 power plants of 500 MW capacity, meaning that 50 power plants would not have to be commissioned.

When energy consumption for ACs in Asean countries is forecast using the best available technology for air-conditioning (BAT scenario), huge savings can be achieved.

If Malaysia and Singapore adopted the BAT scenario, for example, there would be an actual reduction in overall energy consumption for ACs by 2030 for these two countries, compared with 2015 levels. This would be despite growth in populations and affluence.

Conversely, if there is no change to current consumption habits (the business as usual, or BAU scenario) then energy consumption in all Asean countries would increase by a compound annual growth rate (CAGR) of 5.7% by 2030.

Excessive cooling in public spaces gives the wrong message to consumers

Consumers in the region seem to have a basic awareness that more efficient technologies can result in a lower electricity bill. Yet they are not aware of quite how important this is to ensure that the region achieves its targets for CO_2 emission reductions, as reflected in Nationally Determined Contributions (NDCs) to the Paris agreement. This lack of awareness is not helped by the experience of the average city dweller in the region, who regularly encounters excessive cooling in buildings which sends the wrong message that controlling efficiency is not a major priority.

Survey respondents in Singapore seemed the most vocal about the excessive cooling of public spaces with 68% of respondents indicating that they often encounter settings that are too cold. This was also a common response across the region, with significant numbers indicating that they often encounter excessive cooling. The situation seemed to be better managed in Indonesia, where only 38% of respondents stated that they often encountered AC settings in public spaces that were too cold.

Changing consumer habits

The behavioural habits of survey respondents on air-conditioning reflect the relative affluence of the different countries in the region and the installation rate of air-conditioning units in households. Respondents from Vietnam, The Philippines and Indonesia were more likely to report the use of other cooling systems apart from air-conditioning being used in public buildings, whereas respondents from the more developed economies of Malaysia and Singapore were less likely to notice more environmentally-friendly alternatives.

Similarly, respondents from Vietnam and Indonesia were more likely to agree that air-conditioning was a status symbol with respondents from Singapore (where the installed rate was estimated at between 76-100%) much less likely to see it as anything other than a necessity.

Government initiatives needed to manage the cooling crisis

Despite concerns about the excessive cooling of public buildings, 77% of Singapore respondents agreed or strongly agreed that their government was actively managing power demand through initiatives such as promoting energy efficiency standards in air-conditioning. At the other end of the scale, only 30% of respondents from Vietnam agreed or strongly agreed that the same was happening in their country. The most populous country in the region, Indonesia, scored 38% for this question, indicating the scope for improvement across the region through government intervention.

There was no shortage of suggestions from survey respondents as to how the region could better manage its cooling challenge. These ranged from more effective use of passive cooling methods or refrigerant-free alternatives to air-conditioning, to innovative finance and recycling programmes to promote the uptake of more energy efficient models. Respondents were also unanimous in wanting to see their countries move towards clean energy adoption.

Governments around the region have agreed on targets for AC efficiency and are at different stages of local implementation. Given the radical differences in the size, state of economic development, and political situations of the countries that make up the Asean region, the challenges for governments vary considerably. However, in all cases, there are some clear areas where governments can be focusing efforts and directing change more effectively to ensure more efficient cooling.

This paper aims to highlight both the economic and environmental benefits for driving the region towards more efficient use of ACs as well as highlighting some of the most obvious areas that governments, businesses and consumers can direct their immediate attention. Without significant efforts to make cooling efficient and clean in Asean, the region will miss out on economic and social gains while over-polluting the local and global environment.

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Download the full pdf file:
http://www.eco-business.com/media/uploads/freezing_in_the_tropics.pdf

"Freezing in the tropics: Asean's air-con conundrum" *is a whitepaper written and produced by Eco-Business Research, the research arm of Eco-Business. The report has been sponsored by Kigali Cooling Efficiency Program. Eco-Business is the leading media and business intelligence company serving Asia Pacific's sustainable development community. Our platforms include the award-winning Eco-Business.com site, custom publications, research and high-impact bespoke events catered to deepen discussions on sustainability.*

Eco-Business

KIGALI
COOLING EFFICIENCY PROGRAM

DC... stands for Disseminate and Communicate

By Mohannad Khader, Director - Business Development, Qatar Cool

> ***Why will I pay for something that I do not use?!***

this is the common recurring question most district cooling companies are asked by their customers. Most frequently asked in the winter, when most end-users switch off their air conditioning system, yet they have to pay for the fixed monthly fees, more commonly known as the capacity charges.

The answer to this recurring question is not well received from the customer ...why? The lack of awareness and communication from the offset plays a major role. When the building owner/developer signs a Cooling Service Agreement (CSA) with the district cooling provider, to initiate the service, the financial obligations and rights of all concerned parties are communicated, this included that of the customer (end-user) from the cooling service provider. When the building owner/developer starts to sell or lease the unit(s) to the customer, the financial obligations and rights are not always communicated plainly, from the owner/developer, thus leading to the misunderstanding and astonishment towards the cooling service provider from the customer in relation to the fees

It is at this initial stage where the communication gap occurs i.e. the customer must be made aware, by the owner/developer, of all financial obligations before buying or renting the unit(s). Customers must be aware of their responsibilities including paying the monthly charges for the cooling service, this includes the fixed allocated cooling capacity for that unit(s). When the customer is requested to sign the Individual Cooling Service Agreement (ICSA) with the cooling service provider, clarification can be sort from the provider on any misunderstandings of the monthly charges.

It is unfortunate that the miscommunication from the owner/developer, of the financial obligations of the customer clouds the advantages of district cooling, as more focus from the district cooling provider is spent clarifying the charges rather than communicating the vast advantages of the system, thus leading to the lack of knowledge or appreciation of district cooling from the customer's perspective. If the communication was more transparent from the owner/developer, it is likely that the customer will turn to be an advocate for district cooling, armed with the correct knowledge of the system and the benefits over conventional cooling (to compare apple to apple, the argument here is about an apartment/unit located in a tower using either district cooling or conventional chillers).

To name a few disadvantages of conventional cooling, the initial capital cost of the building will be greater as a result of having to install chillers, transformers, extra electrical power connections, and additional contractor profit margins. During the operations, the building owner/customer will have a higher facility management cost due to the extensive scope of work, increased electrical costs due to the additional 60% energy needed in conventional cooling consumption. Whereas these matters are eradicated by district cooling.

In district cooling the customers living in towers do not suffer from any issues related to noise and vibration. They enjoy more space by eliminating the chillers from the building, having freed space for either car parks or roof top amenities. Aside from the environmental benefits of district cooling there are associated building cost benefits, According to our study, implementing district cooling to a tower, reduces the total building cost by 30% over 20 years.

District cooling is similar to other utilities; there are connection fees, fixed (capacity) fees and consumption fees. This applies to electrical power and water where the difference is that the fixed fees are subsidized by the government in the case of electricity and water, therefore the end user only pays the consumption and connection fees, and is rarely aware of the subsidized fees.

District Cooling providers, such as Qatar Cool, with more than 10 years of service are working to document the advantages of using District cooling, over conventional cooling. The saving of natural resources, electrical power, infrastructure and accordingly reducing the carbon footprint are to name a few. The collected data will demonstrate to the government the importance of such technology, for the suitability of the society and for a greener community. The desired outcome of such studies would be to subsidize some of district cooling costs, in order to promote the service based on its merits as oppose to the misconceptions.

District Cooling

In a climate like Qatar, district cooling is a win-win solution for the country, the developers, the customers and the cooling providers. District cooling needs to be recognized and viewed objectively from all parties, the vast benefits and sustainability of the system warrants recognition in the correct light. District cooling is being erroneously compared, it does not make sense to compare a building in the middle of the city with four stories with another in West Bay with fifty stories.

It is imperative for the future of district cooling when designing a city, such as, The Pearl Qatar, Lusail and Msheireb Downtown Doha to form a committee, whom will establish a clear and transparent communication plan, which will disseminate all information of the utility services, such as district cooling, with sub developers or customers before they buy the land or the property.

We cannot and should not rely on the customers to seek the obligatory information or read the fine print, it is the responsibility of the owner/developer to communication clearly and for the cooling service provider to further elaborate and support the information being shared. The lack of awareness and communication will lead to misconceptions on the customer's side in in return affect relations between all concerned stakeholders.

Qatar District Cooling Company was established in 2003 with a vision to be the leading provider of district cooling services in Qatar. Serving its customers from three strategically located cooling plants and an intricate underground piping system, the company built an impressive client base that covers The Pearl-Qatar and West Bay districts. A forth cooling plant in the West Bay

district is soon to join the current plants in the continuous efforts to provide reliable sustainable energy solutions to the country.

As part of its dedication to serving the environment, Qatar Cool had accepted the challenge to design, build and operate the largest district cooling plant in the world at The Pearl Qatar, which serves apartment towers, beachfront villas and townhouses, shopping complexes, offices, schools and hotels throughout the Island, ultimately supplying 130,000 tons of refrigeration to the Island's 45,000 residents once fully occupied.

Air conditioning accounts for 70% of electricity consumption in the Middle East. Qatar Cool's system uses 50% of the energy utilized in conventional cooling systems to produce the same amount of thermal energy. Conventional cooling represents other means of air conditioning in Qatar including, air cooled chillers, packaged units, ducted split units, split unit and window type air conditioners. Qatar Cool could demonstrate thoroughly to developers, authorities, consultants and all other stakeholders the environmental and economic benefits from using district cooling systems over other systems.

A study made by Qatar Cool shows, the produced cooling capacity by all three operational plants in the past eight years, saves a tremendous amount of energy, in comparison to the conventional cooling systems. Over the past eight years we have saved over 1.9 billion Kilo Watt Hours (KWH) of electricity which is equivalent to removing over 1 billion tons of CO_2 emissions. If we were to convert the CO_2 savings into the number of cars we would take off the road that would equate to over 206 thousand cars.

= **1.9 billion**
Kilo Watt Hours (KWH)
Reduction in energy consumption

= **1 billion tons**
of CO_2 emissions

= Taking
206 thousand cars
Off the road

Energy savings made by Qatar Cool during the last 8 years

District cooling plants are operated more efficiently with less harm to the environment by eliminating such things as carbon dioxide, possible gas leak and noise pollution. District cooling offers major environmental benefits and allows us to economize on natural resources.

قطركوول
QATAR COOL
A Better Way to Cool Your Environment

Qatar Cool has won multiple international awards, including the Best District Cooling System in the World award for both districts served, from the International District Energy Association (IDEA). It was also recognized by Kahramaa's 'Tarsheed', a national campaign to improve water and energy efficiency, for its energy conservation efforts in industrial buildings in Qatar.

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Filinvest & ENGIE jointly invest 26M€ brownfield District Cooling system in Northgate Cyberzone Filinvest City, Philippines

By Engie

PDDC
PHIL. DCS DEV'T CORP.
A FILINVEST & ENGIE JOINT VENTURE

> ***Philippines DCS Development Corp. built a 26M€ brownfield District Cooling system in Northgate Cyberzone – Filinvest City – Alabang, Philippines***

This DCS commissioned in July 2017, a first in the country, will produce 42 MWcool (12,000RT) of cooling Energy to supply within Northgate Cyberzone, owned by CPI, the existing 11 buildings, plus 7 additional buildings to be built between 2018 and 2020.

The total GFA cooled by the DCS by end 2020 will be 410,000 m^2. Additional potential customers such as Hotels or Community Malls will also be able to connect to the DCS in the future.

Northgate is a 18.7 hectares information technology park, built around the needs of technology-based companies engaged in Business Process Outsourcing (BPO) and Knowledge Process Outsourcing (KPO).

As the number one supplier of Energy and Environmental Efficiency Services and DCS company in the world, ENGIE provided Filinvest with strong performances guarantees:

1

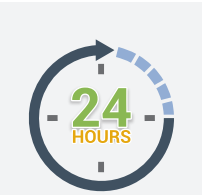
Supply cooling energy within a reliable cooling network of 1.7 kms fully redundant

2

Save 60% of cooling & electrical capacities to be installed for the 7 buildings to be developed by CPI

3

39% reduction of the electricity consumption every year at full development or 18,400 Tons of CO_2 saved



4

Availability of 99.8% guaranteed (cooling energy is key for BPOs running 24 hrs)

5

Capex and Opex guaranteed for 20 years

This solution, besides saving almost 40% of electricity for the existing tenants, will give Northgate a substantial commercial edge to attract new tenants within their IT Park.

ENGIE will Operate & Maintain the DCS guaranteeing lower Operating Expenses to CPI buildings with 24/7 utility services and a response time of 15mn, keeping risks at a minimum while ensuring reliability

This joint venture is part of Filinvest's sustainability efforts, in support of the Philippine Government's drive for green energy. Following the success of Northgate Cyberzone, CPI is developing Filinvest Cyberzone Cebu and Filinvest Cyberzone Pasay.

Event Calendar

11 JUN 2018

11 June - 14 June 2018

Vancouver B.C, Canada

IDEA2018: Local Solutions, Global Impact

APUEA Activity: Co-hosting the workshop on June 11; "District Energy for Warmer Climates including; District Cooling, CHP, and Microgrids for Cities, Communities and Campuses"

27 JUN 2018

27 June - 28 June 2018

Bangkok, Thailand

Asian Utility Week

APUEA Activity: Participating in panel discussion, Promoting the role of the Energy Prosumer in the Facility Management market

JUL 2018

July 2018

Xian, P.R. China

District Energy Conference with focus on the Montreal Protocol

APUEA Activity: Co-hosting the conference together with Danish Board of District Heating (DBDH) and Swedish Environmental Protection Agency

09 AUG 2018

9 August 2018

Brisbane, Australia

Solar Heating and Cooling Forum

APUEA Activity: Speaker on the topic "District Cooling Networks"

SEP 2018

September 2018

Beijing, P.R. China

Smart District Heating

APUEA Activity: Co-hosting the conference together with China District Heating Association (CDHA) and Danish Board of District Heating

01 NOV 2018

1 November 2018

Singapore

Innovations in Energy Services, Urban Energy Efficiency Services

APUEA Activity: Co-hosting the conference together with Clarion Events

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Alliance to Save Energy

Capital Heat

Qatar Cool

Tianjin Euro Energy Technologies Co., Ltd. (TEET)

China District Heating Association (CDHA)

Danish Board of District Heating (DBDH)

International Institute for Energy Conservation (IIEC)

Northeast Clean Energy Council (NECEC)

District Energy in Cities Initiative

International Partnership for Energy Efficiency Cooperation (IPEEC)

Partners and supporting organizations

- Sustainable Energy for All (SEforALL)
- Asian Development Bank (ADB)
- International Energy Agency (IEA)
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General Phone ..... General Fax .....

General E-mail ..... Web .....

Primary Contact: First name ..... Surname .....

Position ..... Direct Phone ..... E-mail .....

2 ORGANISATION CATEGORY (please check as appropriate below):

- ◯ Association / Federation
- ◯ NGO
- ◯ Academic
- ◯ Advisor - Financial / Legal / Banking
- ◯ Consultancy - Engineering / Design / Technical
- ◯ Manufacturer / Equipment Supply
- ◯ Utility / Operator
- ◯ Media company - Press / Journalist / Advertisement
- ◯ Building Sector
- ◯ Other

Specify: .....

3 BILLING INFORMATION (if defferent from above):

Billing Address: .....

.....

.....

4 MEMBERSHIP CATEGORY (please check as appropriate below):

		Employees		
Member Category		**≤ 49**	**50 - 249**	**≥ 250**
Active Member		◯	◯	◯
Allied Member		◯	◯	◯
Affiliate Member	◯			

5 PAYMENT METHOD:

◯ Bank Transfer ◯ Credit Card ◯ Paypal

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