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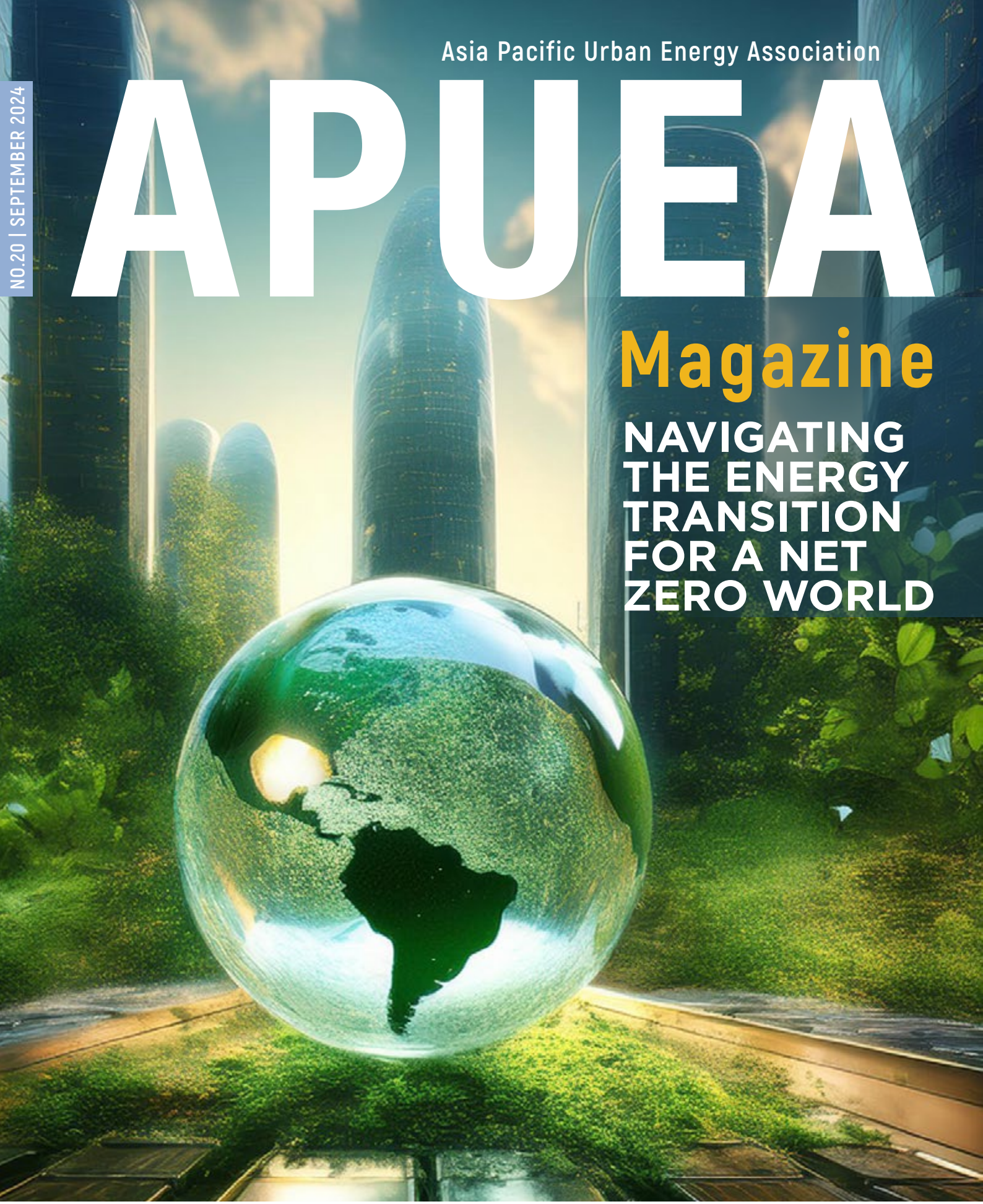
Asia Pacific Urban Energy Association

APUEA Magazine

NAVIGATING THE ENERGY TRANSITION FOR A NET ZERO WORLD



APUEA
Asia Pacific Urban Energy Association

PROMOTING SUSTAINABLE URBAN ENERGY IN ASIA PACIFIC

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Editorial

Mikael Jakobsson

PRESIDENT

ASIA PACIFIC URBAN ENERGY ASSOCIATION (APUEA)

> WE ARE HOLDING OUR BREATH AS THE SECOND NDC UPDATE CYCLE STARTS IN 2024, AND ASIA-PACIFIC MEMBER STATES NEED TO TAKE THE OPPORTUNITY TO DEVELOP MORE ROBUST AND ACCURATE REDUCTION PATHS TO FULFILL THEIR NET-ZERO COMMITMENTS. IT IS OBVIOUS THAT CURRENT NDC COMMITMENTS ARE NOT SUFFICIENT, ONLY REDUCING EMISSIONS BY APPROXIMATELY 10% BY 2030 (RELATIVE TO 2019 LEVELS), LEAVING A 33% GAP TO ALIGN WITH A 1.5°C PATHWAY.

Tabreed has made a remarkable breakthrough with its "Verified Carbon Standard" program at one of its Abu Dhabi District Cooling plants, certifying carbon credits to offset emissions. The independent non-profit agency Verra, which sets the world's leading standards for climate action and sustainable development, carried out a year-long verification program at the plant. Tabreed is now eligible to trade carbon credits in the voluntary market. This achievement positions District Cooling as an officially recognized energy-efficient cooling solution, alongside its role as a not-in-kind solution for HFC phase-out. This initiative paves the way for the entire District Cooling sector and deserves full recognition.

Recently, APUEA has been more active than ever in supporting the development of sustainable urban energy developments through awareness-raising, networking, and knowledge exchange activities at exhibitions, seminars, and workshops, as well as by providing insights into APUEA members' projects.

For the past year, APUEA has participated in the project "Supporting the Clean Heating Transition in China." The project has been led by the Danish Board of District Heating (DBDH) with support from the Danish Energy Agency, focusing on the optimization and integration of renewable energy and waste heat technologies in District Heating systems.

The 3rd edition of the **Asia Urban Energy Assembly 2024** was held on July 4th-5th at the Queen Sirikit National Convention Center in Bangkok, Thailand. During the two days, prominent speakers shared knowledge, experience, and technology to propel the energy transition in the Asia-Pacific region. Six international sessions proved that we have the necessary technology, experience, and business models in place to develop energy systems for a net-zero future. We want to extend our special thanks to our sponsors for their generous support: **Tabreed (Gold Sponsor), Qatar Cool (Silver Sponsor), Hydraulic Analysis, NXITY, and Tangshan Xingbang (Bronze Sponsors).**

In addition to the Asia Urban Energy Assembly, APUEA has co-hosted and featured in several energy events during the third quarter of 2024. On August 23rd, APUEA was invited to provide District Energy insights from the Asia-Pacific region during Green Energy Export Day 2024 in Copenhagen, Denmark. The event was organized by Danish Industries, Green Power Denmark, and DBDH, in collaboration with the Danish Energy Agency, the Danish Trade Council, and State of Green Denmark.

On August 29th, during the Electric & Power Indonesia event, APUEA hosted a workshop titled "The Future of Energy in Indonesia," where the potential of District Cooling and future energy technologies in general was discussed.

On September 5th, during the Electric & Power / HVACR Vietnam event in Ho Chi Minh City, APUEA hosted a workshop on Energy Efficiency, Energy as a Service (EaaS), District Cooling, Smart Grids, and other topics.

From September 25th to 27th, APUEA was a supporting partner for the 24th ASEAN Energy Business Forum (AEBF) in Vientiane, Lao PDR, where the future of energy and unlocking new opportunities for growth were on the agenda.

In this issue of APUEA Magazine, you can read interviews with Narayanan Ranganathan from ABB and Glyn Addicott from Hydraulic Analysis. Additionally, you will find articles on Energy Efficiency, Energy as a Service, District Cooling, Digital Twins, O&M, Energy Management Systems, Lean Engineering, and the latest APUEA activities. We would like to thank ABB, Keppel, Qatar Cool, Tabreed, Grundfos, Hydraulic Analysis, Bluebee Technologies, BECIS, KJTS Group, and Yokogawa for their contributions to this issue of the APUEA Magazine.

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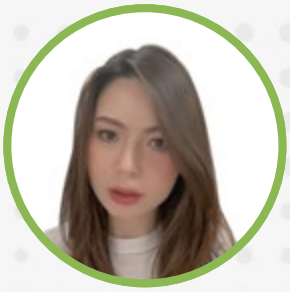

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ASIA PACIFIC URBAN ENERGY ASSOCIATION

The Asia Pacific Urban Energy Association (APUEA) was launched in 2017 to promote the development of sustainable Urban Energy Systems in the Asia Pacific region. The APUEA platform promotes public and private sector collaboration to develop sustainable urban energy systems that support livable cities across the Asia Pacific region. Our membership and activities serve as an information hub to support city policymakers, program managers, and other stakeholders in the design, development, and implementation of sustainable urban energy systems. Through our activities, including APUEA events, conferences, and continuous outreach to our members, we share international and regional best practices for planning and implementing sustainable urban energy systems–including policies and regulations, business models, and technologies for implementing district heating and cooling, smart grids, energy efficiency improvements, and renewable energy systems.

The APUEA membership provides a unique opportunity to liaise with governmental agencies and important stakeholders and get access to valuable information and intelligence on urban energy developments, business opportunities, trends, and financing in one of the fastest growing energy and infrastructure markets in the world. Membership benefits include a marketing platform, newsletters, APUEA Magazine, Annual Publications, Annual General Meeting including Trade Exhibition and Direct Assistance.

APUEA
Asia Pacific Urban Energy Association

For more information about APUEA and how to become a member, contact info@apuea.org

www.apuea.org

ASIA PACIFIC URBAN ENERGY ASSOCIATION

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.

PREMIUM MEMBER

Premium membership includes an active role in the governance of the association through the APUEA Executive Committee and during the APUEA Annual General Meeting.

Premium membership also includes special recognition in APUEA publications and marketing channels, and free participation at APUEA events.

CORPORATE MEMBER

Corporate membership includes influence on the association's activities during the APUEA Annual General Meeting, recognition in APUEA publications and marketing channels, and discounted participation at APUEA events.

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:

CORPORATE CATEGORY	EMPLOYEES		
	< 1,000	1,000 - 10,000	> 10,000
PREMIUM MEMBER	USD 10,000	USD 10,000	USD 10,000
CORPORATE MEMBER	USD 3,500	USD 5,000	USD 6,500
AFFILIATE MEMBER	N/A		

BENEFITS

- Advocacy and Representation
- Matchmaking and Referrals
- Direct Marketing
- Market Intelligence
- Knowledge and Best Practices
- Regional and International Events
- Direct Assistance

TO PUT IT INTO PERSPECTIVE, 45% OF THE WORLD'S ELECTRICITY IS CONVERTED BY ELECTRICAL MOTORS INTO MOTION IN APPLICATIONS THAT CAN BE FOUND ACROSS ALL INDUSTRIES, COMMERCIAL BUILDINGS, AND EVEN HOUSEHOLDS.

ENERGY EFFICIENCY: ACCELERATING ASIA'S SHIFT TO NET ZERO

INTERVIEW

WITH R. NARAYANAN

Group Senior Vice President & Head of Motion Business, Asia

Energy efficiency is a crucial component of the global energy transition. According to the International Energy Agency, improving energy efficiency is even more impactful than expanding renewable energy in the effort to reduce carbon emissions worldwide. One of the leading global companies with a strong focus on energy efficiency solutions is ABB. To get an update on ABB's offerings, we sat down with R. Narayanan, Group Senior Vice President & Head of Motion Business, Asia. During our conversation, we discussed the significant role that motors and drives play in the energy transition, as well as the importance of educating the market on the benefits of energy efficiency. We also explored how energy tariffs influence the adoption of energy-efficient technologies and solutions.

ABB

By APUEA Secretariat

ONLY 25% OF MOTORS ARE CONTROLLED BY DRIVES, BUT THEIR USE CAN LEAD TO SIGNIFICANT ENERGY SAVINGS, ESPECIALLY IN APPLICATIONS LIKE PUMPS, FANS, AND HVAC SYSTEMS IN BUILDINGS.

Can you make an introduction of yourself and ABB Motion?

I'm the Group Senior Vice President, Motion Asia. I've been with ABB for 35 years, handling various businesses and leadership roles, and I've been in my current position for the past 5 years. ABB is a 140-year-old company headquartered in Zurich, Switzerland, and operates in over 100 countries. Listed on the Zurich and Stockholm stock exchanges, ABB achieved over $30 billion in revenue last year and is structured into four main business areas: Electrification, Process Automation, Robotics & Discrete Automation, and Motion.

In Motion, we focus on moving things with electrical motors, generators, and motor controls like variable speed drives which are integral to many aspects of modern life. We're also involved in e-mobility, providing traction chains for heavy-duty vehicles and trains. One of our notable projects is with Queensland Rail to prepare Brisbane for the 2032 Olympics. ABB Motion will be supplying advanced traction technology in collaboration with Downer and Hyundai Rotem to enhance the efficiency and reliability of Brisbane's rail system during the global event.

Can you describe the business scope of the motion business and your main activities and goals?

The ABB Motion business is centered around three key pillars: energy efficiency, decarbonization, and circularity. Energy efficiency is a key focus for us. To put it into perspective, 45% of the world's electricity is converted by electrical motors into motion in applications that can be found across all industries, commercial buildings, and even households. Many of these motors, installed years ago, do not meet today's minimum energy efficiency standards.

As a leading technology company, ABB is at the forefront of developing cutting-edge motors like our Synchronous Reluctance (SynRM) motors, which exceed the IE5 standard—the benchmark for efficiency. These motors can reduce energy losses by almost 50% compared to the IE2-class induction motors. In addition to motors, we also focus on variable speed drives. Currently, only 25% of motors are controlled by drives, but their use can lead to significant energy savings, especially in applications like pumps, fans, and HVAC systems in buildings.

Decarbonization is the second pillar of our business. Many mechanical drives, such as turbine drives in refineries and petrochemicals, consume vast amounts of energy. By replacing these with electrical drive chains—comprising drives and motors—we can achieve considerable energy savings. A notable example is our project with Qatar Gas, where we replaced turbine drives with electrical drive chains, reducing gas consumption and improving cost efficiency. We have executed similar projects in Malaysia and Indonesia.

In the rapidly growing field of hydrogen production, we contribute by supplying power sources for electrolyzers, with successful applications in Japan, Australia, and Europe. Additionally, in the e-mobility sector, we convert diesel drive chains to electric drive chains, such as in the mining industry, to accelerate decarbonization.

The third pillar is circularity, which focuses on optimizing resources and minimizing waste. Our SynRM motors, in particular, are designed for a high recyclability rate of 90%, as calculated according to EN45555, and are sourced with 29% recycled materials. Additionally, the motors are produced at a facility with a 100% landfill diversion rate, consistent with our commitment to zero waste practices.

The same principles are also incorporated in our drives production. In some cases, our drives are produced in carbon-neutral factories located in Helsinki, Finland, which uses green district heating and green electricity. We also have refurbishment and repair services for bigger drives, giving them a second life through upgrades and materials preservation. More than 98% of the materials used for our drives are recyclable.

What are the main challenges in promoting the adoption of higher efficiency motors and drives in Asia?

Efficiency standards are relatively low in Asia. For example, in Thailand, Malaysia, and most other countries in the region, the IE2 standard, which has quite low efficiency, is commonly used. In contrast, Europe mandates motors between 75kW and 200kW to meet the IE4 levels, which are much more efficient. Educating customers on the benefits of higher efficiency motors is crucial.

However, the shift often occurs naturally when power tariffs increase, prompting customers to seek more efficient options to save energy. For example, in Germany, we quoted an IE5 SynRM motor with a drive for a customer. The CAPEX was, of course, higher than an IE4 motor with a drive for that particular application, but the payback period was around one year at that time. However geopolitical pressures caused power tariffs in Germany to rise significantly, allowing the customer to recover the CAPEX in less than few months. This demonstrates the significant role that power tariffs play in driving the adoption of higher efficiency motors.

In Southeast Asia, the primary reason for the use of less efficient motors is due to CAPEX concerns. However, when considering a motor's total lifecycle cost—including the energy cost to run it over a typical 15-year period—the initial CAPEX can amount to less than 2% of the total cost of ownership while maintenance accounts for 1%, and the remaining 97% is spent on electricity. Unfortunately, many people overlook the motor's total cost of

ownership, focusing only on the upfront investment. Therefore, educating the market on the benefits of high-efficiency motors and drives, and the importance of considering the total cost of ownership, is essential.

We also conduct energy efficiency audits to help identify the right size of motors and drives for specific applications. When determining the size of a motor, factors like worst-case temperature, humidity, and loads are considered, often leading to oversized motors. Typically, electric motors are oversized by at least 30%, and without drives, these large motors operate at 100% capacity at all times, resulting in unnecessary energy consumption.

For example, in Thailand, an air conditioning system might be sized for 50 degrees Celsius, even though this temperature is rarely reached. The average temperature is around 30 degrees Celsius, meaning energy is wasted for the majority of the motor's use.

Can you elaborate on ABB Motion's geographic focus area?

The Asian region excludes India and China, which are significant markets managed separately due to their scale. Both countries are major manufacturing hubs, along with Europe and the Americas. In North Asia, we cover Japan, South Korea, and Taiwan. In Oceania, we include Australia, New Zealand, and the Pacific Islands, with Australia and New Zealand managing the latter through channel partners.

In ASEAN, we have offices in the Philippines, Malaysia, Vietnam, Thailand, Indonesia, and Singapore. As a block, ASEAN has a robust growth potential which makes it an important market for ABB.

Our goal is to stay close to our customers, either directly or through our network of channel partners who share our commitment to delivering top-quality service and support to customers in the region.

Can you explain about the importance of energy efficiency in the energy transition and how it is applied in your products and solutions?

Energy efficiency is crucial in the global energy transition, especially as we face rapid population growth and urbanization. The global population, currently around 8 billion, is projected to reach 10 billion in the coming decades, placing immense pressure on our planet. Urbanization, particularly in Southeast Asia, has a significant impact on energy consumption due to the proliferation of high-rise buildings, air conditioning, and other modern amenities.

As mentioned, 45% of the world's electricity is converted by electrical motors into motion, with more than 300 million motors in use across industries. This number is expected to double within the next 20 years, making the deployment of energy-efficient technologies and the replacement of old and inefficient equipment crucial in managing energy demand.

Outdated methods, such as using dampers for air conditioning or valves for water flow control, contribute to significant energy waste. Even in power plants that generate electricity from gas or coal, auxiliary systems like air handling fans and boiler feed pumps consume about 10% of the plant's capacity. By upgrading to higher-efficiency motors and drives, substantial energy savings can be achieved. Ultra-premium efficiency IE5 SynRM motors provide additional benefits like operating performance optimization and reduced maintenance needs. Fitted with variable speed drives, they are less harmful to both the pump and the grid.

At ABB, we have a clear commitment to reaching net zero by 2050. SynRM motors are manufactured in facilities powered by renewable energy using 29% recycled materials and low-carbon copper. These motors are magnet-free and do not use rare earth metals making the manufacturing process less harmful to the environment.

In Malaysia, we work extensively with the Malaysian Green Tech Corporation and Climate Change Corporation to raise awareness on energy efficiency which has been identified as the first lever in the National Energy Transition Roadmap. Our collaboration has been successful with more like-minded stakeholders now lending their support for concrete measures to be taken to deliver tangible energy efficiency progress.

What are some of the market developments that you see at the moment?

Decarbonization is a major focus in market development, with hydrogen emerging as a key trend. In North Asia, hydrogen-powered vehicles, including cars, buses, and trucks, are becoming increasingly common. This shift is supported by investments in hydrogen refueling stations. However, the method of hydrogen production is critical—using fossil fuels to produce hydrogen negates its environmental benefits. Therefore, generating hydrogen from renewable energy sources is vital for true sustainability.

There's also a significant transition from mechanical systems to electrified ones, further driving decarbonization. E-mobility is rapidly expanding, with more cities adopting metro systems and mass transportation. In Japan, trains are the dominant mode of commuting, even in a country renowned for its automotive industry. Similarly, in Korea, trains are preferred over driving for long distances, such as between Seoul and Busan. This trend toward sustainable transportation is gaining momentum in the region and is a crucial aspect of sustainable urban development.

How has the market and your customers changed regarding their Environmental, Social and Governance (ESG) targets?

For multinational companies, the shift toward sustainability is substantial, as they all have ESG targets that they are actively working to achieve. Large corporations, including major oil and gas companies like Petronas and others across Asia, are already committed to sustainability goals. However, more effort is needed to reach small and medium-sized enterprises (SMEs). Educating these businesses about sustainability, especially in Asia, often requires collaboration with industry bodies.

Narayanan speaking at the ENERtec Asia 2024 in Kuala Lumpur

Many countries already have energy ratings for consumer products, with higher ratings indicating more efficient products. This system helps to educate both the market and consumers. As electricity costs rise, people are more likely to invest in energy-efficient products. For example, energy tariffs in the Philippines are significantly higher than in Malaysia or Thailand, driving the adoption of more energy-efficient products and appliances, such as air conditioners.

How do you see the future? What is the market potential for energy efficiency and ABB Motion in the Asia Pacific?

We are in a strong position because sustainability and energy efficiency are now top priorities for everyone. The market for motors is expected to double, at least in terms of quantity. Motors and drives are used across all industries, from light industries like HVAC, air conditioning, water management, and food and beverage, to heavy industries such as mining, oil and gas, metals, and cement. The trend toward decarbonization is also driving demand, as there is a shift from mechanical to electric equipment. Additionally, the rise of e-mobility is pushing the market toward electric solutions. The market is growing significantly across various sectors, and this points to strong prospects for the Motion business, both in Asia and globally.

As the number one global player in motors and drives, ABB has both the opportunity and responsibility to add value, not only for our customers but also for a better planet.

Read more about some ABB Motion success cases:

ABB secures $150 million traction contract to power Australia's QTMP trains and announces new facility in regional Queensland

https://new.abb.com/news/detail/113434/abb-secures-150-million-traction-contract-to-power-australias-qtmp-trains-and-announces-new-facility-in-regional-queensland

German sewage plant cuts energy use by 40 percent, starts supplying power back to the grid

https://www.energyefficiencymovement.com/ie5-synrm-motor-and-drive-packages-clearly-improve-energy-efficiency-in-wastewater-treatment/

ABB is a technology leader in electrification and automation, enabling a more sustainable and resource-efficient future. The company's solutions connect engineering know-how and software to optimize how things are manufactured, moved, powered and operated. Building on over 140 years of excellence, ABB's more than 105,000 employees are committed to driving innovations that accelerate industrial transformation.
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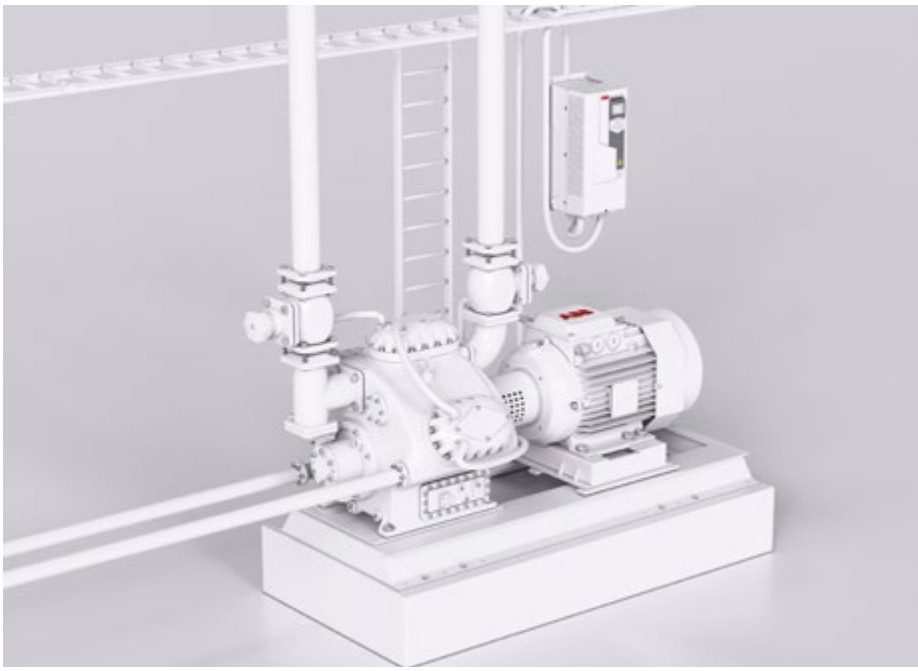
IES SynRM motors & drives - unparalleled energy efficiency



Energy effective compressor control with ABB drives and IE5 SynRM motors

EMPOWERING DECARBONISATION IN THE BUILT ENVIRONMENT WITH ENERGY-AS-A-SERVICE: A PATH TO CARBON NEUTRALITY

By Keppel

Decarbonisation is an immediate priority

During the signing of the Paris Agreement in 2016, nations around the world pledged to keep the rise in global surface temperature to a maximum of 1.5 degrees celsius to mitigate the impacts of climate change. However, achieving this ambitious target requires global greenhouse gas emissions to be halved by 2030.

The end goal for the world is to reach net zero emissions by 2050, where all emissions released by human activities are offset by removing carbon from the atmosphere. Decarbonisation is thus a critical aspect of sustainability, and a key enabler for nations, governments, city leaders, and corporations to achieve net zero.

Keppel

KEPPEL IS THE FIRST DISTRICT COOLING OPERATOR IN SINGAPORE AND HAS A PRESENCE IN CHINA, THAILAND, AND VIETNAM. WITH MORE THAN TWO DECADES OF EXPERIENCE IN DESIGNING, BUILDING, OWNING, AND OPERATING CHILLED WATER SYSTEMS, KEPPEL SERVES A WIDE RANGE OF CUSTOMERS, INCLUDING COMMERCIAL AND INDUSTRIAL FACILITIES, THROUGH OUR DISTRICT AND RETAIL COOLING SERVICES.

ENERGY-AS-A-SERVICE IS THE FUTURE OF AN EVOLVING ENERGY LANDSCAPE

The global push towards decarbonisation has reshaped the energy landscape. Traditional energy models rely on fossil fuels and are being challenged by the need for cleaner and more sustainable alternatives. However, the transition is not without its challenges. Businesses and communities face the daunting task of balancing energy reliability and costs with environmental impact while adapting to rapidly changing technologies and regulations.

One solution that supports decarbonisation efforts is Keppel's Energy-as-a-Service (EaaS) offering, a comprehensive service model that provides customers with tailored energy solutions without the need for significant upfront capital investment. Keppel EaaS operates on a subscription-based business model where clients pay recurring subscription fees for access to Cooling-as-a-Service (CaaS), solar power, and electric vehicle (EV) charging points.

EaaS supports commercial and industrial clients in ASEAN and Asia Pacific towards achieving their carbon neutrality goals by providing an easy-to-implement solution. Through EaaS, deployment of energy efficient infrastructure is simplified. EaaS also brings about cost reductions that asset owners alone cannot achieve. Leveraging data analytics and machine learning tools housed in the KI@Changi Operations Nerve Centre (ONC), we can help building and asset owners reduce their overall energy consumption.

COOLING IS A CRUCIAL PART OF THE ENERGY EFFICIENCY PUZZLE

Keppel is the first district cooling operator in Singapore and has a presence in China, Thailand, and Vietnam. With more than two decades of experience in designing, building, owning, and operating chilled water systems, Keppel serves a wide range of customers, including commercial and industrial facilities, through our district and retail cooling services.

While retail cooling provides cooling for individual buildings, district cooling entails building a centralised chiller plant to distribute cooling to buildings, which can bring about energy and cost savings by aggregating demand from various users. Due to the greater focus on sustainability and the increasing cost of energy, there has been an uptick in demand for Keppel's district cooling solutions, as district and retail cooling can yield significant long-term life energy savings of up to 20-40%.

Keppel can also undertake the operations and maintenance of cooling systems. Repair and overhaul costs are also reduced through a pay-as-you-use tariff model.

In Singapore, Keppel also supports its customers' aspirations for achieving Building and Construction Authority (BCA) Green Mark levels and National Environment Agency (NEA) Minimum Energy Efficiency Standards (MEES).

EAAS IN ACTION

Keppel serves more than 80 developments with over 250,000 refrigeration tonnes (RT) of designed capacity across its international district and retail cooling portfolio. The cooling portfolio is augmented by our growing presence in the solar and EV charging space. Four of Keppel EaaS' notable projects include:

A) The new large-scale district cooling system (DCS) plant over a 30-year period located in Jurong Lake District (JLD), envisioned to be a carbon services hub and a leading centre for green finance in Asia and globally. With a design capacity of 29,000 refrigeration tons to supply chilled water and related services to an estimated 1.4 million square metre of gross floor area (GFA), Keppel's DCS solution for JLD can achieve superior efficiency levels which are over 30% higher than conventional in-building systems and 18% higher than the NEA's MEES, as well as garner significant cost savings of up to 30% compared to conventional systems through state-of-the-art technology and proven operating know-how. With best-in-class design and operations, the JLD DCS plant is estimated to be able to abate over 145,000 tonnes of carbon emissions, equivalent to planting 100,000 trees.

B) The provision of CaaS to Raffles City Singapore over a 15-year period, after being awarded a contract by CapitaLand Investments. With over 3.45 million square feet of GFA and an installed capacity of 10,000 RT, Raffles City Singapore will be the largest integrated development by GFA in Singapore and one of the largest in Southeast Asia to adopt the CaaS system to date.

C) The ongoing installation of Singapore's largest single-site solar photovoltaic (PV) system at Changi Airport. This PV system will generate a total of 43 Megawatt peaks of clean energy—enough to power more than 10,000 four-room HDB flats annually. It will reduce Changi Airport Group's carbon emissions by up to 20,000 tons annually. The PV system will be remotely monitored with predictive maintenance capabilities integrated in Keppel's ONC to enhance energy management and system reliability.

D) Implementation and operation of Southeast Asia's largest public EV fast-charging hub at Jalan Papan in Singapore by Setsco Services. Volt will operate the fast-charging hub for up to 15 years, and the hub will feature up to 80 direct-current charging points which will be installed in multiple phases to serve the general public, including electric buses, taxis, private hire cars, and other electric vehicles.

The transition to a net-zero world requires innovative approaches that can adapt to the evolving energy landscape. EaaS offers a compelling solution by providing the flexibility, efficiency, and sustainability needed to navigate this transition. As more businesses and communities implement EaaS, we move closer to realising a future where energy is not only clean and affordable but also resilient and reliable. Keppel EaaS seeks to support decarbonisation efforts locally and regionally, and ultimately contribute to the global net zero endeavour for a more sustainable future.

Keppel Ltd. is a global asset manager and operator with strong expertise in sustainability-related solutions spanning the areas of infrastructure, real estate and connectivity. Headquartered in Singapore, Keppel operates in more than 20 countries worldwide, providing critical infrastructure and services for renewables, clean energy, decarbonisation, sustainable urban renewal and digital connectivity. Keppel creates value for investors and stakeholders through its quality investment platforms and diverse asset portfolios, including private funds and listed real estate and business trusts.

www.keppel.com

Keppel

IMAGINE THE POTENTIAL IF ENTIRE CITIES COORDINATED EFFORTS TO MITIGATE THEIR ENVIRONMENTAL FOOTPRINT RATHER THAN INDIVIDUAL BUILDINGS. THIS COLLECTIVE APPROACH IS ESSENTIAL FOR ACHIEVING THE TRANSFORMATIVE CHANGES NECESSARY TO REACH NET ZERO EMISSIONS.

By Aysha AlShriem
Chief Admin and Support Services Officer, Sustainability Lead

NAVIGATING THE ENERGY TRANSITION TO A NET ZERO WORLD: THE ROLE OF DISTRICT COOLING

Amidst escalating climate impacts, the priority to achieve a net zero world has never been clearer. At the heart of this transformation lies the energy sector, tasked with drastically reducing greenhouse gas emissions. A promising solution in this journey is district cooling–a system that provides energy-efficient cooling solutions for urban areas.

While individual efforts to reduce carbon footprints are commendable, the scale of impact remains limited without collective action. Shifting focus from isolated projects to city-wide initiatives can yield profound changes. Imagine the potential if entire cities coordinated efforts to mitigate their environmental footprint rather than individual buildings. This collective approach is essential for achieving the transformative changes necessary to reach net zero emissions.

قطر كوول
QATAR COOL

BY INVESTING IN AND PROMOTING DISTRICT COOLING, STAKEHOLDERS CAN PAVE THE WAY FOR A MORE SUSTAINABLE AND RESILIENT URBAN INFRASTRUCTURE. THIS INCLUDES PRIORITIZING RENEWABLE ENERGY INTEGRATION, OPTIMIZING ENERGY EFFICIENCY, AND ENSURING EQUITABLE ACCESS TO EFFICIENT COOLING SOLUTIONS FOR ALL RESIDENTS.

Urban areas, notorious for their heat retention (the urban heat island effect), intensify energy consumption and discomfort. District cooling systems offer a solution by centralizing cooling processes, reducing the heat output associated with numerous individual air conditioning units. This not only cools urban environments but also supports biodiversity by fostering cooler habitats. Moreover, district cooling systems effectively manage peak electricity demand–a challenge exacerbated by traditional air conditioning methods. By storing chilled water during off-peak hours and integrating renewable energy sources like solar and geothermal power, these systems enhance sustainability and grid stability. This integration reduces reliance on fossil fuels, lowers emissions, and ensures reliable cooling even in hot climates.

Implementing district cooling systems presents initial challenges such as high infrastructure costs and resistance from stakeholders accustomed to traditional cooling methods. However, the obligation to secure a sustainable future for generations to come outweighs these obstacles. We are collectively responsible for the environmental challenges we face today, and therefore, collective action is essential to rectify them. If we fail to act decisively, the outlook for future generations will be stark.

As cities continue to grow and face escalating climate pressures, the demand for sustainable cooling solutions will only increase. Policymakers, urban planners, and energy providers must collaborate closely to integrate district cooling systems into broader sustainability frameworks. This proactive approach not only accelerates the transition towards a net zero future but also strengthens urban resilience and enhances overall livability.

By investing in and promoting district cooling, stakeholders can pave the way for a more sustainable and resilient urban infrastructure. This includes prioritizing renewable energy integration, optimizing energy efficiency, and ensuring equitable access to efficient cooling solutions for all residents. Ultimately, embracing district cooling represents a pivotal step towards achieving environmental sustainability and securing a prosperous future for generations to come.

In conclusion, as we navigate the complexities of the energy transition, embracing district cooling emerges as a crucial step towards sustainability. By optimizing energy efficiency, harnessing renewable resources, and mitigating urban heat, district cooling systems pave the way for a resilient, net zero future.

Qatar Cool is the leading district cooling company's in Qatar. Since its inception, Qatar Cool has aimed for operational excellence in every aspect of its business. Over the past 20 years, the company has developed solid technical and operational experience and has refined its approach on both business-to-business (B2B) and business-to-consumer (B2C) fronts. Currently, Qatar Cool is the leading commercial provider of district cooling services in Qatar.

Qatar Cool currently owns and operates five cooling plants covering the West Bay and The Pearl-Qatar districts with the combined capacity of 240,500 tons of refrigeration.

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QATAR COOL

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DISTRICT COOLING | DISTRICT HEATING | MULTI ENERGY SYSTEMS (MES) | SMART ENERGY CITY (SEC)

THE ADOPTION OF DISTRICT COOLING AS AN ENERGY EFFICIENT SOLUTION IS CRITICAL AS IT REDUCES ELECTRICITY CONSUMPTION FOR COOLING BY UP TO 50%, AND LINKED GHG EMISSIONS, AND DECREASES THE USE OF REFRIGERANTS.

BEYOND NET ZERO ENERGY: DISTRICT COOLING FOR INTEGRATED AND CIRCULAR RESOURCE USE

By Sudheer Perla
Managing Director,
Tabreed Asia & Country
Manager, Tabreed India

District Cooling is key to achieving net-zero energy goals and promoting integrated, circular resource use. As an industry leader, Tabreed provides efficient and environmentally friendly District Cooling solutions for communities and businesses.

India has witnessed extreme heat waves as a result of rising global temperatures, increasing energy consumption linked to cooling by 21% between 2019 and 2022 with space cooling today accounting for nearly 10% of overall electricity demand in India.

The adoption of District Cooling as an energy efficient solution is critical as it reduces electricity consumption for cooling by up to 50%, and linked GHG emissions, and decreases the use of refrigerants. District Cooling also contributes to a circular economy by repurposing resources otherwise wasted such as waste heat from industrial processes or power plants, and treated water from Sewage Treatment Plants. By harnessing renewable energy and incorporating thermal storage, District Cooling systems further sustainable urban development.

tabreed

In summer 2024, India experienced a total of 536 heatwave days, the highest after 2010 / Photo: IndianExpress

District Co
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Adopting District Cooling to the diverse needs of people and current business conditions

Public-Private Partnerships (PPP)

District Cooling implementation can be accelerated through innovative business models that distribute risks between the customer and provider. Public-Private Partnerships (PPP) are a strategic model where the government and private companies collaborate, pooling resources and expertise for infrastructure projects. This is crucial for social infrastructure or utilities where government expertise is lacking, and private investment is limited due to unclear returns.

Some key obstacles to District Cooling adoption include high initial capital costs, perceived technological risks, and limited visibility on demand. Through contractual risk allocation mechanisms, public-private partnerships can make these projects more manageable and financially feasible – the Provider bears the upfront capital cost, given demand offtake is guaranteed by the Concession grantor, either in the form of mandating District Cooling in the said area or through absorbing the demand risk directly.

The Provider also ensures modern, efficient technology over a 30-year concession, which combined with public oversight, assures the most forward-looking and efficient technology is implemented.

In 2019, Tabreed, a leading District Cooling company, signed a public-private partnership concession with the Andhra Pradesh government to design, build, own and operate India's first District Cooling system in the state's new capital Amaravati. Under this partnership, Tabreed will install 20,000 Refrigeration Tons (RT) of cooling capacity to meet the cooling requirements of Amravati Government Complex, lowering energy consumption by approximately 20-40 million kWh annually and saving up to 350 million litres of water annually.

Similarly, in 2023, Tabreed and the Telangana government partnered for Asia's largest PPP concession for implementing a District Cooling scheme of 125,000 RT for Hyderabad Pharma City, investing up to $200 million slated to save 6,800 GWh of power, and 41,600 mega litres of water.

These projects exemplify how public-private partnerships can successfully implement District Cooling systems in a cost-effective and efficient manner.

Cooling as a Service (CaaS)

Cooling as a Service (CaaS) is a model where a Provider (District Cooling company) designs, builds, finances, owns, operates, and maintains cooling systems for buildings & customers. Instead of buying and managing their own equipment, Customers pay for cooling as a service, often through a subscription model based on usage, which helps lower upfront costs. Through management of the centralized system by a professional District Cooling company with expertise in operating and maintaining cooling systems efficiently, CaaS can offer significant savings to customers, reducing cooling costs by up to 23% and emissions from electricity use and coolant leakage by up to 49%.

Tabreed is successfully implementing CaaS for Tata Realty's Intellion Park in Gurgaon, which demonstrates how passive and active interventions can come together to foster sustainability in development.

Enabling policy and regulatory environment

Government support is crucial for enabling District Cooling in developing countries like India, as illustrated through regulatory mechanisms adopted in Singapore and other South Asian countries. The India Cooling Action Plan (ICAP), launched in 2019 by the Ministry of Environment, Forest and Climate Change (MOEFCC), highlights District Cooling as a solution to meet the growing demand for cooling in India in a climate-friendly manner. ICAP aims to reduce cooling energy requirements by 25-40% and refrigerant use by 25-30% by 2037-38, for which passive cooling design and District Cooling could be significant levers.

However, the District Cooling and CaaS market in India remains in a relatively embryonic stage due to real estate developers making their individual and varied cooling technology choices. A regulatory framework can ensure that District Cooling systems are integrated into urban planning and development strategies early on, as exemplified in the projects undertaken by the governments

ooling systems like those from Tabreed use wage water for cooling purposes, not only usands of liters of potable water but also g blowdown into our rivers and lakes/ Photo: niversity

District Cooling replaces multiple air conditioning units with a single, efficient central system

in Amaravati and Hyderabad. As a forerunner, Tamil Nadu has set up a District Cooling Steering Committee under the State Planning Commission to put forth District Cooling Guidelines and Policy for the State. As a part of the workshop organised by Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), Bureau of Energy Efficiency (BEE) and Tabreed India, state officials met industry stakeholders in a round table to understand the challenges and opportunities District Cooling presents for Tamil Nadu. The discussions, alongside recommendations for the State, have been published in a pre and post-workshop report (the former is available to view at this link).

Furthermore, government policies and regulations can play a crucial role in streamlining and standardizing cooling approaches by promoting District Cooling and Cooling as a Service (CaaS). These strategies can help states achieve their environmental goals and contribute to India's Nationally Determined Contribution (NDCs) under the 2015 Paris Agreement, by reducing GHG emissions and promoting climate Smart Cities.

While no financial support is likely required, an enabling policy environment can be highly beneficial, including government-backed awareness campaigns to educate stakeholders about the long-term benefits and cost savings associated with District Cooling; mandatory annual disclosures and audits of buildings' energy consumption and efficiency to retain their green certification; feasibility studies to incorporate District Cooling as part of the Environmental Impact Assessment (EIA) report submitted for building clearance and approvals; an easier and fast-tracked permitting regime for buildings adopting District Cooling; differential power tariffs; and zoning and mandates in high-density areas, including Special Economic Zones (SEZs).

District Cooling can make our cities cooler, significantly cutting our dependence on fossil fuels and advancing the creation of sustainable, liveable cities for future generations.

National Central Cooling Company PJSC (DFM: Tabreed)

is a leading international district cooling utility headquartered in the UAE that provides energy-efficient, cost-effective, and environmentally friendly year-round cooling solutions in 6 countries, including Indian markets, through its 89 plants, delivering 1.35 million refrigeration tons (RT) of cooling services to major residential, commercial, government and private developments, eliminating over 1.4 million tons of CO2 emissions annually through its sustainable approach to cooling.

Tabreed India Private Limited is a wholly owned subsidiary of Tabreed Asia Central Cooling Company a 75-25 joint venture between Tabreed UAE and World Bank's International Finance Corporation (IFC). Tabreed India is actively engaged with several leading real estate developers and institutional investors across the country, for implementing and operating district cooling or stand-alone central cooling plants.

tabreed

One of the world's largest public listed cooling utilities

Project design and delivery

Technology and OEM agnostic

Strong R&D and Innovation Focus

Life-cycle cost view

Financing & Capital Structure

$4 BN Consolidated Asset Base

Investment Grade (Fitch-BBB)

Green Bonds Financing Framework

Capital recovery tariffs over 30 years

Operations track record

SLA/KPI based service delivery

Automation, Unmanned, Central teams

25 years, oldest plant in operation

99.8% cumulative average reliability

Centralized Maintenance

In-house with minimal OEM reliance

Reliability Centered Processes

Footprint & Impact

90 plants In 6 countries

1.3 million RT of delivered cooling capacity

1.1 GW Power infrastructure avoided

475 MN+ Sft of area served

1.5 mn tons Elimination of CO2 emissions in 2022 vs alternative approaches

2.5 billion kWh energy consumption saved in 2022 compared to alternatives

Primary Shareholders

MUBADALA

Government of Abu Dhabi's investment fund.

ENGIE

Largest independent power producer (c. 100 GW) and leader in low-carbon services.

Asia Presence through IFC Partnership

tabreed 75%

IFC 25%

Tabreed Asia Central Cooling Company, Singapore — tabreed India

TECH EMERGE

AN INNOVATION OF IFC International Finance Corporation WORLD BANK GROUP

Accelerating market adoption of sustainable cooling technologies through match-making and grant funding (in partnership with IFC)

Cooling Services provider to several iconic buildings

Burj Khalifa

Dubai Mall

Sheikh Zayed Mosque

Yas Marina Circuit

Dubai Metro

Ferrari World

World Trade Center

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APUEA
Asia Pacific Urban Energy Association


WITH URBANIZATION ON THE RISE
+2.5 BILLION
MORE PEOPLE EXPECTED TO LIVE IN
CITIES & URBAN CENTERS BY 2050.

NAVIGATING THE ENERGY TRANSITION FOR A NET ZERO WORLD: DISTRICT COOLING AS A SOLUTION

As the world grapples with the urgent need to transition to a more sustainable energy model, the concept of a 'Net Zero World' has emerged as a beacon of hope. As urbanization accelerates and outdoor temperatures rise, the demand for cooling in cities is surging.

This vision entails a future where human activities result in no net increase in Green House Gas (GHG) emissions, effectively curbing the global warming. Countries like Saudi Arabia, Qatar, UAE, and India for example, are leading the charge with ambitious net-zero commitments, pledging to eliminate their carbon footprints by transitioning from non-renewable to renewable energy sources.

One of the key strategies to achieve this ambitious goal is through the implementation of district cooling systems.

GRUNDFOS

HEATING & COOLING SYSTEMS ACCOUNT FOR NEARLY 50% OF TODAY'S GLOBAL ENERGY CONSUMPTION.

There are many different types of buildings in a city, and the diverse energy profiles of these buildings (building diversity factors) result in varying cooling demand times for end-users. This variation allows the peak cooling loads supplied by district cooling systems to be lower than the total energy consumption of individual buildings, effectively reducing the peak load and the size of the equipment (chillers and pumps, etc.) needed for the district cooling plant.

Additionally, by providing chilled water from a central plant, individual buildings can eliminate their mechanical rooms and cooling towers. This not only frees up space that was previously allocated to these facilities for other uses, but also reduces equipment maintenance costs by centralizing the cooling system within the plant.

District cooling systems are not source-specific and can connect to one or several renewable sources. These sources can include an industrial heat pump, recovered waste heat, rivers, lakes, solar energy, deep geothermal or geo-exchange. This flexibility allows the system to chill water using renewable energy, further reducing greenhouse gas emissions.

GRUNDFOS: PIONEERING THE DISTRICT COOLING REVOLUTION

Grundfos, a global leader in advanced pump solutions and water technology, is at the forefront of this district cooling revolution. With its innovative and energy-efficient pumping solutions, Grundfos is helping cities worldwide transition towards a more sustainable future.

Did you know that cooling is the most rapidly expanding energy usage in buildings? It's projected that by 2050, the energy demand for cooling will have tripled! Cooling systems account for 50-70% of peak electricity demand, and it's estimated that they consume 20% of the world's electricity. This figure is anticipated to rise to approximately 40% of the world's total electricity consumption by 2050.

District cooling can enhance cooling efficiency by 5-10 times compared to traditional unitary systems, and 1.5-3 times compared to standalone chilled water systems. The growth rate of district cooling is expected to be 7-9% year over year until 2030.

Grundfos' district cooling solutions are engineered to optimize energy usage, decrease operational costs, and reduce environmental impact. These systems utilize water as a cooling medium, which is circulated through a network of insulated pipes to deliver chilled water to various buildings in a district.
Grundfos is committed to developing solutions that not only energy saving but also use the available energy more efficiently in entire district cooling grid.

A key example of this is E-pumps, which on average consume 37% less energy than standard pumps. These speed-regulated E-pumps, along with digitally enabled solutions and optimization services, are at the heart of the company's plans.

Grundfos can improve the efficiency of chillers by providing hydronic balancing to the grid via E-pumps. This involves system monitoring the partial loads in the building, balancing the pressure within the grid, and maintaining the desired return temperature from the building to the grid. With proven results in district heating in China, we have achieved a 45% savings in pump energy and an 18% reduction in energy consumption across the entire heating system with Grundfos' hydronic balancing solution.

These solutions offer immediate savings from lower energy consumption and optimized processes, and they achieve GHG emissions reduction without compromising reliability. This is particularly important in many industrial processes where reliability is a critical requirement.

THE ROLE OF DISTRICT COOLING IN THE ENERGY TRANSITION

District cooling plays a crucial role in the energy transition for several reasons. Firstly, it significantly reduces the demand for electricity for air conditioning or individual cooling systems, which is one of the major contributors to peak electricity demand in many countries. By reducing peak demand, district cooling can help to decrease the reliance on fossil fuel-based power generation, thereby reducing GHG emissions.

Secondly, district cooling systems can be integrated with other renewable energy sources, such as solar or wind power, further enhancing their environmental benefits. For instance, produced electricity from Photo-Voltaic consume directly as source for electric chillers to produce chilled water and provide to buildings. And excess renewable energy produced during off-peak times can be used to power the district cooling system, effectively storing thermal energy storage and use for peak shaving of chillers.

Lastly, by centralizing the cooling function, district cooling systems can achieve economies of scale, resulting in lower operational and maintenance costs compared to individual air-conditioning units.

By significantly reducing electricity consumption and GHG emissions, district cooling is an economical pathway toward achieving Net Zero carbon buildings. This is where Grundfos steps in.

Grundfos is accelerating the energy transition in cities by creating the future of district heating and cooling networks. Their aim is to be a trusted partner, available locally, equipped with the right knowledge and experience to provide pre-sales and after-sales support.

In essence, Grundfos is not just providing a solution, but a partnership for a sustainable future.

Together, we can make Net Zero carbon buildings a reality.

Join us in shaping a sustainable future with district energy. Grundfos – your partner for efficient, green district solutions.

COOLING IS THE FASTEST GROWING USE OF ENERGY IN CITIES THE DEMAND FOR SPACE COOLING IS EXPECTED TO 3X BY 2050

Grundfos in brief

Grundfos develops, produces and sells pump solutions, which help reduce water-related challenges globally. We create research and product development-based solutions to meet growing demands of customers and the outside world for minimizing the consumption of resources as well as the emission of CO2.

Our solutions are used for heating, cooling and ventilation in buildings, and industrial purposes among other things. They are also used in the water supply, water treatment and wastewater sectors.

To minimize energy consumption, several pumps are equipped with intelligent built-in electronics ensuring that the pumps provide no more no less than what is needed. Some of them are powered by solar energy.

An annual production of more than 15 million units positions the Grundfos Group as one of the world's largest pump manufacturers. The Group employs approximately 20,000 people located in companies in 56 countries.

The company was founded in 1945 and today the Poul Due Jensen Foundation is the main shareholder. Profits are re-invested in the company as a means of continued growth.

GRUNDFOS

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ONE OF DISTRICT ENERGY'S STRENGTHS IS ITS ABILITY TO USE NON-FOSSIL FUEL ENERGY SOURCES, SUCH AS WATER, BIOMASS, AND ENERGY FROM WASTE. THE FUTURE LIES IN HAVING MULTIPLE ENERGY SOURCES SUPPLYING THESE NETWORKS.

INTERVIEW

WITH GLYN ADDICOTT

Operations Director
Hydraulic Analysis Group

The concept of digital twins has gained significant traction in recent years, and as technology advances, it's becoming evident that software modeling of infrastructure projects–such as water, gas, and district energy systems–can greatly optimize operations and enhance system efficiency. To explore how digital twins can be applied to district energy systems, we spoke with Glyn Addicott, Operations Director at Hydraulic Analysis Group. In our discussion, we delved into the potential benefits that district energy systems can offer to cities and districts, and how digital twins and hydraulic modeling can help overcome some of the complexities currently hindering their development.

hydraulic analysis group

By APUEA Secretariat

> DISTRICT ENERGY SYSTEMS ARE COMPLEX, AND OUR EXPERTISE LIES IN FINDING SOLUTIONS, WHETHER IT'S IDENTIFYING BYPASSES, TROUBLESHOOTING USER ISSUES, OR OPTIMIZING SYSTEM PERFORMANCE. WHEN YOU HAVE A DIGITAL TWIN OF THE SYSTEM AND CAN COMPARE IT TO THE ACTUAL MEASURED SYSTEM, DISCREPANCIES BETWEEN THE SIMULATED AND MEASURED DATA HIGHLIGHT THE AREAS WHERE PROBLEMS EXIST.

Can you make an introduction of yourself and the Hydraulic Analysis group?

I am the Operations Director for the Hydraulic Analysis Group, the world's leading pipeline simulation specialist. We have been in business for over 50 years, with offices around the globe and our headquarters in the United Kingdom. We specialize in the modeling of pipeline systems across various sectors, including oil and gas, water, and district energy.

Our involvement in district energy dates back to 1981, when we contributed to design studies for district energy systems in Denmark. What sets us apart is our ability to deploy our software not only for design and planning but also in control center environments for real-time hydraulic simulation or digital twins. These systems operate continuously, providing live data and analysis on pipeline networks worldwide, including in China, Indonesia, Malaysia, the Middle East, and Europe.

Can you describe the business scope and your main activities and goals?

Our main business focuses on the hydraulic design of pipeline systems, and surge analysis. What makes our software unique is its ability to model highly detailed control systems. When simulating panel systems, we don't just analyze pressure, flow, and temperature changes; we also model the impact on controllers. This is critical for accurate simulations because when a control valve or pump speed controller activates, it can significantly alter the system's hydraulics. This capability allows us to achieve highly accurate modeling of systems, both offline and in real-time environments, with typical errors of just 2-3% between simulated and measured data. With this level of precision, it becomes much easier to identify and resolve issues within the system.

Can you share which markets in the Asia-Pacific you are active in?

Our experience in the Asia-Pacific region is extensive. Personally, I've worked on projects in Japan, Indonesia, China, Thailand, Vietnam, Malaysia, Singapore, Myanmar, Brunei, Australia, and New Zealand. We have a large office in Jakarta, staffed by engineers with over 10 years of experience, who support and install these systems. We are not new to district energy or the Asia-Pacific region. Although I'm based in the UK, I spend a significant amount of time in this region, having set up our offices there. I'm a seasoned traveler who enjoys visiting these diverse and unique countries.

What are the key benefits and challenges of district energy systems, and how can they contribute to addressing climate change and energy efficiency?

I believe district energy is essential for addressing fuel poverty, spiking oil and gas prices, and most importantly, climate change. Decentralized, localized energy is a powerful tool because it doesn't rely on grids and supports diverse, low-cost energy sources. One of district energy's strengths is its ability to use non-fossil fuel energy sources, such as water, biomass, and energy from waste. The future lies in having multiple energy sources supplying these networks. In the UK, the main challenge is the significant upfront investment in infrastructure, such as underground pipes, which requires a long-term return on investment.

What inspires me about district energy is the drive and commitment of people in the industry, especially the growing interest from young professionals. We regularly welcome new graduates who are eager to integrate technologies like AI and machine learning into the industry. Attracting young talent is crucial, especially as the average age in Europe's district energy sector is over 50, though this is beginning to change.

Can you explain how you are applying your solutions for District Energy networks?

I always stress that district energy systems are among the most complex to understand and model. While we work in sectors like water, oil, gas, petrochemical, nuclear, and food industries, district energy systems are unique in their complexity. They involve not only pressure, flow, temperatures, and hydraulics, but also independent control systems.

Achieving an accurate hydraulic model of a district energy system is challenging because it requires understanding how all the control systems interact. Building complexity into your hydraulic model is essential for understanding how the system operates. While we do a lot of design-based hydraulic modeling for district energy, particularly in the UK where district energy is relatively new, most of our projects involve troubleshooting. Often, these systems don't perform as expected due to a lack of understanding of how they should operate. Common issues include high return temperatures or the inability to meet energy loads, often due to user buildings.

One example is the Putrajaya district cooling system in Malaysia, a project we worked on many years ago. We conducted the design study, but the client faced challenges because the system was designed for full build-out. As is often the case, customer sign-ups and connections were slow, causing difficulties in the early stages. We helped stabilize the system by installing small temporary control valves to bypass the main controllers. This kind of support is one of our strengths.

District energy systems are complex,

and our expertise lies in finding inefficiencies, whether it's identifying bypasses, troubleshooting user issues, or optimizing system performance. When you have a digital twin of the system and can compare it to the actual measured system, discrepancies between the simulated and measured data highlight the areas where problems exist. For example, in a current project, we discovered three open bypasses in one system. This caused the system to underperform, but once these bypasses were closed, the system's performance dramatically improved, delivering an additional 1.5 megawatts of energy.

We're also excited about the possibilities in what we call the "live world" or real-time environment. By connecting our hydraulic model to SCADA or BMS systems, we can run a continually live hydraulic model. We have many such examples in industries like gas and water, with real-time digital twins operating in countries like China, Indonesia, the UAE, Qatar, and Saudi Arabia. We're now beginning to implement this technology in district energy systems in mainland Europe, which will allow us to optimize energy use and improve efficiency.

Can you give an estimate how much energy you can save by optimize pumping in a system?

We're confident in achieving a 10-15% reduction in energy costs through optimization alone, without needing equipment changes. Beyond this, further savings would require system modifications, like replacing 3-port valves with 2-port valves or upgrading heat exchangers.

Adding components like thermal storages, chillers, or batteries can further enhance efficiency. A common issue in district energy systems is that pumps often run at high speeds or pressures, which are then reduced by control valves, wasting energy. Our software includes an optimizer that identifies the ideal pump speeds and control valve settings to minimize energy use while maintaining performance. Unlike simple optimizers, our hydraulic model tests the impact of changes across the entire system, ensuring that adjustments are beneficial throughout.

We also offer a training simulation tool, popular in China, which functions like a flight simulator for district energy. Operators can test changes in a virtual environment, reducing the risk of errors in the actual system and building confidence in making adjustments.

Can you share some ongoing market developments for district energy?

In the UK, there's a need to repeatedly explain district energy, unlike in mainland Europe, where it's more familiar, particularly in places like Denmark and Sweden. Interestingly, policies are shifting. For instance, in Denmark, it's no longer mandatory to connect to district energy, allowing the use of gas, which feels like a step backward. However, other regions, especially in Asia Pacific, seem more aware and enthusiastic about district energy.

While countries like Indonesia might be a bit behind, there's still a strong understanding of the environmental and cost benefits of district energy. This awareness is crucial and something we need to foster globally. For example, in Canada, we worked on a massive project called ESAP, which involved creating chilled water and district heating networks to decarbonize government buildings in Ottawa. It was reassuring to see that Canadians understood the benefits of district energy, replacing legacy steam systems with river water heat pumps and decarbonizing 80 buildings with a 250 MW network.

Overall, it's encouraging to see district energy gaining traction, especially among the younger generation, who are more informed and open to change. Education remains vital, which is one reason I'm passionate about sharing knowledge and promoting district energy. It's not just about selling; it's about ensuring people understand the broader benefits district energy can offer. Another trend we observe is the development of smaller, localized district energy systems that can later be interconnected. This approach requires less initial investment and allows for faster implementation compared to large, complex systems.

What are some of challenges and misconceptions for district energy systems?

The challenge with district energy systems is how easily they can go wrong. Often, a network will start off working well, but if problems arise, someone might change a valve set point without fully understanding the consequences. This can lead to a cascade of changes, altering how the entire system operates, and ultimately, people may revert to using gas, blaming the system for not working as intended.

People often assume heating or cooling systems in the nuclear or oil and gas sectors are complex, but those systems usually have constant flows and locked-in settings, making them easier to manage. District energy, on the other hand, involves varying demands and human factors, making it much more complex to balance and operate consistently. The demand on a district energy system can fluctuate dramatically within a day, and these changes need to be understood and managed carefully.

The reputation of district energy systems often suffers not because of bad design, but due to the lack of proper training or documentation. When set points or valve positions are changed without being logged, it leads to confusion and inefficiency. It's crucial that operators understand the impact of their actions on the system as a whole, and that changes are properly recorded to avoid long-term issues.

How do you see the future for district energy systems?

District energy systems are evolving with the integration of digital twin technology, which involves creating live hydraulic models and employing machine learning to optimize performance. These systems can leverage real-time data such as weather forecasts and electricity tariffs to enhance efficiency. Innovations include energy-sharing solutions between buildings and advanced technologies for connecting to existing structures, which help reduce costs.

Given that heating and cooling account for approximately 40% of global energy consumption, the role of district energy is becoming increasingly crucial. In the UK, while there is a strong push for individual heat pumps, these systems are not always suitable for every building due to space and size constraints. In such cases, district energy systems are often a more viable and effective solution, particularly in economically disadvantaged areas. The initial costs and disruption associated

with installing district energy pipes are mitigated by advancements in technology. Modern plastic pipes, which can last up to 100 years, are easier and cheaper to install compared to traditional metal pipes. This shift to plastic pipes is expected to facilitate wider adoption of district heating and cooling systems.

As the industry continues to innovate, the potential for district energy systems is expanding. Emerging technologies, such as more efficient heat exchangers and the use of various energy sources, could make district energy even more cost-effective. By incorporating multiple energy sources, these systems can better manage fluctuations in energy availability and pricing, leading to more reliable and flexible energy solutions.

What technologies do you think will be important in the energy transition?

From my perspective, the integration of digital twins and machine learning is transforming district energy systems. We're seeing this especially in China, Dubai, and Qatar, where live hydraulic models and centralized data management are enhancing system efficiency and visibility. Digital twins consolidate data on pressure, flow, and energy into one platform, allowing operators to monitor and optimize the system more effectively. This centralization also enables customized dashboards for each operator, making it easier to understand and manage the system.

Moreover, there's a lot of untapped potential in using water and geothermal energy. Water, with its consistent temperature differences, provides a reliable energy source. Technologies to extract energy from river or lake water could significantly boost district energy efficiency. Similarly, geothermal energy, particularly in regions like Indonesia with vast reserves, offers great promise.

Incorporating digital twins is crucial for maximizing these advancements. They provide a comprehensive view of the system, overcoming the challenge of monitoring buried pipelines and helping to identify and resolve issues more effectively. Overall, the combination of digital twins, innovative energy sources, and centralized data management is driving the future of district energy. These technologies make systems more efficient, flexible, and capable of meeting global energy needs.

How has the market and your customers changed regarding ESG targets?

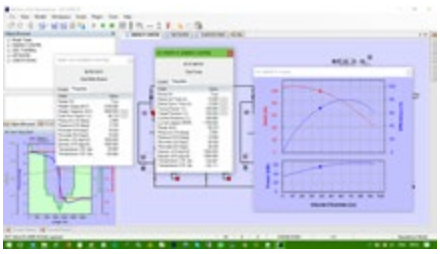
I believe we are witnessing a significant shift in how businesses approach ESG targets. It's impressive to see that these targets are no longer just a compliance measure but are becoming integral to corporate strategy. Companies are increasingly focused on understanding and reducing their carbon footprints, which is a crucial step forward. However, to drive real progress, we need robust government policies. Governments must set clear regulations and incentives to guide this transition effectively.

The younger generation is playing a pivotal role in this transformation. They are not just aware of environmental issues but are actively demanding change. This generational shift is evident globally, from the proactive stance of young people in China to the growing environmental consciousness among Indonesian graduates. Their pressure on governments is helping to accelerate the adoption of green energy solutions. In terms of energy infrastructure, investments in district energy systems are essential. However, for these systems to be viable, they need to compete on a level playing field with other energy sources. This is where government policy is critical—subsidies for fossil fuels can skew the market and make it harder for cleaner alternatives to gain traction.

In the Asia-Pacific region, we are seeing encouraging developments, with district energy becoming a standard consideration for new buildings and developments. This is a positive trend, but we need to ensure that these systems are powered by green energy sources, not fossil fuels. The focus should be on reducing reliance on fossil fuels entirely, not just offsetting emissions. Renewable energy sources, such as wind and solar, offer enormous potential and should be at the forefront of our strategy. We also need to be vigilant about distractions in our energy policy. For instance, the current push for hydrogen derived from methane is a step in the wrong direction. Instead of being sidetracked by such proposals, we should focus on advancing genuinely sustainable energy solutions and challenging policies that continue to support fossil fuels.

In summary, while ESG targets are becoming more central to corporate operations, we need stronger government action and a concerted effort to shift away from fossil fuels. The future of energy depends on embracing renewable sources and leveraging technologies that enhance efficiency and sustainability.

Lastly I want to acknowledge the importance of industry bodies like APUEA and the work that you do to lobby and try and make a difference by educating the market and increasing awarness of technology and business models.



> WE'RE CONFIDENT IN ACHIEVING A 10-15% REDUCTION IN ENERGY COSTS THROUGH OPTIMIZATION ALONE, WITHOUT NEEDING EQUIPMENT CHANGES.

The Hydraulic Analysis Group supplies high performance software-based pipeline solutions and engineering design / consultancy services to the water, oil, gas, district energy and power industries.

We supply offline and real-time business focused solutions for all aspects of a pipelines' operation using our pipeline hydraulic simulator product (VariSim) that has been developed over 50 years. Our unrivalled experience and knowledge is encapsulated in the product and has allowed us to be active and successful in delivering our solutions to major operating companies in Asia and particularly China.

For more information, visit www.hydraulic-analysis.com.

hydraulic analysis group

VISUAL MANAGEMENT IS INTEGRAL TO THE SUCCESSFUL IMPLEMENTATION OF LEAN. IT INVOLVES THE USE OF VISUAL CUES, DISPLAYS, AND CONTROLS ON THE SHOP FLOOR TO CONVEY CRITICAL INFORMATION ABOUT EQUIPMENT STATUS, MAINTENANCE SCHEDULES, AND PERFORMANCE METRICS.

NEXT-GEN VISUAL MANAGEMENT IN THE LEAN PLANT: 5 BENEFITS

Energy utilities play the leading role in the transition to a Net Zero world. While the spotlight is often on plant technology and design, Operation & Maintenance (O&M) also has a major impact on reducing emissions. Lean originates in Japan's manufacturing industry with the advent of the Toyota Production System and Total Productive Maintenance (TPM).

It emphasizes continuous improvement and operational excellence through waste and loss reduction, efficient processes, and employee involvement. Lean is also applicable to energy utilities (and other types of utilities and infrastructures). Lean is often associated with paper works, checklists, boards displaying printed KPIs, magnetic color tags on whiteboards, etc. While this approach has achieved great results, it may also seem hopelessly outdated in the Smart Plant age.

bluebee®

Bluebee Technologies was founded in 2013, as a spin-off of the Siveco China R&D activity started in 2009, by veterans of the CMMS (Computerized Maintenance Management System) and EAM (Enterprise Asset Management) market, who observed how little support existing systems provided for Lean. Even in highly automated and digitalized plants, all Lean activities remain Excel and paper-based: visual dashboards, inspection checklists, failure analysis etc. Thus, the bluebee® Smart O&M solution was born.

Visual Management is integral to the successful implementation of Lean. It involves the use of visual cues, displays, and controls on the shop floor to convey critical information about equipment status, maintenance schedules, and performance metrics. Visual Management promotes transparency, facilitates communication and understanding among team members and helps engage employees contribute to the overall success of the organization. It is however often hindered by the limitations and burden of paper-based processes still prevalent today.

Traditional paper dashboards and forms

In traditional Lean implementations, Visual Management relies on paper. Not much has changed since the 1980s. Performance dashboards take the form of paper boards displaying KPIs and performance metrics, manually updated. 5S visual controls are based on color coded labels, floor markings, shadow board for tools. Checklists and SOPs consist in paper forms posted on machines. One-point lessons posted on a board, etc. are all paper-based.

A revolutionary shift

The transition from traditional paper dashboards to a digitalized solution such as bluebee® on touch screens or large display panels, with workers on mobile devices and possibly real-time connection to machines, brings about a revolutionary shift in the concept of visual management.

VISUAL MANAGEMENT PROMOTES TRANSPARENCY, FACILITATES COMMUNICATION AND UNDERSTANDING AMONG TEAM MEMBERS AND HELPS ENGAGE EMPLOYEES CONTRIBUTE TO THE OVERALL SUCCESS OF THE ORGANIZATION.

Typical paper-based Lean dashboard

Let's explore 5 benefits of bluebee® for visual management:

1. Visibility

When one visits a Smart factory using bluebee®, Lean excellence is immediately visible, in action:

Operator using bluebee® at a waste-to-energy plant of CEP, a leading Chinese environmental plant

Digital interactive real-time O&M dashboards at gas producer Yingde Gas

2. Real-time

Traditional paper dashboards have static information and lack real-time updates. In contrast, bluebee® offers dynamic, real-time monitoring of KPIs directly from the factory floor, eliminating the need for manual updates and providing instant insights into performance metrics. Real-time alerts for deviations also ensure immediate issue recognition, promoting prompt response and resolution.

3. Trusted data

Instead of relying on handwritten forms, followed perhaps by manual data entry in Excel or ERP, bluebee® seamlessly integrates with real-time management systems, capturing data automatically from machines and workers' mobile devices when maintenance activity happens. This ensures accuracy, reduces delays, and eliminates the risk of human errors.

4. Methodological support

While paper forms may incorporate a step-by-step method in their design (for example 5-Whys), bluebee® interactively assists users to follow the right methodology.

For example, bluebee® mobile aids in root cause analysis, by providing methodological support and access to related historical data such as past failures for this equipment.

Analytics touchscreens invite users to drill-down from plant KPIs into more specific KPIs (for example at machine level), going down into the contributing data, all the way to specific events, as an aid to decision-making.

5. Remote collaboration

Instead of being physically confined to the shop floor like traditional Lean forms and boards, bluebee® offers remote accessibility on web and mobile. Stakeholders can collaborate and access visual data from different locations, fostering efficient teamwork. Photos of incidents and their resolutions are readily available. Remote users access the exact same data, from high level KPIs to specific records, as plant users.

All in all, bluebee® represents a transformative shift from the traditional paper-heavy Lean approach. The solution provides unprecedented visibility and transparency into plant performance and Lean activities, from shop floor workers to top managers all the way to corporate office.

BlueBee® has been adopted by hundreds of utility plants all over Asia, providing daily Visual Management support, ensuring environmental compliance by enforcing O&M best practices and fostering continuous improvement through systematic analysis based on proven data from workers and machines. Users include Singapore PUB for the Tuas Water Reclamation Plant, Phnom Penh Water Supply Authorities, Ranhill Power's Rugading Power Plant in Malaysia, Keppel Infrastructure for the Hongkong Integrated Waste Management Facilities (IWMF), Asia's largest industrial gas company Yingde Gases, distributed energy provider BECIS in its biomass plants, specialty gas producer Nippon Sanso, and many more.

This experience demonstrates that, contrary to current practices that continue to associate Lean with a paper-based approach, Lean and digitalization must go hand-in-hand to help utilizes in their Net Zero transition.

This article was taken from the white paper "Digitalizing TPM, WCM and LEAN", published by Bluebee Tech. This white paper explores how plants can get rid of the traditional paper processes and enhance operational efficiency through digitalization, while fostering continuous improvement and employee engagement in line with TPM, WCM and LEAN principles. Do not hesitate to request a copy of the full white paper by writing to info@bluebeecloud.com.

French-invested Bluebee Technologies was founded in 2013. It is headquartered in Hong Kong, with R&D center in Shanghai, offices in Singapore and Bangkok, value-added partners all over Asia. www.bluebeecloud.com

bluebee®

Welcome to Smart O&M

Over 1,000 client sites use bluebee® in Environment, Energy, Manufacturing, Infrastructures and Facilities. Major clients in Asia include AstraZeneca, Arkema, Hyundai Engineering, Keppel Infrastructures, Suez, Taiyo Nippon Sanso, Ranhill Power, SP Group, PUB Singapore, etc. In Thailand: Chonburi Clean Energy, Veolia, Daramic, Essilor, Center One Shopping Plaza etc.

Bluebee Tech

Control your industrial risks with Smart O&M solutions!

Bluebee Technologies design innovative yet practical Digital Twin for O&M solutions known as bluebee®.

bluebee® supports **Industrial Risk Management**, **Asset Management** and **Environmental, Social and Governance (ESG)**, **Operation & Maintenance** by enabling industrial decisions based on true data from mobile workers, connected objects and external systems.

Talk to our Bangkok team for your requirements on:

- ✓ CMMS / EAM / Maintenance 4.0
- ✓ Mobile solutions for O&M
- ✓ BIM for Asset Management
- ✓ Partnering with us

French-invested Bluebee Technologies was founded in 2013. It is headquartered in Hong Kong, with R&D center in Shanghai, offices in Singapore and Bangkok, value-added partners all over Asia. Through our partnership with Chulalongkorn University's School of Integrated Innovation, Bluebee Tech benefits from a strong Thai ecosystem.

To see bluebee® in action (movie testimonial) and learn more in English and Thai, scan the QR code, visit www.bluebeecloud.com or mail info@bluebeecloud.com

EMPOWERING SUSTAINABLE GROWTH WITH Energy-as-a-Service: THE FUTURE OF ONSITE SOLAR AND BIOGAS

THE ENERGY-AS-A-SERVICE REVOLUTION

EaaS is transforming how businesses approach energy management. Unlike traditional models where companies purchase energy from external providers, EaaS offers a holistic solution. It encompasses everything from energy generation to consumption optimization, asset management, and maintenance. Companies can now harness renewable energy without the need for significant upfront investment or the burden of managing the infrastructure.

BECIS'S EAAS MODEL IS PARTICULARLY BENEFICIAL FOR BUSINESSES SEEKING TO ALIGN WITH SUSTAINABILITY GOALS WHILE MAINTAINING OPERATIONAL EFFICIENCY.

By leveraging the power of onsite solar and biogas, BECIS enables companies to achieve energy independence, reduce operational costs, and meet stringent environmental regulations.

ONSITE SOLAR: HARNESSING THE POWER OF THE SUN

Onsite solar energy is rapidly gaining traction as one of the most reliable and cost-effective renewable energy sources. Solar power systems installed directly at business sites allow companies to generate their electricity, significantly reducing reliance on traditional energy sources and cutting down on energy costs. BECIS offers comprehensive onsite solar solutions, customized to meet the specific energy needs of businesses across various industries. environmental regulations.

BECIS
Commercial Industrial Solutions

*Deloitte. Shifting Sands: Are Consumers Still Embracing Sustainability? London, United Kingdom: Deloitte, 2021.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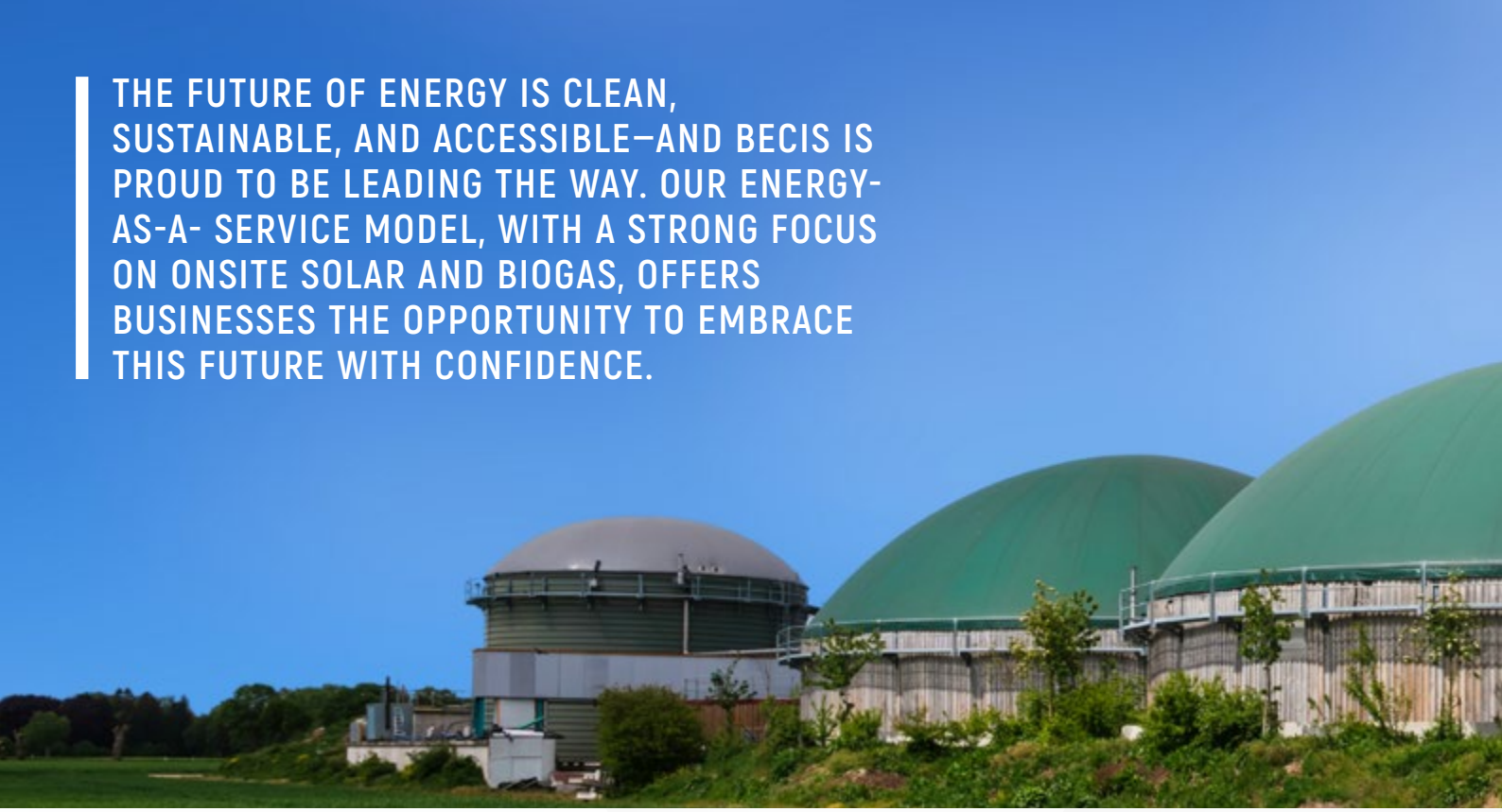
BIO

THE FUTURE OF ENERGY IS CLEAN, SUSTAINABLE, AND ACCESSIBLE—AND BECIS IS PROUD TO BE LEADING THE WAY. OUR ENERGY-AS-A- SERVICE MODEL, WITH A STRONG FOCUS ON ONSITE SOLAR AND BIOGAS, OFFERS BUSINESSES THE OPPORTUNITY TO EMBRACE THIS FUTURE WITH CONFIDENCE.



WHY US?

1. Significant savings on energy costs and reduced emissions: Achieve substantial savings on your energy bills while reducing your carbon footprint.

2. Extensive design and installation capabilities: Benefit from BECIS's expertise in designing and installing solar systems on various surfaces, including RCC and metal rooftops, carports, ground mounts, and even water-floating solutions.

3. Power management solutions: Seamlessly integrate your solar system with the grid, diesel generators, and energy storage systems for optimal efficiency.

4. Real-time remote monitoring: Cloud-based IoT systems provide real-time visibility into your solar system's performance.

5. Agile operations and maintenance: Rely on BECIS's dedicated team to ensure your solar system operates at peak performance.

6. Stringent environmental, health, and safety standards: Trust BECIS's commitment to adhering to the highest environmental, health, and safety standards.

BECIS's approach to onsite solar goes beyond installation. We manage the entire lifecycle of the solar energy system, from design and installation to operation and maintenance, ensuring optimal performance and longevity. Our flexible financing models, including Power Purchase Agreements (PPAs), make it easier for businesses to adopt solar energy without the burden of upfront capital investment.

BIOGAS FOR BUSINESS: TURNING WASTE INTO PROFIT

Biogas is another cornerstone of BECIS's EaaS offering. It represents a sustainable way to manage organic waste while generating renewable energy. Biogas is produced through the anaerobic digestion of organic matter such as agricultural waste, manure, and food waste. This process not only helps in waste management but also produces a clean and renewable source of energy that can be used for electricity generation, heating, or as a fuel for vehicles.

THE ADVANTAGES OF BIOGAS

1. Waste Management: Biogas systems provide an efficient way to manage organic waste, reducing the need for landfills and minimizing environmental pollution. By converting waste into energy, businesses can address two significant challenges—waste disposal and energy generation—with a single solution.

2. Renewable Energy: Biogas is a renewable energy source that can be continuously produced as long as organic waste is available. This makes it a reliable and sustainable energy option for businesses, especially those in industries that generate significant amounts of organic waste.

3. Cost Efficiency: Biogas production can lead to significant cost savings, particularly for industries with high waste disposal costs. By turning waste into energy, businesses can lower their energy expenses and generate additional revenue from the sale of excess energy.

4. Environmental Benefits: Biogas production helps reduce greenhouse gas emissions by capturing methane, a potent greenhouse gas, that would otherwise be released into the atmosphere. Additionally, the by-products of biogas production, such as digestate, can be used as a nutrient-rich fertilizer, promoting sustainable agriculture.

BECIS's biogas solutions are designed to integrate seamlessly with existing operations, maximizing energy output while minimizing disruption. We provide end-to-end management of biogas projects, ensuring that businesses can reap the full benefits of this sustainable

energy source with minimal hassle.

A PARTNERSHIP FOR SUSTAINABLE GROWTH

At BECIS, we understand that the transition to sustainable energy is not just about technology–it's about building partnerships that empower businesses to achieve their sustainability goals. Our EaaS model is tailored to meet the unique needs of each client, providing them with the tools and support they need to succeed in the renewable energy landscape.

By focusing on onsite solar and biogas, we offer businesses a diversified energy portfolio that enhances resilience, reduces costs, and contributes to a more sustainable future. Whether it's reducing carbon emissions, achieving energy independence, or managing waste more effectively, BECIS is committed to driving positive change for our clients and the planet.

The future of energy is clean, sustainable, and accessible–and BECIS is proud to be leading the way. Our Energy-as-a-Service model, with a strong focus on onsite solar and biogas, offers businesses the opportunity to embrace this future with confidence. By partnering with BECIS, companies can unlock the full potential of renewable energy, achieve their sustainability goals, and secure a competitive advantage in the market. As the demand for sustainable energy solutions continues to grow, BECIS is here to provide the expertise, innovation, and commitment needed to navigate this new energy landscape.

Together, we can build a brighter, more sustainable future–one that benefits not just our clients, but the world at large.

#NetZerowithBECIS

BECIS is a leading Energy as a Service (EaaS) provider to high-quality commercial and industrial customers. With the EaaS model, BECIS develops, constructs, operates, and owns distributed energy solutions. This reduces the risk and complexity for our customers whilst achieving their key objectives of sustainability, increased cost efficiency, and resilience of their energy infrastructure, all with no requirement for capital investment.

Expertise & Capabilities

· **Investment**
BECIS finances projects to minimize or eliminate customer CAPEX spend.

· **Design & Engineering**
Our solutions are engineered to high safety and reliability standards.

· **Sustainability & Decarbonisation**
BECIS continues to expand its solutions offerings which enable our customers to achieve ambitious targets.

· **Construction**
We safely manage and deliver projects – reducing complexity and risk for our customers.

· **Asset Performance**
Our assets are monitored and maintained over their life to ensure reliable delivery of energy & service.

BECIS
Commercial Industrial Solutions

AT KJTS GROUP BERHAD, WE BELIEVE THAT DISTRICT COOLING SYSTEMS AND LONG-TERM OPERATIONS AND MAINTENANCE (O&M) PLAY A CRUCIAL ROLE IN THIS JOURNEY TOWARDS A SUSTAINABLE AND NET ZERO WORLD.

NAVIGATING THE ENERGY TRANSITION FOR A NET ZERO WORLD: THE ROLE OF DISTRICT COOLING SYSTEMS AND LONG-TERM O&M

By KJTS Group Berhad

As the world grapples with the pressing need to mitigate climate change, the transition to a net zero emissions future has become an imperative. This transition requires a comprehensive approach encompassing innovative technologies, effective solutions, supportive policies, and sustainable business models. At KJTS Group Berhad, we believe that district cooling systems and long-term operations and maintenance (O&M) play a crucial role in this journey towards a sustainable and net zero world.

District cooling involves the centralized production of chilled water, which is then distributed to multiple buildings through an underground pipeline network. This system offers several advantages in the pursuit of energy efficiency. Centralized production allows for the optimization of energy usage through the deployment of larger, more efficient cooling plants. By consolidating cooling operations, district cooling systems can significantly reduce greenhouse gas emissions compared to individual building-based cooling systems.

IN ADDITION TO THE ENVIRONMENTAL BENEFITS, DISTRICT COOLING SYSTEMS OFFER ECONOMIC ADVANTAGES. THE CENTRALIZED NATURE OF THESE SYSTEMS RESULTS IN LOWER OPERATIONAL AND MAINTENANCE COSTS COMPARED TO INDIVIDUAL COOLING UNITS

Enhanced energy efficiency is another benefit of district cooling. Centralized plants often incorporate advanced technologies and energy recovery systems, leading to higher overall energy efficiency. Additionally, district cooling systems can be easily expanded to accommodate new buildings, making them adaptable to growing urban areas. Furthermore, district cooling plants can readily integrate renewable energy sources such as solar or geothermal power, further enhancing sustainability. Moreover, district cooling systems can harness waste heat from industrial processes or power generation, turning a potential environmental liability into a valuable resource. Thermal energy storage, on the other hand, allows for the shifting of cooling demand to off-peak periods, optimizing energy use and reducing strain on the electrical grid.

In addition to the environmental benefits, district cooling systems offer economic advantages. The centralized nature of these systems results in lower operational and maintenance costs compared to individual cooling units. Building owners and tenants can benefit from reduced energy bills and lower upfront capital expenditures. Furthermore, district cooling systems enhance the reliability and resilience of cooling services, reducing the risk of equipment failure and ensuring a comfortable environment for occupants.

However, the success of district cooling systems in contributing to a net zero future depends not only on the technology itself but also on effective long-term operations and maintenance strategies. At KJTS Group Berhad, we recognize that the sustainability and efficiency of these systems are intrinsically linked to meticulous O&M practices. Proper maintenance ensures that the system operates at peak performance, minimizing energy waste and prolonging the lifespan of equipment.

A proactive O&M approach involves regular monitoring, preventive maintenance, and timely upgrades. Advanced monitoring systems equipped with sensors and data analytics enable real-time tracking of system performance, identifying potential issues before they escalate into costly problems. Preventive maintenance, such as cleaning heat exchangers, inspecting pipes for leaks, and ensuring optimal refrigerant levels, can prevent efficiency losses and avoid unexpected breakdowns. Timely upgrades to more energy-efficient components and the integration of cutting-edge technologies, such as artificial intelligence and machine learning, can further enhance the performance of district cooling systems.

Furthermore, the transition to a net zero world requires a collaborative effort between various stakeholders, including governments, businesses, and communities. Supportive policies and regulations are essential to drive the adoption of district cooling systems and incentivize investments in long-term O&M. Governments can play a pivotal role by providing financial incentives, implementing energy efficiency standards, and facilitating public-private partnerships. Businesses, on the other hand, must prioritize sustainability in their operations and invest in training and development to build the necessary expertise for effective O&M. Communities, too, have a role to play by embracing sustainable cooling solutions and advocating for environmentally responsible practices.

In addition to technical and policy measures, public awareness and education about the benefits of district cooling systems are crucial. Many stakeholders, including building owners, facility managers, and the general public, may not be fully aware of the advantages these systems offer. Educational campaigns and outreach programs can help demystify district cooling technology, highlighting its efficiency, cost savings, and environmental benefits. By fostering a broader understanding and acceptance of district cooling, we can accelerate its adoption and amplify its impact on achieving net zero emissions.

At KJTS Group Berhad, we are committed to leading the charge in promoting district cooling systems and long-term O&M as key enablers of the energy transition. Our projects, such as the state-of-the-art district cooling plant in the heart of the city, demonstrate the feasibility and benefits of this approach. This facility, equipped with advanced energy-efficient technologies and renewable energy integration, serves as a model for sustainable urban cooling. By continuously innovating and collaborating with stakeholders, we aim to set new benchmarks in sustainable urban cooling and contribute to the global effort to

achieve net zero emissions.

Moreover, our dedication to long-term O&M ensures that our district cooling systems remain efficient, reliable, and environmentally friendly. We employ a team of skilled technicians and engineers who conduct regular maintenance, monitor system performance, and implement necessary upgrades. Our use of advanced monitoring systems and data analytics enables us to optimize operations, reduce energy consumption, and promptly address any issues that arise. By prioritizing O&M, we not only extend the lifespan of our equipment but also maximize the environmental and economic benefits of our district cooling systems.

The implementation of district cooling systems and long-term O&M practices is not without its challenges. Initial capital investment can be a barrier, and retrofitting existing buildings to accommodate district cooling infrastructure requires careful planning and coordination. However, these challenges are outweighed by the long-term benefits. Financial incentives and supportive policies can help offset initial costs and encourage adoption. Additionally, successful case studies and pilot projects can serve as valuable references for other cities and organizations considering district cooling solutions.

Looking ahead, the future of district cooling systems is promising. Technological advancements, such as the development of more efficient chillers, improvements in thermal energy storage, and the integration of artificial intelligence for predictive maintenance, will continue to enhance the performance and viability of these systems. Furthermore, the growing emphasis on sustainability and the increasing urgency to address climate change will drive greater interest and investment in district cooling as a key strategy for reducing urban carbon emissions.

In conclusion, the path to a net zero world demands a multifaceted approach that integrates advanced technologies, sustainable solutions, and effective policies. District cooling systems, supported by robust long-term O&M practices, represent a vital piece of this puzzle. At KJTS Group Berhad, we are dedicated to harnessing the potential of these systems to create a cooler, greener, and more sustainable future for all. By championing district cooling and committing to excellence in O&M, we aim to lead by example and inspire others to join us in navigating the energy transition for a net zero world.

LOOKING AHEAD, THE FUTURE OF DISTRICT COOLING SYSTEMS IS PROMISING. TECHNOLOGICAL ADVANCEMENTS, SUCH AS THE DEVELOPMENT OF MORE EFFICIENT CHILLERS, IMPROVEMENTS IN THERMAL ENERGY STORAGE, AND THE INTEGRATION OF ARTIFICIAL INTELLIGENCE FOR PREDICTIVE MAINTENANCE, WILL CONTINUE TO ENHANCE THE PERFORMANCE AND VIABILITY OF THESE SYSTEMS.

INTEGRATED BUILDING SUPPORT SERVICES

Malaysia | Singapore | Thailand

KJTS Group provides one-stop integrated building support services on a regional scale. We offer a combination of cooling energy solutions, cleaning services, and facilities management services. With a focus on quality, safety, and environmental responsibility, we work closely with clients to deliver customized solutions that help businesses save energy, reduce costs, and improve performance.

At KJTS Group, we are dedicated to integrating Environmental, Social, and Governance (ESG) principles into our operations. Our focus on environmental sustainability entails implementing measures to reduce energy consumption and carbon emissions effectively while addressing broader environmental concerns. This commitment aligns with our dedication to the Net Zero mission.

COOLING ENERGY

Our cooling energy management involves supplying chilled water for space cooling, managing energy usage efficiently, and providing O&M for cooling energy systems.

FACILITIES MANAGEMENT

We harness our technical experience and centralized command center to deliver comprehensive and cost-effective facilities management services.

CLEANING SERVICES

Our dedicated team strives to provide a reliable, holistic approach to all cleaning services, ensuring your commercial properties consistently remain in top condition.

+603-2716 6866 www.kjts.com.my enquiry@kjts.com.my

INTEGRATING PLANT CONTROL AND ENERGY MANAGEMENT SYSTEMS FOR YURI GREEN HYDROGEN PROJECT

GREEN HYDROGEN, PRODUCED USING ELECTRICITY DERIVED FROM RENEWABLE ENERGY, IS PARTICULARLY IMPORTANT IN ACHIEVING CARBON NEUTRALITY.

Hydrogen, which emits no carbon dioxide (CO2) when used, is gaining attention as a new form of clean energy for the decarbonized era and is expected to find applications in a wide range of fields such as the power business, transportation, and various industries. Green hydrogen, produced using electricity derived from renewable energy, is particularly important in achieving carbon neutrality.

Countries and regions around the world, including the EU, are promoting green-hydrogen strategies at a policy level to encourage the use of green hydrogen.

YOKOGAWA

Co-innovating tomorrow™

Yokogawa Australia has been selected to provide the integrated control system (ICS) and energy management system (EMS) for the Yuri Green Hydrogen Project, an effort in Australia to produce industrial-scale renewable hydrogen. This project is being undertaken in the Pilbara region of Western Australia by Yuri Operations Pty Ltd, a joint venture between ENGIE Renewables Australia Pty Ltd and Mitsui & Co., Ltd. A consortium comprising the engineering, procurement, construction and commissioning (EPCC) companies Technip Energies and Monford Group Pty Ltd. is constructing these facilities, which will consist of an 18-megawatt solar power plant, 8-megawatt battery energy storage system (BESS), and 10-megawatt electrolyzer. Using carbon-free solar energy, the facility will be able to produce up to 640 tons of green hydrogen per year. The hydrogen will be used as a feedstock to produce green ammonia at an adjacent ammonia plant operated by Yara Pilbara Fertilizer Pty Ltd (YPF). YPF is a wholly owned subsidiary of Yara International ASA, which is one of the world's largest producers of nitrogen-based mineral fertilizers.

The core of the ICS is the OpreX Collaborative Information Server. In addition to being compatible with various communication standards and facilitating rapid decision-making in operations, the server enables centralized management by integrating the handling of large amounts of data from the many different kinds of equipment in use at ammonia production plants. The EMS, provided by Yokogawa Group company, PXiSE Energy Solutions LLC, controls the solar power plant, battery energy storage system (BESS), and electrolyzer for producing the green hydrogen to be used as a feedstock for the production of green ammonia. Combining the ICS with the EMS will make it possible to manage the Yuri facility's renewable energy production autonomously to ensure consistent stability and power quality based on the operating requirements of the adjacent ammonia plant, the weather, and other factors.

In a world where systems are becoming closely integrated around the system of systems (SoS) concept, Yokogawa will contribute to the realization of carbon neutrality while achieving ESG management for customers by offering higher value-added solutions, including the integration of plant control and EMSs that enable the timely control of complex power systems.

YOKOGAWA WILL CONTRIBUTE TO THE REALIZATION OF CARBON NEUTRALITY WHILE ACHIEVING ESG MANAGEMENT FOR CUSTOMERS BY OFFERING HIGHER VALUE-ADDED SOLUTIONS, INCLUDING THE INTEGRATION OF PLANT CONTROL AND EMSS THAT ENABLE THE TIMELY CONTROL OF COMPLEX POWER SYSTEMS.

Yokogawa provides advanced solutions in the areas of measurement, control, and information to customers across a broad range of industries, including energy, chemicals, materials, pharmaceuticals, and food. Yokogawa addresses customer issues regarding the optimization of production, assets, and the supply chain with the effective application of digital technologies, enabling the transition to autonomous operations.

As the beacon of innovation and spearheading technological advancements, Yokogawa drives industries and paves the way for a sustainable future for all. Leveraging Yokogawa's expertise in IT/OT convergence and further acquisition of BAX Energy's cutting-edge Asset Performance Management, Yokogawa supports customers in boosting energy efficiency and asset reliability for renewable power plants through real-time data and predictive analytics to deliver smarter, more sustainable energy operations worldwide.

Founded in Tokyo in 1915, Yokogawa continues to work toward a sustainable society through its 17,000+ employees in a global network of 127 companies spanning 60 countries.

For more information about Yokogawa in Southeast Asia, please visit www.yokogawa.com/sg

YOKOGAWA

Co-innovating tomorrow™

A Yokogawa Company
PXiSE
Energy Solutions

RECENT APUEA ACTIVITIES

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ASIA URBAN ENERGY ASSEMBLY 2024 – TOWARDS A NET ZERO FUTURE IN THE ASIA PACIFIC

The 3rd edition of the Asia Urban Energy Assembly, co-located with ASEAN Sustainable Energy Week, was held on July 4-5 as a two-day international conference at the Queen Sirikit National Convention Center in Bangkok, Thailand. ASEAN Sustainable Energy Week is one of the region's largest and most comprehensive international exhibitions and conferences on renewable energy, energy efficiency, energy storage, and environmental technology.

The Assembly served as a platform for discussing the most pressing energy issues, with a focus on how the public and private sectors can prepare for the future by applying today's technologies and solutions. Key discussions centered on increasing energy efficiency, integrating more renewable energy into society, and the role of district energy systems in addressing the growing cooling demand in the Asia-Pacific region. The conference attracted energy professionals from various sectors, including utilities, government officials, policymakers, developers, consultants, investors, international organizations, and universities.

Over the two days, our speakers inspired us with their knowledge, experience, and technological insights to drive the energy transition in the Asia-Pacific region. Our six international sessions proved that we have the technology, expertise, and business models needed to develop energy systems for a net-zero future.

Agenda at a glance:

DAY 1, 4 JULY 2024 – THE FUTURE OF ENERGY IN THE ASIA PACIFIC

- **Asia Future Energy Outlook**
- **Developing Energy Systems for a Net Zero Future**
- **Financing Sustainable Energy Approaches in the Asia-Pacific to Achieve the SDGs**

DAY 2, 5 JULY 2024 – INTERNATIONAL DISTRICT ENERGY DAY

- **European District Energy Experiences**
- **Asia-Pacific District Energy Developments**
- **India Outlook**

We extend our special thanks to our sponsors for their generous support:
Gold Sponsor: **Tabreed**
Silver Sponsor: **Qatar District Cooling Company - Qatar Cool**
Bronze Sponsors: **Hydraulic Analysis Group Limited, NXITY,** and **Tangshan Xingbang Pipeline Engineering Equipment Co., Ltd.,**

We also deeply thank our co-host, **Informa Markets in Thailand**, including **Ian Roberts, Sanchai Noombunnam**, and **Varnnapran Patanotai,** for their successful and long-standing collaboration. We also want to thank **Euroheat & Power** through **Eloi Piel** for supporting and co-hosting a session with us!

We look forward to seeing you again at our upcoming events in the region or the 4th edition of the Asia Urban Energy Assembly in 2025! Stay tuned for more opportunities to engage, learn, and collaborate on advancing urban energy projects and solutions in the Asia-Pacific region and beyond!

HVACR VIETNAM / ELECTRIC & POWER VIETNAM 2024 – EXPLORING THE FUTURE OF ENERGY IN VIETNAM

On 4 September, on the first day of the HVACR and Electric & Power Vietnam 2024 show, APUEA hosted the seminar titeled "Exploring the Future of Energy in Vietnam. As one of the region's significant carbon emitters, largely reliant on coal-powered energy, Vietnam has been grappling with the impacts of climate change, including severe droughts that disrupted hydropower generation and led to widespread power shortages. In response, Vietnam set ambitious climate goals to achieve Net-Zero greenhouse gas emissions by 2050.

This seminar brought together top experts who presented cutting-edge technologies and innovative solutions aimed at reducing Vietnam's reliance on fossil fuels and transitioning toward a sustainable, renewable energy future. Attendees engaged with industry leaders, gained invaluable insights, and contributed to shaping a greener energy landscape for

Agenda at a glance:
Session introduction
• Peter Lundberg, Executive Director, Asia Pacific Urban Energy Association (APUEA)
Energy Outlook Vietnam
• Van-Anh Do, Manager of Capital Projects & Infrastructure, PwC Vietnam
The Potential of District Cooling in Vietnam
• minh quan ton that, Country Manager, Keppel Energy-as-a-Service (EaaS)
Exploring Energy as a Service in Vietnam, lessons leardned from Malaysia
• Adrian Lim, Chief Operation Officer (Projects), KJTS Group Berhad
Energy Efficiency
• Xuan TranAnh, Motion Business Director, ABB Vietnam
Smart Grids
• Vachan Alva, Senior Manager, Head of Sales, Singapore Yokogawa Engineering Asia Pte Ltd
Global and Regional Market Trends for Advanced Batteries
• John Lewinski, Group Vice President, Informa Markets
Panel Discussion / Q&A

Our heartfelt thanks go out to our speakers for their thought-provoking presentations and dynamic panel discussion. We're also grateful to our co-host, Informa Markets in Vietnam, especially Michelle Lui, and Donna Ha for their partnership in making this session a resounding success.

ELECTRIC & POWER INDONESIA 2024 - THE FUTURE OF ENERGY IN INDONESIA

We had an excellent turnout at our seminar on August 27th on the second day of Electric & Power Indonesia in Jakarta!

Indonesia, like many other countries, faces significant challenges in reaching its net-zero targets by 2050. However, the positive news is that Indonesia is abundant in renewable energy resources. By implementing energy-efficient solutions such as district cooling, high-efficiency motors and drives, and integrating renewable energy with advanced energy management systems, we already have the tools to shape a sustainable energy future for Indonesia!

Participants had the opportunity to hear from leading experts who showcased groundbreaking technologies and innovative solutions aimed at reducing Indonesia's dependence on fossil fuels and accelerating its transition to a sustainable society, and contribute to shaping a more sustainable energy future for Indonesia.

Session introduction
- Peter Lundberg, Executive Director, Asia Pacific Urban Energy Association (APUEA)

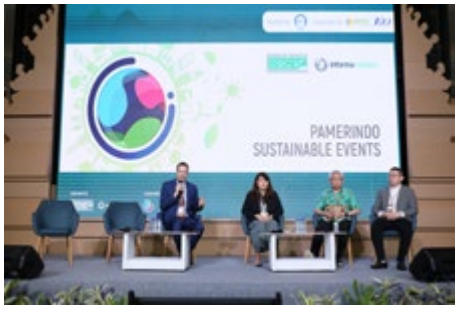
Keynote address: Energy Outlook Indonesia
- Suroso Isnandar - Director of Risk Management PT PLN (Persero)

Panel Discussion: Eploring the potential of District Cooling in Indonesia
- Rana Yusuf Nasir, Board of Governance - ASHRAE Indonesia Chapter
- Hui Qi Woon Qi Woon, Manager Business Development, Keppel Energy-as-a-Service (EaaS)
- Adrian Lim, Chief Operation Officer (Projects), KJTS Group Berhad

Panel Discussion: Future Energy Technology
- Chee-Seong Chiam, Global Customer Support Hub Manager- Asia, ABB
- Osmond Pratama Manurung, Head of Sales Renewable Energy Power & Water, PT Yokogawa Indonesia,
- Binu George, Business Development Director, BECIS - Commercial Industrial Solutions Indonesia
- Kin Yu Lam, Regional Application Engineering Leader, Cargill
- Hogan Liao, AP Transformer Expert, Dupont

We are deeply grateful to our speakers for their insightful presentations and engaging panel discussions. We also want to thank our co-host, **Pamerindo Indonesia**, especially **Lia Basyuni**, and **Max Bruinier** for partnering with us to create this successful session!



THE GREEN ENERGY EXPORT DAY 2024

On August 23rd, APUEA participated in The Green Energy Export Day 2024 in Copenhagen, Denmark, arranged by DI Energy, Green Power Denmark, the Danish Board of District Heating, State of Green, the Danish Energy Agency, and the Trade Council.

The one-day conference provided the latest perspectives and news from important export markets for wind energy, green hydrogen, district energy, and energy efficiency. The event covered a range of markets in Europe, Asia, and North America, with deep dives into countries such as the US, Germany, Poland, South Africa, Vietnam, and Australia.

Together with Jakob Bjerregaard from Devcco and Leif Jakobsen from Danfoss, APUEA's President, Mikael Jakobsson, shared district cooling insights from around the world.

Thanks to **DBDH** for inviting us to the event!

ENERTEC ASIA 2024 – FORGING THE ENERGY FUTURE IN MALAYSIA

On 27 June, during second day of ENERtec Asia 2024 at KLCC in Kuala Lumpur, APUEA hosted the seminar titeled Forging the Energy Future in Malaysia.

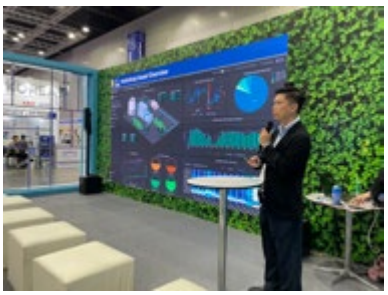
Like many countries, Malaysia faces significant challenges in achieving its net-zero targets by 2050. However, the good news is that Malaysia is rich in renewable energy resources. By deploying energy-efficient solutions such as district cooling, high-efficiency motors and drives, and integrating renewable energy with advanced energy management systems, we already have the tools to shape Malaysia's energy future.

During the seminar, our experts listed below presented and discussed technologies and solutions aimed at reducing Malaysia's reliance on fossil fuels and transitioning to renewable energy-based systems.

Session introduction
• Peter Lundberg, Executive Director, Asia Pacific Urban Energy Association (APUEA)
Malaysia District Cooling Market Outlook
• Ahmad Firdaus Mansor, Vice President, Malaysia District Cooling Association
The Importance of Systemic Efficiency
• Narayanan Ranganathan, Group Senior Vice President & Head of Motion Business, Asia, ABB Motion
Energy-as-a-Service: One Stop De-carbonization Solution
• Leo Cher, Senior Manager, Business Development, Keppel Energy-as-a-Service (EaaS)
Transition towards carbon neutral cooling networks
• Alex Chien, Head of Partnership & Corporate Development, ENGIE Services Malaysia
Energy as a Service
• Adrian Lim, Chief Operation Officer (Projects), KJTS Group Berhad
Low Carbon Solution for Smart Cities
• Kong Sin Foo, Yokogawa Malaysia

We extend our heartfelt thanks to our speakers for their insightful presentations and engaging panel discussions. We also want to thank your co-host, **Informa Markets in Malaysia**, especially Angeline Tang for creating the session with us!






EUROHEAT & POWER CONGRESS 2024- THE COOL KID IN THE BLOCK

On June 4th, as part of the second day of the Euroheat & Power Congress 2024, APUEA co-hosted the workshop titeled "The cool kid in the block" together with Euroheat and Power.

Often referred to as "the elephant of the waiting room", cooling is set to become a major challenge for countries confronted with hotter summers and extreme heat waves event. Globally, cooling demands are already growing exponentially, calling for the urgent implementation of efficient and sustainable heating solutions. How to cool our cities without warming our planet? This session will shed light on state-of-the-art district cooling projects from Europe, Asia-Pacific, Middle-east and South-America.

The Cool Kid in the block workshop was represented by:

Moderator
- Mikael Jakobsson, President, Asia Pacific Urban Energy Association

Panelists
- Raphaëlle Nayral de Puybusque, Secretary General, Fraîcheur de Paris,
  Neil Parry, Global Head of District Energy, Alfa Laval
  Eric Lindström, Partner, Devcco

Thanks to **Euroheat & Power** and **Eloi Piel** for developing a super interesting session with us!

INTERMACH SUBCON THAILAND 2024 – DECARBONIZING INDUSTRIES IN ASIA WITH SMART ENERGY AND ASSET MANAGEMENT

On May 17 May, at INTERMACH & SUBCON Thailand 2024, APUEA hosted a seminar focused on smart energy technology and asset management solutions tailored to the needs of Thailand's and Asia's industry sectors.

Like many Southeast Asian countries, Thailand faces the pressing challenges of climate change, including extreme heat and rising sea levels. In response, Thailand has committed to achieving carbon neutrality by 2050 and net-zero greenhouse gas emissions by 2065. To realize these ambitious goals, Thailand is revamping its Energy Master plan, with an emphasis on ramping up targets for renewable energy and energy efficiency.

In 2023, the industry sector accounted for a significant 24% of Thailand's CO2 emissions, contributing to the country's air pollution woes alongside the agricultural sector. But here's the silver lining: Thailand boasts vast renewable energy resources, with IRENA estimating a whopping 3604 GW available–73 times more than its installed power capacity.

Speakers:
- Naranusorn Sungpetch, Business Development Director, Bluebee Technologies Thailand
- Oscar Loza, Group Head Business Development, Sales & Offering Management, BECIS - Commercial Industrial Solutions
- Thanakrit Baisolsakunee Baisolsakunee, Country Head - KJTN Engineering Co., Ltd Engineering Co

Moderator
- Peter Lundberg, Executive Director, Asia Pacific Urban Energy Association (APUEA)

Attendees engaged with top-notch energy experts, delved into insightful presentations, and explored strategies to reduce reliance on fossil fuels and transition towards renewable energy-based systems. The event played a key role in the movement to decarbonize industries across Asia, and participants embarked on a journey toward a cleaner, greener future. We want to thank **Informa Markets in Thailand** for hosting the session with us!

EVENT CALENDAR

APUEA EVENTS

ASIA URBAN ENERGY ASSEMBLY 2024

3-4 JULY 2025

Bangkok, Thailand

25-27 SEPTEMBER

24TH ASEAN ENERGY BUSINESS FORUM
Vientiane, Laos

25-27 SEPTEMBER 2024

4-8 MARCH

INDIA SMART UTILITY WEEK
New Delhi, India

4-8 MARCH 2025

19-21 MARCH

PHILENERGY
Manila, The Philippines

19-21 MARCH 2025

3-5 JUNE

EUROHEAT & POWER CONGRESS
Prague, Czech Republic

3-5 JUNE 2025

TBC JUNE

ASIA CLEAN ENERGY FORUM
Manila, The Philippines

JUNE 2025

2-4 JULY

ASEAN SUSTAINABLE ENERGY WEEK
Bangkok, Thailand

2-4 JULY 2025

17-20 SEPTEMBER

ELECTRIC & POWER INDONESIA
Jakarta, Indonesia

17-20 SEPTEMBER 2025

5-7 NOVEMBER

HVACR VIETNAM
Ho Chi Minh City, Vietnam

5-7 NOVEMBER 2025

12-14 NOVEMBER

ELECTRIC & POWER VIETNAM
Ho Chí Minh City, Vietnam

12-14 NOVEMBER 2025

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Keppel DHCS

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NXITY

Becis

Qatar Cool

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Danish Board of District Heating (DBDH)

Gradyent

IVL Swedish Environmental Research Institute

District Energy in Cities Initiative

DEVCCO

Thai ESCO Association

Overseas Environmental Cooperation Center (OECC)

Institute for Sustainable Energy Policies

tabreed

Chongqing Renewable Energy Society

YOKOGAWA

Kamstrup

Bluebee Technologies

Hydraulic analysis group

Euroheat & Power (EHP)

Alliance for an Energy Efficient Economy (AEEE)

Asia LEDS Partnership

Grundfos

KJTS Group

PARTNERS AND SUPPORTING ORGANIZATIONS

- Asian Development Bank (ADB)
- International Energy Agency (IEA)
- United Nations Environment
- Asian Infrastructure Investment Bank (AIIB)
- REN21
- C40 Cities

1 ORGANISATION / COMPANY DETAILS:

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Marketing name and/or Abbreviation.....

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4 MEMBERSHIP CATEGORY (please check as appropriate below):

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Member Category		≤ 1,000	1,000 - 10,000	≥ 10,000
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Corporate Member		◯	◯	◯
Affiliate Member	◯			

5 PAYMENT METHOD:

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