Asia Pacific Urban Energy Association

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APUEA Magazine

ASIA URBAN ENERGY ASSEMBLY

SUPPORTING THE ENERGY TRANSITION IN THE ASIA PACIFIC

QUEEN SIRIKIT NATIONAL CONVENTION CENTER (QSNCC)

31 AUG - 1 SEP 2023 BANGKOK THAILAND

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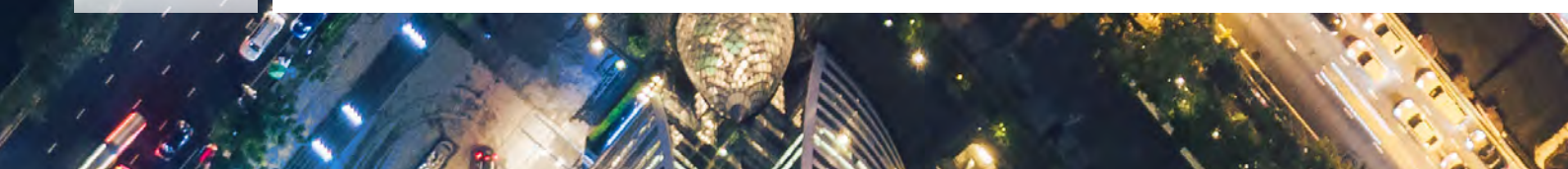
ASEAN SUSTAINABLE ENERGY WEEK



Content

Editorial

Mikael Jakobsson

President,
Asia Pacific Urban Energy Association (APUEA)

In the APUEA Magazine Editorial, I often come back to recent reports on climate change and its potential risk. We have seen global temperature records break in recent years, one after another. I've also touched upon the importance of not panicking. Jim Skea, the new head of the UN's IPCC, recently called for a balanced approach to the climate change debate. This statement is very important. We need to be pragmatic and work in a systematic manner for sustainability and resilience through systemic efficiency.

We often focus on carbon emissions only when talking about climate change and forget about the impact of refrigerants in compressor heat pumps and chillers. Refrigerants often have thousands of times higher GWP (Global Warming Potential) than CO2. The Kigali Amendment to the Montreal Protocol has already come to play, phasing down the production and consumption of hydrofluorocarbons (HFCs) worldwide. This directly impacts the heat pump and chiller technologies to use alternative refrigerants. New and amendments to existing F-gas (fluorinated greenhouse gas) regulations are being processed at present, as well as PFAS (Perfluoroalkyl and Polyfluoroalkyl Substances), which would also include the planned substitute to HFCs, namely HFO (Hydrofluroolefin). This leaves the heat pump and chiller technologies with mainly natural refrigerants such as ammonia and CO2. The future of HFO is not certain, but the good news is that there are many projects around the world where natural refrigerants have been applied successfully.

Sustainable refrigerants are of great importance as we see the importance of compressor heat pumps and chillers growing. Cooling demand is increasing dramatically across the Asia Pacific, and sustainable heating will to a large extent, rely on RE-integrated heat pumps. Without renewable energy, sustainable refrigerants, and system integration, compressor heat pumps and chillers are questionable individual technologies in energy-dense urban areas.

However, as we often point out, technology is seldom a barrier to developing sustainable urban energy schemes. What we need to focus on is capacity building across the entire stakeholder spectrum and implementing planning practises – urban planning, energy planning, heating and cooling planning. The energy systems of the future will require flexibility, and Integrated Urban Systems are often the answer to this – integration of energy (heating, cooling, electricity, gas/hydrogen, and storage) and Water (e.g. wastewater). We refer to this as a Multi-Utility System. Multi-Utility Systems unlock the potential for Systemic Efficiency and a Circular Economy approach to achieve sustainable and resilient urban energy.

Since the last APUEA Magazine, APUEA has hosted a workshop on the Green Transformation of the Heating and Cooling sector during ADB's Asia Clean Energy Forum in Manila, and a Sustainable Cooling event during Informa Markets' HVACR Vietnam event in Hanoi. APUEA also participated in and supported the Asia Solar+Storage Summit Thailand 2023 in Bangkok and the Euroheat & Power Congress 2023 in Torino.

Now we are pretty busy with the final planning and execution of the Asia Urban Energy Assembly, which will be hosted from 31st August – 1st September at Queen Sirikit National Convention Center in Bangkok in conjunction with the ASEAN Sustainable Energy Week. Asia Urban Energy Assembly is hosted by APUEA in collaboration with Informa Markets Thailand, sponsored by Danfoss and Qatar Cool, and supported by Euroheat & Power, DBDH, and GIZ India. The region's front-runners in integrated municipal and industrial multi-utilities are gathering to discuss Systemic Efficiency, Decarbonization, and Sustainable Urbanization in the world's fastest-growing region. We are very much looking forward to meeting all colleagues and friends from around the world during this annual urban energy event of the year. In this issue of the APUEA Magazine, you can read articles on Five Steps that Businesses can take to Accelerate the Energy Transition, how District Cooling can support the Energy Transition, Cooling as a Service, The Renewables 2023 Global Status Report, and Smart O&M's role in the Energy Transition. We want to thank ABB, BECIS, REN21 and Bluebee Technologies for contributing to this issue of APUEA Magazine.

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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.

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Asia Pacific Urban Energy Association

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

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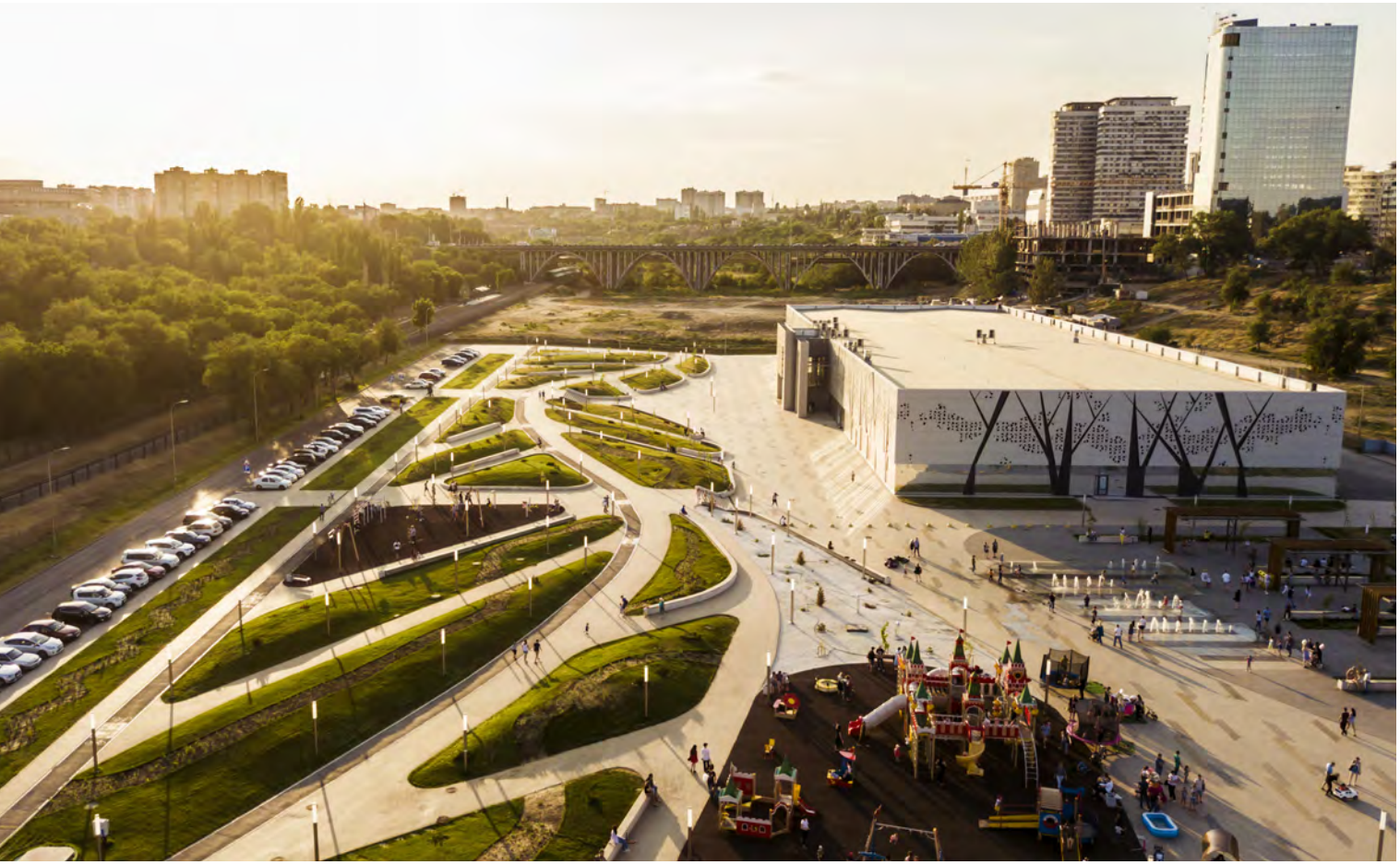

ASIA PACIFIC URBAN ENERGY ASSOCIATION

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.

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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.

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

THE WORLD FACES AN URGENT NEED TO DECARBONIZE. HOWEVER, ACCORDING TO ABB'S 2023 ENERGY INSIGHTS SURVEY, 64.6 PERCENT OF APAC BUSINESSES EXPECT THE ENERGY CRISIS TO DELAY THEIR SUSTAINABILITY EFFORTS – IN SOME CASES BY AS MUCH AS FIVE YEARS.

ACCELERATING THE ENERGY TRANSITION IN APAC: FIVE STEPS BUSINESSES CAN TAKE TODAY

By R. Narayanan,
Group Senior Vice President
and Head of ABB Motion, Asia

The Asia-Pacific (APAC) region has a significant role in the world's shift to net zero and as climate-forward actions gain momentum, the focus on energy efficiency has to increase in parallel. Energy efficiency is the key to reaching net zero and cutting operating costs, yet many businesses are unsure about where to start. R. Narayanan, group senior vice president and head of ABB Motion, Asia, outlines five ways industrial businesses can boost their efficiency.

APAC is responsible for a significant proportion of global industrial production – including producing highly energy-intensive products such as steel, cement, and chemicals. As a result, our region is responsible for nearly 50 percent of the world's electricity consumption. Unfortunately, almost half of APAC's electricity is generated using coal. The world faces an urgent need to decarbonize. However, according to ABB's 2023 Energy Insights Survey, 64.6 percent of APAC businesses expect the energy crisis to delay their sustainability efforts – in some cases by as much as five years. This is higher than the global average of 58 percent. Fortunately, there are several steps that businesses can take today to reduce their energy use. This is also important for business competitiveness, as electricity is typically a facility's greatest operating expenditure (OpEx), and more efficient equipment directly lowers operating costs. Here's what businesses can do.

1 IDENTIFY OPPORTUNITIES FOR ENERGY EFFICIENCY

To find ways to improve energy efficiency, a business must first analyze its existing systems. They can achieve this with an energy efficiency audit carried out in partnership with a trusted energy service company or other provider. An expert conducting an energy audit typically considers a facility's historical energy use, the efficiency of various pieces of equipment and their operating characteristics, as well as the cost and emissions associated with normal operations. More advanced energy audits now use sensors and automation to gather in-depth data over time, enabling even greater insights. Data from an energy efficiency audit highlights easy opportunities for improving efficiency, such as motors that are consistently operating outside of their peak efficiency range. It also produces a baseline to measure future improvement against. Even a simple audit can identify zero-cost measures that improve efficiency by around 5 to 10 percent. More advanced audits in facilities that have not been examined for over a decade can reveal measures that create savings of up to 20 percent – or, in extreme cases, up to 40 percent. Using sensors and automation to gather in-depth data over time, enabling even greater insights.

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2 RIGHT SIZE ASSETS AND PROCESSES

A common finding in an energy efficiency audit is that equipment is bigger or more powerful than is needed for a given task. For example, an oversized motor may run at 65 percent load – far from its peak efficiency, which is achieved at around 95 percent load. This means that it is using power unnecessarily.

Right sizing this equipment to its specific operation can result in significant energy savings. In cases where adjustments are relatively simple, such as changing operational requirements or adjusting settings, they can be implemented immediately.

In other cases, the machine may need to be replaced with a more suitable design. Here, it makes sense to factor this into the facility's lifecycle management plan.

3 SPECIFY HIGH EFFICIENCY MOTORS AND DRIVES

Electric motors are typically the most energy-intensive component in an industrial facility. Worldwide, industrial electric motors and the systems they drive consume approximately 45 percent of all electricity generated. Fortunately, modern motor designs and variable speed drives (VSDs) enable significantly better energy efficiency. This makes upgrading motors an effective way to reduce a facility's energy use.

IE5 Synchronous reluctance motor-drive packages (SynRM), can achieve 50 percent lower losses than the IE2-class induction motors that many facilities in APAC still use. This means that the energy savings can pay back the cost of the motor in under a year in many cases.

SynRM motors are also designed to act as drop-in replacements for older models, making upgrading to a more efficient motor quick and simple.

The efficiency of existing motors can be further improved using a VSD. Without a drive, a motor runs continuously at full speed and its output is controlled using throttling. This is like keeping one foot firmly on a car's accelerator pedal and adjusting its speed with the brakes – it is very inefficient.

A drive, by comparison, directly adjusts a motor's speed – like using the accelerator pedal. Any time the motor is not running at full speed, the system is saving power. This is especially significant as around three in four motors run pumps, fans and compressors, which rarely need to operate continuously at full speed. In common applications, adding a VSD can achieve savings of 30 percent on average. In pumps, this can increase to 80 percent. Despite this, very few facilities globally make effective use of drives. While estimates suggest that around 50 percent of all industrial electric motors could use a drive, only around 23 percent currently do. This makes installing drives an ideal opportunity for a facility to lower its OpEx and improve its competitiveness.

ELECTRIC MOTORS ARE SIGNIFICANTLY MORE EFFICIENT THAN DIESEL ENGINES – THEY CAN ACHIEVE OVER 95 PERCENT EFFICIENCY, WHILE A DIESEL ENGINE IN ITS OPTIMUM LOAD RANGE PEAKS AT AROUND 45 PERCENT. THIS RESULTS IN SIGNIFICANT EMISSIONS REDUCTIONS. FOR EXAMPLE, ELECTRIFYING JUST ONE 24-TON DIESEL EXCAVATOR ELIMINATES THE EQUIVALENT OF 48 TONS OF CO_2 EVERY YEAR.

4 GO DIGITAL

Like an energy efficiency audit, digital and internet of things (IoT) technologies enable a facility to monitor its energy use. Unlike a one-time audit, however, these technologies enable continuous, real-time monitoring of energy flows. Data gathered in this way unlocks a range of other opportunities.

Sensors throughout a facility can be integrated into a building management system (BMS), which automatically monitors and regulates the energy use of systems like heating, lighting, and ventilation. This approach is increasingly popular, and around 85 percent of businesses worldwide report that they are now adopting IoT initiatives.

Combining a BMS with artificial intelligence (AI) technology can produce significant energy savings – it can cut HVAC energy costs by 25 percent. This doesn't come at the expense of people or equipment, as the same system can increase occupancy comfort by 60 percent and equipment lifespan by 50 percent.

5 ELECTRIFY TO ELIMINATE DIRECT EMISSIONS

In addition to indirect emissions from electricity generation, many of APAC's industrial businesses also rely on equipment that emits carbon directly, such as mining vehicles, trucks, delivery vans, and forklifts. Increasingly, operators are choosing to electrify these vehicles.

Electric motors are significantly more efficient than diesel engines – they can achieve over 95 percent efficiency, while a diesel engine in its optimum load range peaks at around 45 percent. This results in significant emissions reductions. For example, electrifying just one 24-ton diesel excavator eliminates the equivalent of 48 tons of CO^2 every year. These vehicles are also quieter and more pleasant to work around.

Heating is another area where electrification is growing in popularity. Electric heat pumps are an ideal alternative to the fuel-fired boilers that many APAC facilities currently use. A heat pump uses thermal gradients to maximize electricity-to-heat generation. Heat pumps can be used for space heating and process heating up to 180° Celsius.

EFFICIENCY IS THE FUTURE FOR APAC

Many businesses in APAC have already started to invest in energy efficiency. For example, almost 200 businesses across APAC have already joined the Energy Efficiency Movement, an international stakeholder-led campaign to champion industrial energy efficiency.

These businesses have recognized that efficiency is a clear way to achieve both sustainability and business goals – and more are sure to follow.

Learn more at:
https://join.energyefficiencymovement.com

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SUPPORTING THE ENERGY TRANSITION IN THE ASIA-PACIFIC WITH DISTRICT COOLING

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

MOST COUNTRIES IN THE ASIA-PACIFIC REGION HAVE SET NET-ZERO GREENHOUSE EMISSION TARGETS BY MID-CENTURY, AND NATIONAL GOVERNMENTS ARE WORKING TO UPDATE THEIR ENERGY AND CLIMATE POLICIES TO ACHIEVE THESE TARGETS. TODAY, COOLING STANDS FOR ABOUT 10% OF THE WORLD'S GHG EMISSIONS. STILL, DUE TO INCREASED TEMPERATURES IN COMBINATION WITH POPULATION AND ECONOMIC GROWTH IN THE HOTTEST PART OF THE WORLD, THE COOLING DEMAND IS EXPECTED TO TRIPLE BY 2050 IF NO ACTION IS TAKEN.

THIS IS WHY COOLING SOMETIMES IS CALLED THE ELEPHANT IN THE WAITING ROOM, REFERRING TO ITS IMPORTANCE IN THE ENERGY TRANSITION AND MEETING CLIMATE TARGETS. DISTRICT COOLING OFFERS MANY BENEFITS TO MEET THE GROWING COOLING DEMAND AND COULD PLAY A VITAL ROLE IN SUPPORTING THE ENERGY TRANSITION IN THE ASIA-PACIFIC REGION.

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One indicator to survey the future cooling demand in the region is to look at usage of ACs in various countries. In Thailand, about 35% of households have ACs. In Malaysia and Singapore, 80% of households have ACs even though the climate is similar, and in countries like India, Indonesia, Vietnam and the Philippines, less than 10% of households use ACs. With these numbers in mind, it is pretty clear that ownership of ACs in countries with low AC usage will increase in the next couple of decades, and to support the energy transition, this cooling demand must be met by energy-efficient and environmentally friendly technology.

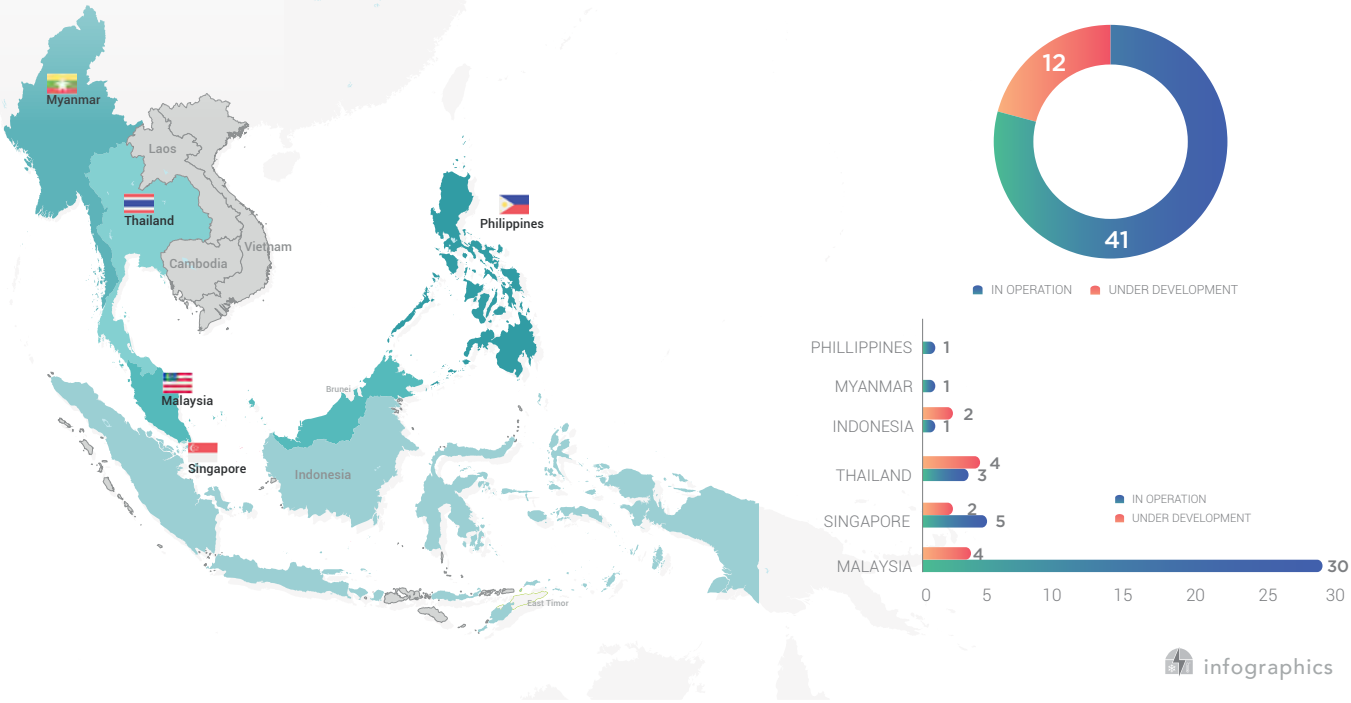
Another important environmental factor to consider when looking at the cooling demand is the refrigerants used in ACs and chillers. Out of the GHG emissions coming from cooling systems, 80% comes from energy consumption, and 20% comes from direct leakage of refrigerants into the atmosphere. With growing numbers of installed ACs and Chillers, selecting refrigerants with low Global Warming Potential (GWP) and minimizing leakage into the atmosphere is important. Reducing the refrigerant volume in cooling systems is of course also vital.

To further assess the future cooling demand, it is vital to include the ongoing urbanization trend, referring to the migration of people from the countryside to cities. Today, 58% of the global population lives in cities, and more than 70% of the world's energy is used in cities. There are currently 33 Mega Cities in the world, meaning cities with a population of 10 million or more, and 17 are located in Asia. In 2030 the number of Mega Cities is expected to grow to 43 globally, with 25 of them located in Asia. The growth of cities worldwide leads to a concentration of energy demand, including demand for electricity, heating and cooling.

In cities, ACs and cooling systems generate waste heat that is emitted to the surroundings increasing the temperature and adding to the cooling demand. This is called the Urban Heat Island Effect.

One type of cooling system that can address many of the challenges faced by cities in the Asia-Pacific region and support their energy transition is District Cooling. Simply described, District Cooling are centralized cooling systems where the chilled water is produced in a centralized production plant and then distributed to multiple buildings through a chilled water pipeline. District Cooling systems are suitable in cities and urban areas with high cooling demand. District Cooling Systems are also scalable and offer many benefits compared to conventional stand-alone cooling systems.

DISTRICT COOLING SYSTEMS IN SOUTHEAST ASIA



DISTRICT COOLING SYSTEMS (DCS) OFFERS:

- Up to 50% lower energy consumption than conventional cooling systems.
- Up to 30% reduced installed cooling capacity than individual cooling systems.
- Solutions to integrate renewable electricity from Solar and Wind.
- Potential to reduce peak loads with Thermal Energy Storage systems (TES).
- Reduction of refrigerant volume and refrigerant leakage.
- Reduction of the Urban Heat Island Effect.
- High availability and long lifespan.
- Competitive cooling tariffs, and O&M Costs.
- Huge market potential in the Asia-Pacific, and suitable for Mixed Used Developments, Central Business Districts, Transit Oriented Districts, Industry parks, Airports, Hospitals, Universities, Hotels and Data Centers.

Today, more than 41 District Cooling Systems are in operation in South East Asia, and more than 10 are under development. The largest District Cooling market in South East Asia is Malaysia, with more than 30 DCS in operation, followed by Singapore and Thailand, with 5 and 3 DCS in operation. India currently has 8 DCS in operation, and the largest market in the Asia-Pacific region is China, with at least 200 DCS in operation.

District Cooling Systems offer many benefits to cities in Asia to meet the growing cooling demand and, at the same, support the energy transition by maximizing energy efficiency and minimizing the environmental impact. District Cooling systems also support the energy transition as a way to integrate more renewable electricity into cities by acting as a large thermal battery that can be charged by intermittent energy from Solar and Wind energy systems. This is a more cost-effective way than using batteries which are much more expensive.

The Asia Pacific Urban Energy Association (APUEA) is a Bangkok based industry association 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.

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ASEAN SUSTAINABLE ENERGY WEEK

THE FUNDAMENTAL PRINCIPLE OF CAAS REVOLVES AROUND REPLACING OUTDATED AND INEFFICIENT CHILLER SYSTEMS WITH CUTTING-EDGE, HIGHLY EFFICIENT ONES. THIS TRANSFORMATION INVOLVES INTEGRATING ADVANCED AUXILIARY SYSTEMS, STATE-OFTHE-ART CONTROL, AND MONITORING SYSTEMS, AND IMPLEMENTING RIGOROUS OPERATION AND MAINTENANCE PRACTICES.

CaaS AS A SERVICE

In the pursuit of sustainable urban environments, businesses across various industries are actively seeking innovative solutions to reduce costs and minimize their carbon footprint.

One such transformative approach that offers a range of benefits for optimizing cooling systems is Cooling as a Service (CaaS). As a leading service provider, BECIS specializes in delivering efficient and environmentally friendly cooling solutions that enable businesses to achieve their sustainability goals.

CAAS AT ITS CORE: REVOLUTIONIZING COOLING SYSTEMS

The fundamental principle of CaaS revolves around replacing outdated and inefficient chiller systems with cutting-edge, highly efficient ones. This transformation involves integrating advanced auxiliary systems, state-of-the-art control, and monitoring systems, and implementing rigorous operation and maintenance practices. Our goal is to optimize performance and maximize electricity savings. We handle the entire capital expenditure investment when transforming our clients' cooling systems and provide a performance guarantee throughout the full contract period.

As part of our CaaS offering, we provide all required services, including engineering design, installation, and the integration of new chillers into the cooling system. During implementation, we establish a connection to the factory through a header pipe that consolidates all the chillers, effectively meeting the cooling load.

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

CONQUERING COOLING CHALLENGES: A TALE OF F&B GIANTS

Now, let's dive deeper into the transformative power of CaaS with an inspiring example from the F&B industry. A renowned multinational in this sector faced the dual challenge of upgrading their refrigerated warehouse capacity and reducing their environmental impact. Turning to BECIS for a sustainable solution, the company discovered that their existing cooling system was inadequate and relied on the use of R22 refrigerant, which posed a significant greenhouse gas threat. To overcome these challenges, BECIS designed a cutting-edge system that not only eliminated greenhouse gas emissions but also increased efficiency by 35%, resulting in reduced energy consumption and operational costs.

UNLEASHING THE POWER OF SUSTAINABLE COOLNESS

As the demand for cooling systems continues to rise, the need for low-carbon technologies becomes increasingly crucial. CaaS emerges as the game-changing force that enables businesses to embrace sustainable cooling without the burden of upfront costs. Under the service-based business model offered by BECIS, customers can unlock cost savings of between 20% and 35% through enhanced consumption efficiency. Moreover, regular maintenance services provided by BECIS ensure the reduction of emissions by up to 49%. This powerful alliance between businesses and BECIS is not only a win for the bottom line but also a triumph for the planet.

SUPERCHARGING COOLING THROUGH DIGITIZATION

CaaS sets itself apart by integrating advanced digitization into the cooling system. By leveraging cutting-edge monitoring technologies, such as real-time online monitoring, BECIS ensures optimal performance and efficiency of cooling system components. This digitized approach empowers businesses to achieve their sustainability targets while benefiting from uninterrupted cooling operations. Through continuous monitoring, potential issues are promptly identified, enabling immediate corrective actions and minimizing downtime.

ELECTRIFYING COOLNESS AND WASTE HEAT WIZARDRY

CaaS unveils fascinating cooling possibilities through two primary methods: electrical cooling and waste heat utilization. Electrical cooling electrifies businesses with its energy efficiency and scalability. Waste heat utilization, on the other hand, transforms wasted energy into cooling bliss through the utilization of absorption chillers. This dynamic duo provides businesses with flexibility and tailored solutions, effectively reducing their carbon footprint.

THE GLOBAL DEMAND FOR SUSTAINABLE COOLING

The future holds a tripled global demand for cooling systems by 2050, representing 10% of global electricity consumption. This rapid growth highlights the pressing need for scaling low-carbon technologies and adopting sustainable cooling solutions. With urbanization on the rise and temperatures increasing, businesses must embrace these solutions to meet future demands and minimize environmental impact. CaaS by BECIS emerges as the transformative answer, providing access to energy-efficient and eco-friendly cooling solutions without upfront investment costs.

CONCLUSION

In conclusion, Cooling as a Service (CaaS) represents a transformative approach to sustainable cooling solutions for businesses across industries. By partnering with BECIS, companies can leverage CaaS to achieve efficient cooling, reduce costs, and minimize their carbon footprint. Through advanced digitization, monitoring, and a range of cooling options, CaaS empowers businesses to meet their sustainability goals while benefiting from optimized performance and reliability. With CaaS, companies can embrace low-carbon technologies, optimize energy consumption, and pave the way for a greener and more sustainable future.

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 achieveambitious 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

Controlling your industrial risks

Proven, innovative, yet practical solutions, already over 1000 client sites in Asia...

Welcome to Smart O&M

Focus Areas

Industrial Risk Management

As per ISO 31000, define risks and controls, manage incidents, audits andactions, communicate with stakeholders, based on true data from mobile users and external systems.

Operation & Maintenance

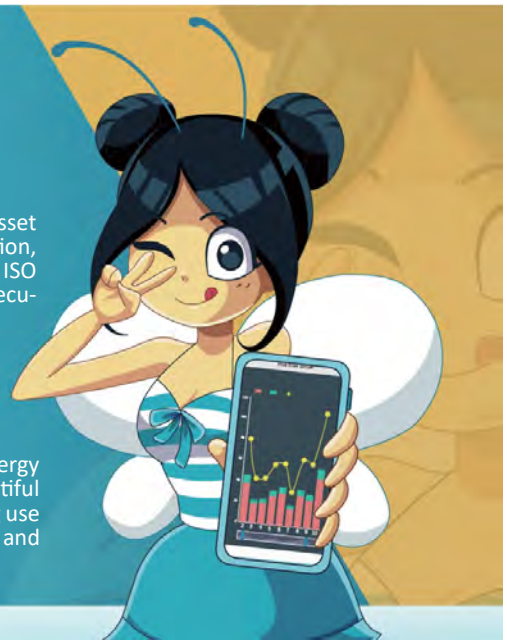
Designed to enforce O&M best practices from top managers to field workers, bluebee® visually integrates 3D BIM models, GIS maps, with datafrom IoT and legacy systems.

Asset Management

bluebee® supports the entire asset lifecycle, from construction to operation, for owners and operators, closing the ISO 55000 loop betweenstrategy and execution.

Environmental, Social and Governance (ESG)

Beyond just monitoring energy consumption and providing beautiful KPIs, bluebee enables ESG by making use of its in-depth Asset Management and Risk Management functionalities.



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www.bluebeecloud.com/th

Kian Gwan House III, 5th Fl.,
152 Wireless Rd., Lumpini, Pathumwan, Bangkok 10330

THE RENEWABLES 2023 GLOBAL STATUS REPORT SHOWS CONSTANT GROWTH IN RENEWABLES BUT ALSO IMPORTANT CHALLENGES AND BOTTLENECKS.

By REN21

In 2022, the global energy landscape was shaped by a turbulent and uncertain period, with a post-pandemic economic rebound, Russia's invasion of Ukraine, and growing climate concern in the face of extreme weather events. Against this backdrop, energy prices soared to record levels and the idea of transitioning away from fossil fuels to meet energy and climate security goals gained ground across the world.

Released in five modules between March and August 2023, the latest edition of REN21 Renewables Gobal Status Report (GSR2023) dives into key aspects of the renewable energy sector: from renewable energy supply, to demand, systems/infrastructure and the socio-economic benefits of renewables. The GSR2023 finds that, in 2022, the use of renewables as a reliable and affordable energy source has grown significantly. It also shows that, with a record 30% share, renewable electricity is driving the energy transition.

Last but not least, it shows that renewables are spinning the economic wheel with new industrial activities, jobs and social value in the countries that have embraced them. In parallel to these positive trends, the GSR2023 also documents imbalances in the uptake of renewables among regions and across technologies.

VISIT THE FULL REPORT ONLINE AT

https://www.ren21.net/gsr-2023

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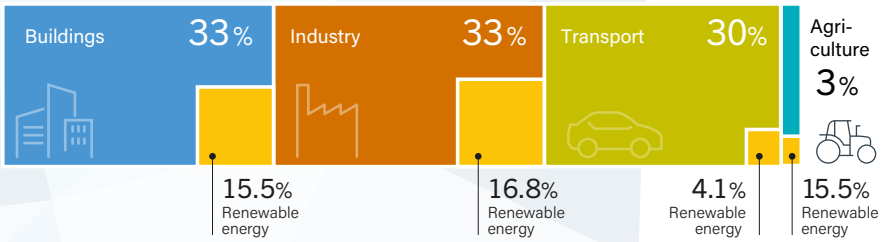
Renewables are making progress, but it is uneven across regions and technologies.

While the renewable energy sector's growth is evident, the shift to renewable energy is progressing unevenly across regions and technologies.

Globally, the renewable electricity generation grew by 8.1%, an increase from the 5.5% growth seen in 2021. In Asia alone, renewable electricity generation grew by 11%. Driven by this increasing trend, renewables accounted for 12.7% of global energy consumption in 2021 and reached 30% of power generation in 2022.

RENEWABLES IN **ENERGY DEMAND**

Total Final Energy Consumption and Total Modern Renewable Energy Consumption, by Sector, 2020



Total renewable energy demand grew **4.7%** per year on average between 2010 and 2020

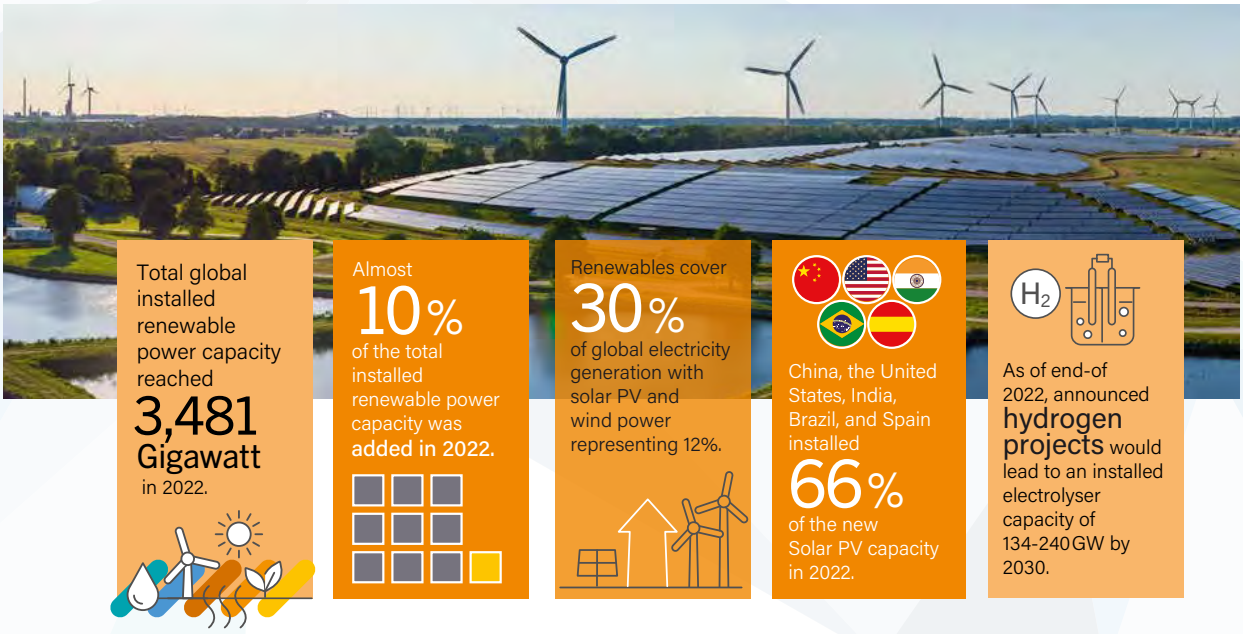
As of 2022, **94 countries** had either a renewable energy policy or target in at least one demand sector

As of 2022, **3 countries** had renewable energy targets or policies in **all** four demand sectors

Agriculture and transport have the fastest yearly growth rates of renewable energy adoption with more than **7%**

The share of renewable electricity in TFEC grew 3% in the last decade to reach **7%** in 2020

Renewables in Energy Supply



Total global installed renewable power capacity reached **3,481 Gigawatt** in 2022.

Almost **10%** of the total installed renewable power capacity was **added in 2022.**

Renewables cover **30%** of global electricity generation with solar PV and wind power representing 12%.

China, the United States, India, Brazil, and Spain installed **66%** of the new Solar PV capacity in 2022.

As of end-of 2022, announced **hydrogen projects** would lead to an installed electrolyser capacity of 134-240 GW by 2030.

With China leading in renewable investments in 2022, followed by Europe at 11.3%, Asia-Oceana (excluding China and India) at 10.8%, and the United States at 10.0%, all other world regions collectively accounted for less than 4% of total investments.

In terms of technologies, the growth is mainly seen in solar PV manufacturing capacity, at 39% and wind energy, at 2%. Together, solar PV and wind power comprised 92% of renewable capacity in 2022. While 348 GW capacity was added to renewable power in 2022, deployment is still insufficient to achieve net-zero targets. Solar PV manufacturing is concentrated in China, a country that is also increasingly competitive in the wind energy sector. Heat pump and electrolyser manufacturing is distributed globally, with significant shares in China, the US, and the EU. Asia has experienced rapid growth in biodiesel production, driven mainly by expanding mandates in Southeast Asian countries.

Demand for renewables is growing in all sectors, but more incentives and better regulatory frameworks are needed.

The GSR2023 shows that electrification increased in all sectors, primarily in agriculture, industry, and buildings. The rising share of electricity in the total final energy consumption in these sectors has encouraged further efforts to develop the infrastructure needed for the energy transition.

Electrification of transport surged, with record investments in electric vehicles and charging infrastructure. Asia is the renewable energy-powered transport trendsetter, as countries in the region seek to grapple with pollution and climate risks. Agrivoltaics, geothermal, and bioenergy gained ground in agriculture, driven by a desire for self-reliance and additional income generation.

> **EVIDENTLY, THE SHIFT TO A RENEWABLES-BASED ECONOMY IS NOT ONLY REDUCING EMISSIONS AND TACKLING CLIMATE CHANGE. IT HAS ALREADY CREATED MORE THAN 12.7 MILLION JOBS GLOBALLY AND GENERATED GREAT SOCIAL VALUE WITH REDUCED ENERGY COSTS, BETTER HEALTH, MORE INCLUSION AND ENHANCED ENERGY SECURITY AND ACCESS.**

Virtual power plants continue to expand in Europe, with a total installed capacity of nearly **50 GW.**

Curtailment of variable renewable energy is still occurring due to a **lack of transmission and storage capacity,** inadequate planning and land management challenges.

More than **1,000 GW** of solar and wind power projects were **stuck in permitting and interconnection queues** as of 2022.

Global investment in battery storage capacity totalled **15.7 USD billion** in 2022.

Total pumped storage capacity increased by **10.5 GW** in 2022, for a global total of 175 GW.

Energy-intensive industries were hard-hit by the energy crisis, leading to production cuts, but also to the development of renewable-powered industrial parks and corporate power purchase agreements (PPAs). These high energy consuming sectors likely require high upfront investment to transition to renewable sources of energy, which is often not feasible without government support and incentives.

On the demand side, the GSR2023 identifies around 80 new renewable energy policies (mostly in the form of fiscal/ financial incentives) announced in 2022, while regulatory policy announcements stagnated, bringing the total to 454 policies across sectors. These announcements were made in 49 countries, with more than half of the countries in Europe, 8 in Latin America and the Caribbean, 7 in Asia, 4 in Africa, 2 in Oceania and only 1 each in North America and in the Middle East and North Africa.

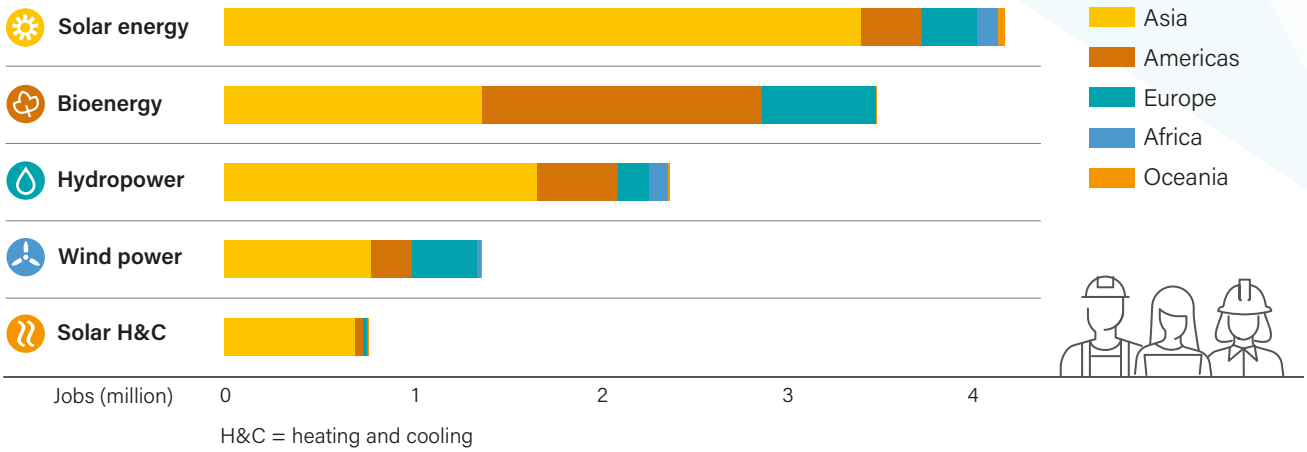
Programmes such as the US Inflation Reduction Act, the European Union's (EU) Fit for 55 and RePowerEU packages, the Australia's Climate Change Bill, the Japan's GX Green Transformation and China's 14th Five-Year Plan were also announced in 2022 and include substantial measures to foster energy efficiency and advance the adoption of renewables and reflect increased investments and spending on the energy transition.

The benefits of renewables are larger than climate mitigation yet fossil fuels still attract more investment than renewables.

Evidently, the shift to a renewables-based economy is not only reducing emissions and tackling climate change. It has already created more than 12.7 million jobs globally and generated great social value with reduced energy costs, better health, more inclusion and enhanced energy security and access. This invigorated economic and social cycle is set to increase, the faster governments deploy renewable energy.

Yet even as renewables repeatedly prove their efficiency and reliability, investments in renewable energy pale in comparison to the huge increases in investments in fossil fuels. The GSR2023 finds that in 2022, the average capital expenditure of the top five fossil fuel companies increased to USD 16.1 billion (up from USD 12.4 billion in 2021), yet the share of low-carbon investment, of which renewable energy is only a fraction, did not increase. Fossil fuel companies funnelled their record profits into carbon-intensive fossil fuel projects, shareholder dividends, share buybacks, and debt rather than towards long-term net zero targets.

Global Renewable Energy Employment, by Technology and Region, 2021



H&C = heating and cooling

> Even though investment in renewables reached a record high of USD 500 billion in 2022, this figure is still dwarfed by the USD 1 trillion invested in fossil fuels. In 2021, private banks provided a staggering USD 395 billion for fossil fuel projects and only USD 53 billion to renewables. Out of the total investment in energy infrastructure, 30% is spent on renewables, 52.5% on fossil fuels and nuclear energy, and 17.4% on grids and storage.

Divestment and sustainable finance frameworks suggest hope for the future.

There have, however, been some alterations to this trend. Since 2011, a rising number of institutions have been divesting from fossil fuels. By October 2022, 1,559 institutions with substantial assets had committed to fossil fuel divestment. New sustainable financial structures, like green bonds and the Asian Development Bank's Innovative Finance Facility, are ushering in support and investments for renewable initiatives.

While promising shifts in the landscape in 2022 highlighted the power and promise of renewables, the energy transition is not happening at the urgent pace required. Nevertheless, the collective efforts of countries, industries, and communities worldwide are scaling up action, speeding up policy and technological innovation, and building up the energy system needed to achieve net-zero.

REN21 is the only global renewable energy community of actors from science, governments, NGOs and industry. We provide up-to-date and peer-reviewed facts, figures and analysis of global developments in technology, policies and markets. Our goal: enable decision-makers to make the shift to renewable energy happen – now.

Our more than 2,000 community members guide our co-operative work. They reflect the vast array of backgrounds and perspectives in society. As REN21's eyes and ears, they collect information and share intelligence, by sending input and feedback. REN21 takes all this information to better understand the current thinking around renewables and change norms. We also use this information to connect and grow the energy debate with non-energy players.

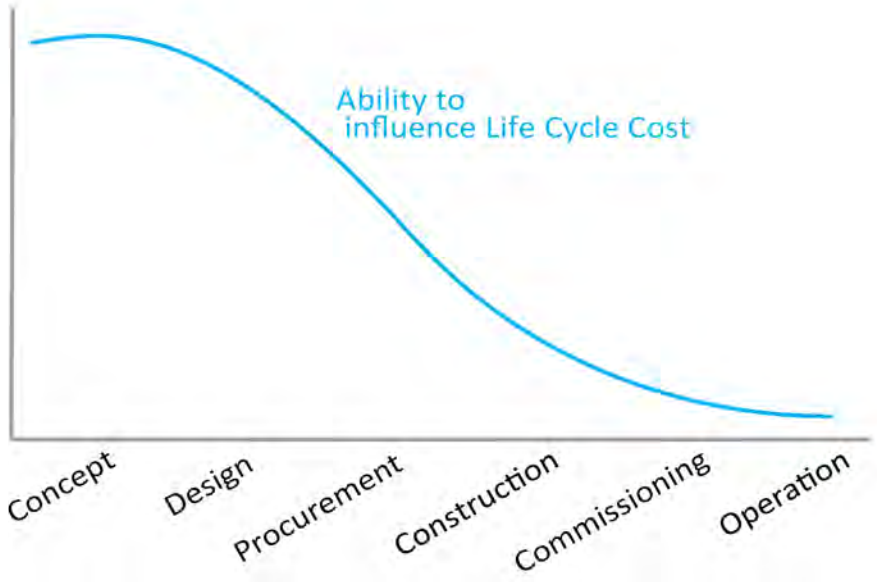
REN21
RENEWABLES NOW

SMART O&M'S ROLE IN THE ENERGY TRANSITION: OPTIMIZING O&M FROM THE CONSTRUCTION PHASE IN NEW ENERGY PROJECTS

By Bruno Lhopiteau, Managing Director of Siveco China and Bluebee Technologies

A significant untapped potential in the ongoing energy transition

Experience in the energy industry has shown that paying attention to reliability and maintainability earlier in the project helps reduce future Operation & Maintenance costs.



Yet, complex business realities put priority on immediate commercial, technological and construction matters. EPC companies also tend to lack the overall lifecycle perspective. Focus on cost control and an "agile" as-you-go construction approach contribute to future O&M problems: poor as-built documentation, lack of established maintenance plans, etc. Even in projects that have invested heavily in sophisticated BIM software, useful O&M data is often scattered between Excel and paper documents or simply missing. Design or installation problems that should have been identified during commissioning may go undetected: quick fixes were applied, problems went unreported, no analysis was carried out, resulting in early replacements, reliability problems and spiraling cost during operations.

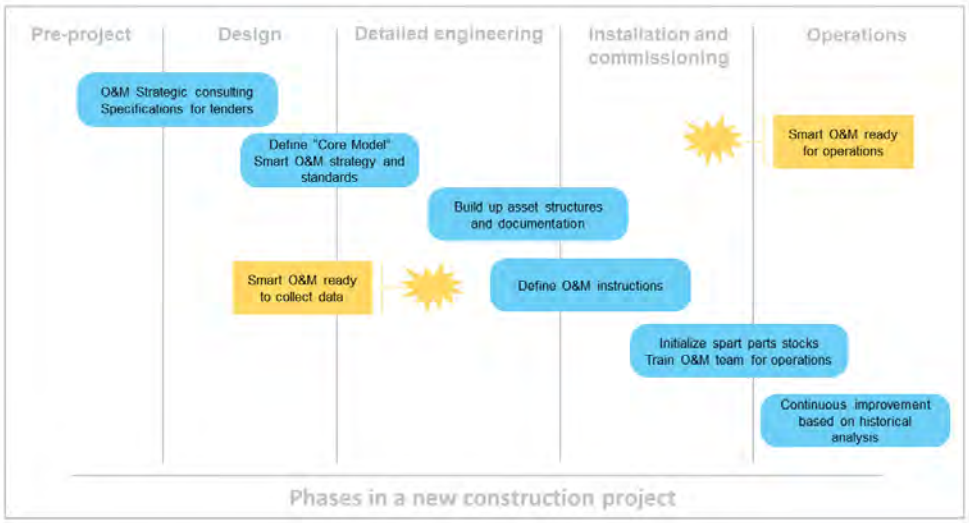
In New Energy projects, new technologies, a higher degree automation, sometimes overconfidence in modern control system, IoT platforms and the likes, and the relative lack of O&M experience, exacerbate the challenge. O&M preparation represents a significant untapped potential in the ongoing energy transition.

"IN NEW ENERGY PROJECTS, NEW TECHNOLOGIES, A HIGHER DEGREE AUTOMATION, SOMETIMES OVERCONFIDENCE IN MODERN CONTROL SYSTEM, IOT PLATFORMS AND THE LIKES, AND THE RELATIVE LACK OF O&M EXPERIENCE, EXACERBATE THE CHALLENGE. O&M PREPARATION REPRESENTS A SIGNIFICANT UNTAPPED POTENTIAL IN THE ONGOING ENERGY TRANSITION."

bluebee®

A significant untapped potential in the ongoing energy transition

Siveco Group, established in France in 1986, and Bluebee Technologies, the Smart O&M R&D unit launched in 2009, have in the past 35 years developed specific expertise working alongside plant owners and EPC contractors from the early stage of the project, ensuring smooth transfer of technical documentation from construction to operation, ensuring maintenance readiness before start-up using Smart O&M solutions.

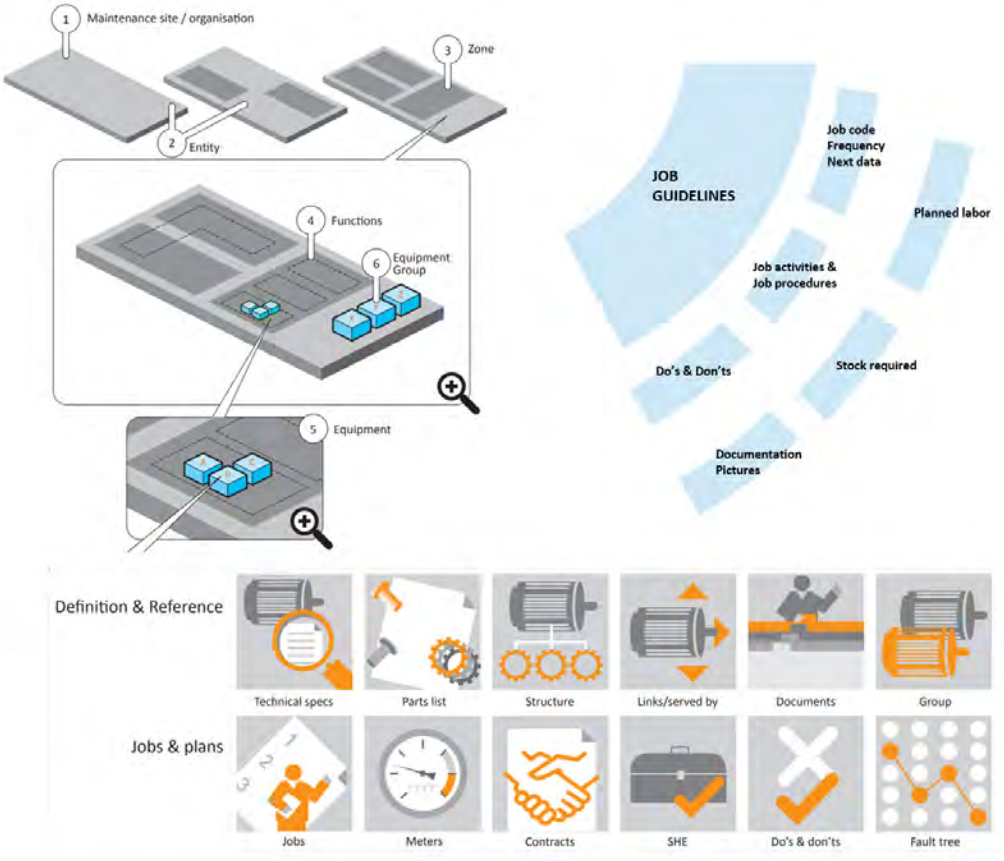


Smart O&M is a modernized take on the traditional Computerized Maintenance Management Systems or CMMS, encompassing modern BIM and IoT technologies and a wider scope covering HSE and ESG. The solution is ideal for greenfield plants, supporting data preparation, commissioning and start-up with an accurate technical database and enforcing good maintenance practice from day one.

In Asia more than anywhere else, the Smart O&M solution turns out to be the ideal tool to bring concrete structure to the O&M preparation process often perceived as abstract ("Prepare for maintenance? But the equipment has not yet been delivered! The maintenance team hasn't been hired!"). The high-tech factor becomes a key motivator for engineers involved in the project.

Main benefits
Detailed, accurate and easily accessible plant documentation

The Smart O&M platform helps coordinate suppliers to build up a detailed and accurate technical documentation (specifications, contracts, spare-parts lists, etc.), in line with O&M standards (rather than construction habits) and immediately usable by the O&M team.



Traceability of commissioning problems

Commissioning engineers record problems onsite in their Smart O&M mobile app, ensuring proper follow-up by construction company and suppliers. Faults occurring in the early phases of operation are accurately documented, with root cause analysis, remedial action plans, in the O&M historical database.

Support ESG goals in the O&M system

As ESG is gaining traction, it is often managed separately from O&M. More than just monitoring emissions, energy consumption and showing beautiful KPIs, ESG relies on the systematic analysis of problems, tracking improvement actions, based on proven data from sensors and people. ESG is best tackled as part of the Smart O&M build-up, to ensure ESG and O&M strategies are fully aligned.

Integration with automation systems

Construction is the best time to integrate data from automation systems (DCS, SCADA, IoT in general) in the Smart O&M as this is when the O&M strategy, in particular the role played by predictive maintenance, is defined. Joint systems design ensures more meaningful data transfer (traditional DCS-CMMS interfaces often send alarms and measurements indiscriminately) and full HMI integration (operators can access technical documentation directly from their supervision HMI).

Integration with BIM

Similarly, an early integrated Smart O&M design allows the smooth buildup of completely integrated "BIM for O&M" solutions, with user interface integration allowing users to view the model (usually in Revit format) inside their O&M environment and to access all data from O&M to BIM, from BIM to O&M.

Optimized plant lifecycle

In greenfield energy projects, ROI from the Smart O&M approach can be achieved as early as startup time, thanks to direct savings during the construction to maintenance handover, with lower manpower (in-house teams and maintenance consultants), as well as lower IT and systems integration costs. In projects involving ambitious BIM plans, savings may be achieved by lower BIM consulting fees alone. More importantly during the O&M phase, this approach can easily save millions of dollars in risk reduction through the enforcement of better HSE standards, avoided losses (downtime, delayed repairs, recurring problems etc.), and ensuring regulatory compliance.

Global projects highlights

Sunzil, a JV of Total and EDF, operates over 750 solar PV plants in the French overseas territories, islands scattered all over the world, presenting enormous O&M challenges. Rationalized work procedures in the centralized system (Coswin 8i) resulted in improved service levels (response time divided by 2 to 3), better safety and a more secured supply of spare parts.

SVA Group owns 30 hydroelectric plants for a total capacity of 906 MW in northern Italy. The company standardized assets management and HSE, ensuring a proactive O&M governance to ultimately extend the useful life of assets. The Coswin 8i-based O&M solution runs on PC (web), mobile (offline and online app) and is interfaced with the corporate SAP.

Photo credit C.V.A. S.p.A.

The 230 MW Garadagh Solar PV Plant in Azerbaijan is developed by Masdar, the Abu Dhabi Future Energy Company, and built by Dongfang Electric. The bluebee® solution (web and mobile), integrated with the plant SCADA system, will be ready in time for start-up in late 2023, ensuring best O&M practices from day one.

Korean EPC Hanwha Engineering & Construction built the 450MW Biskra Simple Cycle Power Plant in Algeria. Siveco China provided a turnkey O&M solution in time for start-up (2016). Data preparation services and system configuration were performed in Asia, with final system installation and end-user training onsite in Algeria.

Center One Shopping Plaza in Bangkok, Thailand, launched a project aimed at improving the maintenance of centralized utilities at the 20,000sqm mall. The implementation of bluebee® was conducted by a joint team between Bluebee Technologies and academic partner Chulalongkorn University's School of Integrated Innovation.

Bruno Lhopiteau is the Managing Director of Bluebee Technologies and Siveco China, with offices in Singapore, Bangkok, Hongkong and Shanghai. Bluebee Technologies (www.bluebeecloud.com) designs innovative yet practical Smart O&M solutions that support Industrial Risk Management, Asset Management and Environmental, Social and Governance (ESG) by enabling industrial decisions based on true data from mobile workers, connected objects and external systems.

bluebee®

RECENT APUEA ACTIVITIES

ACHIEVING NET ZERO TARGETS IN VIETNAM WITH SUSTAINABLE COOLING

On July 25th, APUEA hosted the workshop Achieving Net Zero Targets in Vietnam with Sustainable Cooling during the HVACR Vietnam 2023 in Hanoi with Informa Markets.

Like most countries in Southeast Asia, Vietnam aims to reach net-zero GHG emissions by 2050, and the government has announced ambitious targets to double clean energy capacity by 31-38 GW, leading to a 15-20% Renewable Energy share of the country's total energy supply. Today, Vietnam's population is 97 million, and its economy increased by 8% in 2022. At the same time, despite its tropical climate, only 7% of the households use ACs which is significantly lower than neighbouring countries like Thailand (35%) and Malaysia (80%). This number will likely rapidly increase due to Vietnam's economic growth and high urbanization rate.

Today, space cooling stands for 10% of the world's GHG emissions, and with increased temperatures due to global warming and increased population and economic growth in the hottest part of the world, the cooling demand is expected to triple by 2050, leading to equivalent increased energy demand in no action is taken. Cooling is sometimes called the Elephant in the waiting room, referring to its importance in the energy transition and meeting climate targets. This is applicable both globally and in Vietnam.

The workshop discussed how to meet the future cooling demand in Vietnam with sustainable cooling solutions and explored how sustainable Cooling is one tool in the toolbox to reach the country's climate targets.

Session topics:
- Vietnam in the Energy Transition - Introduction to Energy and Climate Change Policies, Refrigerants Management Roadmap, and Sustainable Cooling Developments (MONRE)
- Optimizing Real Estates with Cooling as a Service (Keppel)
- Heat pump - A Low Carbon Technology for Heat Recovery and Energy Savings (Johnson Controls)
- International District Cooling Experiences (Peter L)

Speakers:
- Mikael Jakobsson, APUEA (Moderator)
- Nguyen Dang Thu Cuc, Deputy Head, Division for GhG Emission Reduction and Ozone Layer Protection, Ministry of Natural Resources and Environment (MONRE)
- Quan Ton, Country Manager, Keppel DHCS
- Chia Peng Kiang, Growth Application Manager (Industrial Refrigeration), Johnson Controls Singapore Pte Ltd
- Peter Lundberg, Executive Director, APUEA

GREEN TRANSFORMATION OF DISTRICT HEATING AND COOLING

On June 14th, APUEA co-hosted the Deep Dive Workshop: Green Transformation of District Heating and Cooling together with the Asian Development Bank during the Asia Clean Energy Forum in Manila.

District Heating and Cooling has become one of the most important energy infrastructures to achieve systemic efficiency. Carbon emissions can be reduced significantly through the integration of clean heating solutions and heat recovery, the connection of energy-efficient buildings while also supporting the integration of renewable energies in the electricity grid. District Heating supports multiple SDGs and is crucial to achieving NDCs. This session presented some of the projects that the Asian Development Bank (ADB)'s Central and West Asia Department (CWRD) is working on to support the green transformation of district heating into clean heating and cooling system through multiple projects within its region. The session also include insights into international District Energy developments to inspire further developments in the CWRD region and beyond.

Session Topics:
- Carbon Neutral District Heating Outlook (Peter L)
- Supporting Renewable Technology-Inclusive Heat Supply Legislation in Kazakhstan (Ronald R)
- Energy Efficiency for the Energy Transition Reducing Reliance on Conventional Cooling Systems Through Innovative Technologies (Elmer A)
- International District Energy Developments Clean Heating Technologies (Jean-Baptiste D)
- Innovative District Energy Developments in Japan (Dr Matsubara)
- Renewables Global Status Report (Laura W)

Speakers:
- Mikael Jakobsson, President, APUEA (Moderator)
- Joonho Hwang, CWEN Director, Asian Development Bank (Welcome Remarks)
- Alimzhan Turar, Kazakhstan Ministry of Energy (Opening Remarks)
- Peter Lundberg, Executive Director, Asia Pacific Urban Energy Association
- Ronald Rost, Head of International Sales, Dornier Power and Heat
- Elmar Asgarzade, Director, Climasel (Azerbaijan)
- Jean-Baptiste Dreanic, Head of Operations, ENGIE Services Philippines
- Dan Brian Millison, Sustainable Energy Technology Expert (consultant), SDCC Energy Sector Group, ADB
- Dr Hironao Matsubara, Chief Researcher, Institute for Sustainable Energy Policies (ISEP)
- Laura Williamson, Membership & Institutional Partnerships, REN21

COOLING – THE ELEPHANT IN THE WAITING ROOM

On May 24th, APUEA participated in the workshop called Cooling – the Elephant in the waiting room during the Euroheat & Power Congress 2023 in Torino, Italy. During the session, APUEA's Executive Director, Peter Lundberg, presented an outlook on District Cooling developments in Asia.

Session introduction (by Euroheat & Power)
According to the IEA, global energy consumption for space cooling has tripled since 1990, with significant implications for electricity demand and associated CO2 emissions. As the globe faces its warmest days and summers for decades, the growing demand for Cooling is set to reach a new level. Cooling is already the main driver for electricity demand growth in the southern hemisphere. For this reason, sustainable Cooling is most definitely the "Elephant in the waiting room", an issue that must be addressed proactively by European and international policymakers to avoid irreversible environmental impacts.

Efficient and sustainable, District Cooling is already increasingly deployed globally, notably in the Asia-pacific region. In Europe, cities progressively realize the value of District Cooling to strengthen their energy resilience and achieve broader energy and climate objectives.

This session included the latest update and outlook for District Cooling, focusing on Europe and some global market highlights.

Speakers:
- Jakob Bjerregaard, Partner, Devcco
- Peter Dahl, Investment Manager, Polhem Infra
- Chiara Delmastro, Energy Analyst, International Energy Agency
- Alex Ivancic, Partner & Senior Consultant, Aiguasol
- Peter Lundberg, Executive Director, Asia Pacific Urban Energy Association - APUEA

WEBINAR - AVOIDING THE "CHEAP CMMS" TRAP, GET ROI FROM MAINTENANCE DIGITAL TRANSFORMATION

On August 11th, APUEA was a supporting partner of the webinar Avoiding the "Cheap CMMS" Trap, Get ROI from Maintenance Digital Transformation hosted by Bluebee Technologies.

Webinar title: Avoiding the "Cheap CMMS" Trap, Get ROI from Maintenance Digital Transformation
Hosted by: Bluebee Technologies
Speaker: Bruno Lhopiteau, Managing Director, Bluebee Technologies
Supported by: Asia Pacific Urban Energy Association (APUEA), Acoem, Lobster, and JSC

Session topics:
- Typical pains and needs of facility owners in Asia
- Market trends in CMMS/EAM and related technologies
- Conflicting perspectives on maintenance and asset management
- In practice, how to gain value from your CMMS/EAM project:
- System functional scope
- Implementation approach
- IT Considerations
- Examples of ROI from real projects in Asia
- Summary: Do's and Dont's

All issues of the APUEA Magazine can be found on www.apuea.org

APUEA
Asia Pacific Urban Energy Association

EVENT CALENDAR

APUEA EVENTS

ASIA URBAN ENERGY ASSEMBLY

31 August-1 September | Bangkok, Thailand

30-1 AUGUST - SEPTEMBER
ASEAN SUSTAINABLE ENERGY WEEK
Bangkok, Thailand
30AUG-1 SEP 2023

13-16 SEPTEMBER
ELECTRIC & POWER INDONESIA
Jakarta, Indonesia
13-16 SEPTEMBER 2023

31-1 OCTOBER - NOVEMBER
DISTRICT COOLING INTERNATIONAL CONFERENCE
GOA, India
31OCT-1NOV 2023

14-15 NOVEMBER
GLOBAL DISTRICT ENERGY CLIMATE AWARDS
Brussels, Belgium
14-15 NOVEMBER 2023

6-7 DECEMBER
SHANDONG URBAN ENERGY SUMMIT
Jinan, China
6-7 DECEMBER 2023

MEMBER DIRECTORY

PREMIUM MEMBERS

ABB

Engie

Johnson Controls

Keppel DHCS

MEMBERS

International District Energy Association (IDEA)

NXITY

Becis

Qatar Cool

China District Heating Association (CDHA)

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

Black and Veatch

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

APUEA REGISTRATION FORM - MEMBERSHIP

WE, THE UNDER-MENTIONED ORGANISATION / COMPANY,
HEREBY APPLY TO BECOME A MEMBER

You can print out your registration and entry form below.

1 ORGANISATION / COMPANY DETAILS:

Organization name.....

Marketing name and/or Abbreviation.....

Street.....

Postal code..... City..... Country.....

General Phone..... General Fax.....

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

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

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

2 ORGANISATION CATEGORY (please check as appropriate below):

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

Specify:.....

3 BILLING INFORMATION (if different from above):

Billing Address:.....

.....

.....

4 MEMBERSHIP CATEGORY (please check as appropriate below):

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

5 PAYMENT METHOD:

◯ Bank Transfer ◯ Credit Card ◯ Paypal

Please indicate preferred payment method. Payment instructions will be provided following confirmation of membership.

Please complete the form, and send a scanned version
to info@apuea.org

APUEA
Asia Pacific Urban Energy Association

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