

APUEA

Magazine

FUTURE

URBAN ENERGY

www.apuea.org



Promoting Sustainable Urban Energy in Asia Pacific



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Editorial

On February 4th, 2019, NASA announced that the Earth's global surface temperatures in 2018 were the fourth warmest since 1890. Interestingly, the four previous years (2014 - 2017) had also been the four warmest years in over a century; and this trend has continued since the '70s. This fact is indisputable, as NASA Goddard Institute for Space Studies, Berkeley Earth, Japanese Meteorological Agency, NOAA National Climate Data Center, Met Office Hadley Center, among many other institutions, have been showing similar trends.

Despite the negative trends and alarms indicating that global warming targets agreed in the Paris Agreement at COP21 are hard to reach, we get even more inspired and convinced that our mission is crucial to achieving sustainable cities in the future. Never have Asia Pacific Urban Energy Association (APUEA) and similar initiatives promoting sustainable urban energy been as important as now. We are also encouraged to see a new generation growing up and taking these warnings seriously. They are not quietly waiting for a single disastrous event to happen, but they can read the statistics and see the consequences of extreme weather around the world. APUEA will not only continue its efforts but accelerate in 2019.

In 2018, we recruited Mr. Peter Lundberg who joined APUEA as Head of Operations to strengthen and lead daily operations of the secretariat in Bangkok. Thanks to Peter and his team's terrific work, APUEA has managed to develop and improve in many aspects throughout the course of 2018. We have seen the APUEA Magazine realized, the visibility of APUEA increase through publications on social media, involvement in numerous events across the region, growing memberships, and ad-hoc services being provided to APUEA members.

Now, APUEA is raising the bar, and the operation plan for 2019 is very ambitious. More publications will be launched and, on average, APUEA will host or participate in more than one event per month, promoting sustainable urban energy development in China, India, and Southeast Asia. Our activities in the first quarter include the publication of this first APUEA Magazine of the year and participating in India Smart Grid Week during 12-16th March in New Delhi and The Future Energy & Tech Investment Forum on the 28th of March in Shanghai.

In this issue of the APUEA Magazine, you can read about the future of urban energy, including the digital transformation of power, district heating, district cooling, waste-to-energy, and other interesting topics.

We want to highlight the Asia Clean Energy Forum (ACEF) scheduled for 17-21st June at the Asian Development Bank in Manila where APUEA will host its Annual General Meeting and has proposed to co-host a Deep Dive Workshop on District Energy in collaboration with UN Environment's District Energy in Cities Initiative (UN DES). This will be an excellent opportunity to get insight into the concept of district energy and its challenges and opportunities in the region. ACEF will offer an opportunity for networking and potential partnerships with hosting organizations, contributing organizations, and other participating organizations and individuals. More information on the events can be found in this issue of the APUEA Magazine and on the APUEA portal (www.apuea.org).

Once again, we would like to express our appreciation to our founding members ABB, Engie, and Johnson Controls, who have been committed to developing the association since its establishment in 2017. Finally, we would like to thank all our active, allied and affiliate members for their commitment to support the cities in the Asia Pacific to develop sustainable urban energy.



Mikael Jakobsson
Executive Director,
Asia Pacific Urban Energy Association (APUEA)

Secretariat



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Asia Pacific Urban Energy Association

The APUEA is an initiative of the International Institute for Energy Conservation (IIEC) that promotes 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. The Association's online portal serves 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 this portal, APUEA events, conferences, and continuous outreach to its members, the Association shares 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.

An APUEA membership will provide 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.

For more information about APUEA and how to become a member, contact membership@apuea.org or visit www.apuea.org





ASIA PACIFIC URBAN ENERGY ASSOCIATION MEMBERSHIP

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

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

APUEA Membership categories are:



ACTIVE MEMBER

Member that benefits from the Association and take an active role in the Association in terms of its governance and operation. An Active Member will be able to influence the scope of APUEA publications and will be recognized in published material from the Association.

ALLIED MEMBER

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

AFFILIATE MEMBER (Invitation only)

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

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

Member Category	Employees		
	≤ 1,000	1,000 - 10,000	≥ 10,000
Active Member	USD 4,000	USD 5,500	USD 7,000
Allied Member	USD 3,000	USD 4,500	USD 6,000
Affiliate Member	N/A		

BENEFITS

- ✓ Online Portal (www.apuea.org)
- ✓ Newsletters
- ✓ APUEA Magazine
- ✓ Publications
- ✓ Direct Assistance
- ✓ Regional and International Events
- ✓ Annual Meeting and Trade Exhibition



IIEC – the Driving Force behind APUEA



Felix Gooneratne
Executive Director,
International Institute for
Energy Conservation (IIEC)



The International Institute for Energy Conservation (IIEC) is pleased to be the initiator of APUEA in 2017.

As an NGO established in USA in 1984, IIEC's mission is to accelerate the global adoption of energy efficiency and renewable energy policies, technologies and practices to enable economic and environmentally sustainable development. IIEC pursues this mission in developing countries and countries in transition through fieldwork undertaken by its regional offices in Thailand, India and the Philippines.

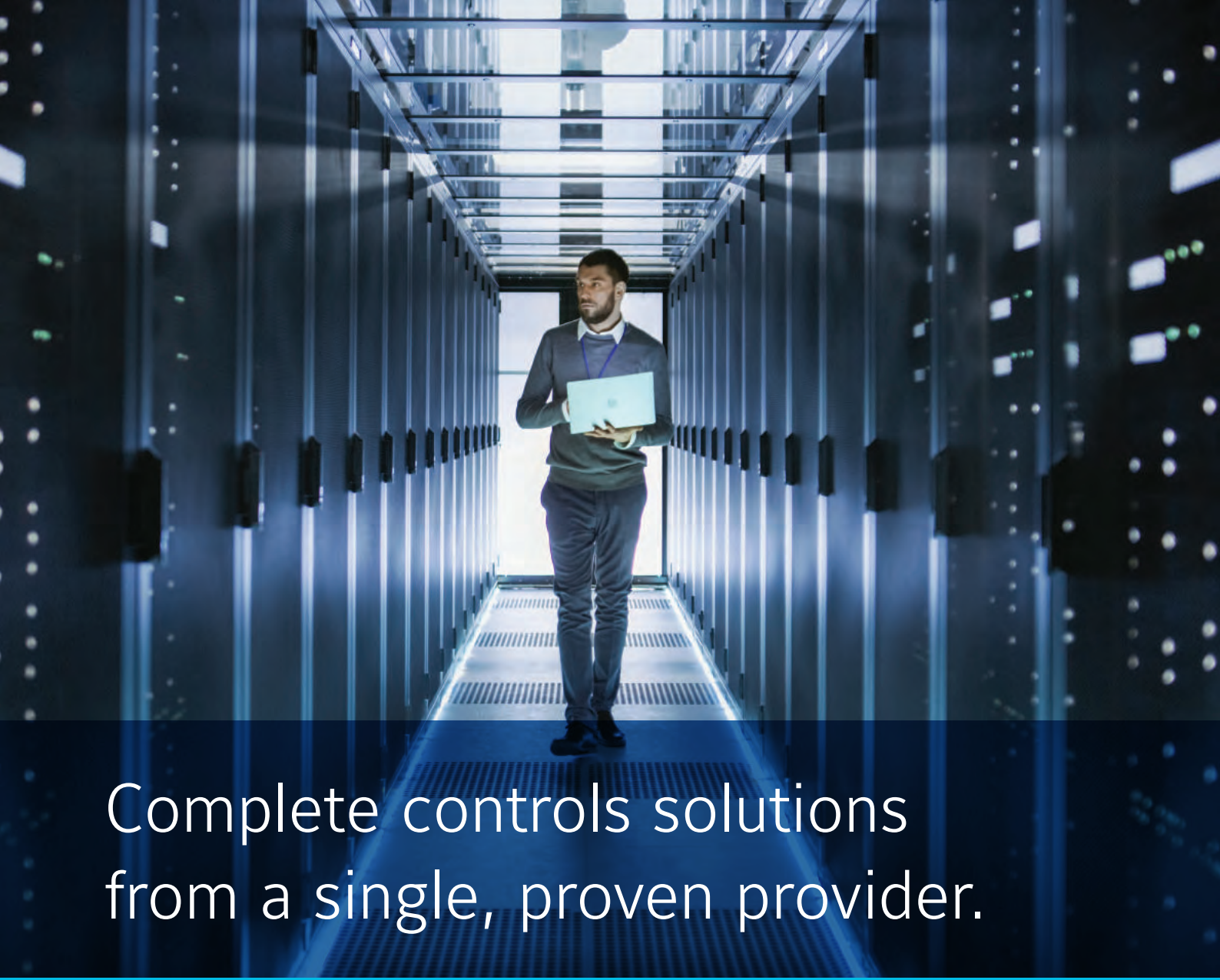
IIEC works with governments and the private sector to develop, implement, and evaluate energy efficiency and renewable energy policies, programs, and projects in more than 50 countries across Asia, Pacific and Africa. IIEC has been the lead consultant on a number of climate change, energy efficiency and renewable energy policy, clean energy financing, technology & market assessments, communication & outreach projects, ESCO market assessment and development projects in Asia, funded by a broad range of international agencies.

The development of sustainable urban energy systems—including a combination of district heating and cooling, smart grids, energy efficiency, and renewable energy technologies—is a critical need for addressing energy demand, development, and environmental issues in the world's rapidly growing cities. Initiatives to promote sustainable urban energy systems have been launched in North America and Europe, and there was a clear need for such an Association in the Asia Pacific—the fastest growing region in terms of economy, urbanization, and energy consumption.

IIEC launched the APUEA initiative in response to requests by international agencies to support the development of sustainable urban energy systems in the Asia Pacific region. APUEA was initially established in collaboration with the Asian Development Bank, United Nations Environment, Euroheat & Power, and the Danish Board of District Heating. As a NGO with more than three decades of experience carrying out clean energy programs worldwide, and with regional offices in Asia, IIEC was well placed to host such an Association. The Association was officially announced on 6th June 2017 at Asia Clean Energy Forum in Manila and was operational from 1st July 2017. This initiative is consistent with IIEC's mission of promoting sustainable energy and environmental solutions in developing and emerging economies.

IIEC has allocated its own resources to support the development activities of APUEA and funded the initial start-up costs. Furthermore, IIEC has reserved physical office space to accommodate the Asia Pacific Urban Energy Association, within the existing office in Bangkok.

With the current interest in the Association, we are confident that APUEA will be a central force to support various stakeholders in the development of urban energy systems.



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ENERGY EFFICIENCY PAVILION PROMOTION

Exhibit at Asian Utility Week 2019

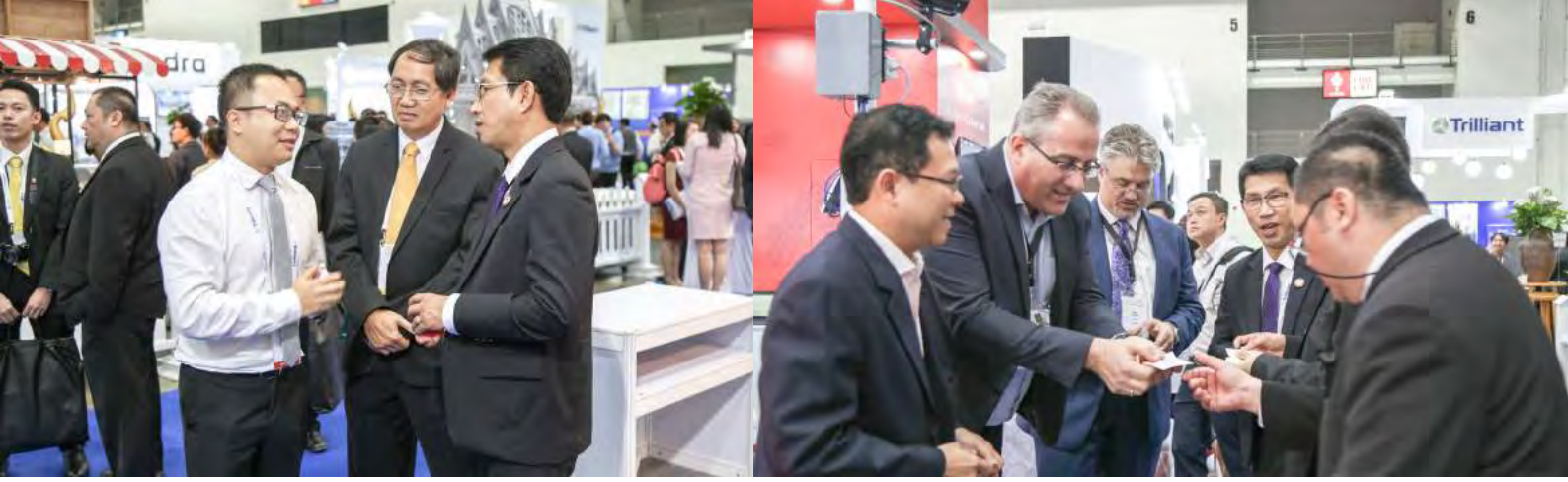


***11,000+ attendees | 2,000+ utility
representatives | 450 speakers | 350+ exhibitors***

**3 - 5 SEPTEMBER 2019
MITEC, KUALA LUMPUR, MALAYSIA**

In tandem with renewable energy policies, energy efficiency is key to building a reliable and sustainable energy system for the future of ASEAN.

The question is how to leverage innovation in hardware, software and business models to increase urban and rural energy efficiency?



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EXHIBIT AT ENERGY EFFICIENCY PAVILION

Exhibition Offer for APUEA Members

As a supporting partner to the expos in Kuala Lumpur, APUEA can offer its members a 10 % discount on a 9 m2 exhibition stand at a dedicated space at the Energy Efficiency Pavilion. The exhibition space is dedicated to APUEA members and offers great opportunities to showcase products and interact with expo visitors. The offer also includes a 20 % discount on the Full Conference Delegate package for the 2019 event for exhibitors at the Energy Pavilion.

Exhibition offer for APUEA Members:

10 % discount on a 9 m2 exhibition stand at the Energy Efficiency Pavilion

20 % discount on the Full Conference Delegate package for exhibitors

This offer is time limited to 31 March 2019

Take the opportunity and book your exhibition stand already today!

For more information about the event/exhibition opportunities, please contact:

Rod Mclauchlan at rod.mclauchlan@clarionevents.com

Peter Lundberg at plundberg@apuea.org

Interview with Martin B. Petersen, ABB



Martin B. Petersen
Regional Marketing & Sales Manager for Power Generation,
District Energy & Water in Northern Europe, ABB

In this first APUEA Magazine of year, we are happy to share a conversation with Martin B. Petersen from ABB, one of the founding members to APUEA. Martin is a Regional Marketing & Sales Manager for Power Generation, District Energy & Water in Northern Europe. During our conversation we talked about ABB's strategies, geographical focus, ABB Denmark's role as Center of Excellence for District Energy, the importance of district energy in the energy transition and more. Martin is based at ABB Denmark's headquarters in Copenhagen.

by APUEA



Q: Can you give us an introduction to ABB?

ABB is a global company focusing on delivering products and solutions to industry, utilities, and transportation sector. We are spread around the globe quite evenly and we operate in more than 100 countries in Asia, Middle East, Africa, Europe, and the Americas. We deliver everything from what is inside buildings, like lighting control and HVAC, to the transformation of wind turbine energy, all the way from the transformers, sub-stations to you as a consumer. Robots for industry sector is also an important segment for us. In the district energy sector, we deliver everything from motors, drives, instrumentation, and analytics to the overall control system and software solutions that bind it all together in an optimal way. The focus of ABB has always been to be a pioneering technology leader, bringing the world to another place with new and innovative ideas. We offer our customers pioneering technology with products, systems, services, and software. Service is very crucial for us, and that is why we are located in so many countries. We are also developing ways to centralize our experience and know-how in larger units centralized across the world. We call it Collaborative Operation Centers, where people from across ABB sit together and support our customers.

Q: ABB has just announced to sell its Power Grids Division to Hitachi, how do you think this will affect the company?

Today we have four divisions. Power Grids is the division that focuses on very large utility projects where most of the other divisions focus on industry projects. As Hitachi is the main player in the Power Grids market, we believe that this division is a better fit for Hitachi. Looking at the synergies between our divisions and Power Grids, this enables us to change our focus and streamline the organization.

Focusing ABB's portfolio on digital industries and further simplifying the business creates a better company and a strong basis for long-term growth. The Power Grids division will stay in ABB until April 2020, so there will be a transition period and we will still do projects together in the future.

Q: Can you describe your current position and role in ABB?

I am a Regional Marketing and Sales Manager for power generation, water, district heating and district cooling in northern Europe, including Scandinavia and the UK. We do everything from nuclear to water projects in Northern Europe. This also includes turnkey projects such as hydropower projects in northern Scandinavia and district energy projects in China. We also work with district energy projects in Denmark where we supply automation and control systems. As a Marketing and Sales Manager, I am responsible for our customers and the customer interface. I am also a manager of our country sales teams. We operate as one unit and each country in my region has its own excellence in a given business line: Denmark - district heating, Norway - water, Sweden - nuclear energy, Finland - engines and balance of plant (BOP), the UK - services. It is always possible to get support from each other.

Q: Can you elaborate on ABB Denmark's role as a Center of Excellence in District Energy within ABB?

A lot of this is due to our history. We have been involved in many district energy projects during the last forty years. We have an extensive installed base of ABB products in Denmark. For example, an ABB control system controls more than 60 % of the district heating delivered to the end customer in Denmark. We have also done a lot of district energy projects across the world, for example in Europe, China and Mongolia. This has given us the experience to operate large projects including equipment and solutions from not only ABB but also from third parties. The latest project we have finalized in China is the Shangri-La project. It is an exciting project with heat pumps that operate with electrical boilers and deliver district heating to five different areas within the city. We have delivered everything from control systems, heat pumps, frequency converters and water softeners. The electricity to the heat pumps and electrical boilers is supplied from a hydropower plant nearby which provides CO₂-free electricity as base load. During peak operation, electricity is provided from the national grid. The Shangri-La project is a great example how to utilize multiple energy sources in the best possible way. Our experience includes the whole value chain, all the way from production, operation and distribution to the end customers. It is the process, knowledge, solutions and products that make us the center of excellence for district energy within ABB.

Q: What is your geographical focus (in regards to District Energy)?

Things are moving fast in Europe at the moment, the transformation from coal to biomass, gas, and wind power is changing our focus and the way we deliver to the end customers. Countries like Germany, Netherlands, UK, France,

Spain, and Italy are now focusing on district energy. This is because district energy is a way to utilize excess electricity from solar and wind power and excess heat from nearby industries, data centers, and small gas or biomass plants. Solar thermal systems are also getting more popular in Europe. The integration of all these technologies is the core of ABB's business and also the big challenge for the European energy sector. A lot of things are happening in Eastern Europe, for example, Ukraine is building up infrastructure from scratch. Going further east, China and Mongolia are still the two main markets because of our project portfolio. The development in the US and Canada has also been surprisingly good during the last couple of years as some cities are looking into modern district energy systems as a way to deliver green heat to its citizens. So, to summarize, there is a huge potential for district heating in China and Mongolia. It is developing in the US and Canada so we will adapt our resources and respond to the demand in these markets. The expertise comes from Denmark, but we will cooperate with our local teams, and this is really a strength of ABB. In terms of district cooling, we have more of a case-to-case approach. We have large district cooling projects in Singapore, the Middle East and South East Asia, and we interconnect with smaller district cooling projects across Europe. The potential is huge, larger than district heating globally and we are following the development.

Q: How do you see the India Market?

When it comes to solar energy, power plants and wind energy, we are very involved in the Indian market. At the moment, we have not been involved in district energy projects in India, but this is something we are looking into as India is a growing market with a large potential. Overall, there is a large potential for district energy projects in the whole Asia Pacific region.

Q: How do you see competition in the market from ABB's point of view?

District energy project in China is completely different from, for example, a power plant project. In a power plant project, things are predictable and we know who is going to bid, whereas each district heating project is different and the market structure depends on the project. The driver can be the local community, an investment company or the government. So the competition is very different depending on the project and the country. Just look at Denmark and Sweden, two neighbouring countries with two very different markets. For district energy projects, the competition comes from local companies because it is very much about adapting to the local market and local conditions. To the best of my knowledge, ABB is the only company of its type that focuses on district energy in a unique way.

Q: What is your value proposition to the market - how do you differentiate yourselves?

We have a unique process-knowledge. We understand our customers and their challenges from our cooperation for over 40 years across the world. This means that no matter where you are in the development of your district heating/cooling



Martin during a panel discussion at the Qingdao Low-carbon District Energy Workshop, 12 December 2018

plant, we understand the issues on how to build and operate them. We have developed our automation and control systems and also optimization and efficiency systems together with our customers which means that they are tailored made for the district energy industry. We incorporate solutions and products across ABB. We also work with other companies, such as Danfoss, Grundfos, Kamstrup, Broen, Alfa Laval, Logstor and Isoplus, to get the best solutions to the end customers by integrating their products into our solutions and systems. In the Asia Pacific region, I want to highlight our partner NXITY who have an in-depth understanding of the local markets in the region and we have a long history of working together with them to develop and execute district energy and distributed energy projects.

Q: In your opinion, what are the key technologies in the Energy Transition?

I would say that we already have many technologies, like solar, wind, and biomass. However, the storage part has to change. I would also like to see technologies to produce base load energy easier. For example, nuclear energy is a base load technology, but it is very expensive. It is difficult to start up, and it takes for ages to build and then you have the waste issues. Someday, we will have new technology that is CO₂-free and does not depend on the wind to blow or the sun to shine. Before this happens, we need to increase the knowledge of how to store energy including battery storage and seasonal thermal storage from, e.g., solar energy. The energy transition also means that we are going from one energy source like coal to five to ten different energy sources in one area. Therefore, data-driven technologies, digitalization, and control systems are the key to get everything up and running smoothly and efficiently, there is no doubt about that. We at ABB deliver battery storage solutions and fast chargers to Electrical Vehicle's. It is very important for us to offer solutions to fill the gaps in the energy transition which are storage and data-driven new solutions.

Q: Do you work specifically with Data Centers?

Yes, we have a lot of different products and solutions specifically for data centers. This covers everything from building and controlling to how it interacts with the surrounding community on the thermal side (utilizing the excess heat and delivering cooling to the data centers) as well as the electricity needed to drive the data centers.

Q: Can you describe how ABB is working together with partners like APUEA and other Associations?

I think all relationships go two ways. ABB benefits from the work that APUEA and other associations are doing, and we can supply information, new ideas and

participate in events that are relevant to us. APUEA offers interaction with valuable players in different markets, and the partnership is also a stepping stone to collaborate within the ABB organization. It was ABB Denmark that initiated the partnership with APUEA. As we are far from the Asia-Pacific market, ABB in Singapore takes the lead in this partnership because they are very close to the market.

Q: When you receive delegations from around the world, what are their challenges and what do they seek from ABB?

I would say that there are two categories of visitors. One that already has district energy systems but is looking for new ways of doing it. If you look at Ukraine, China, Mongolia or Eastern Europe countries, they are trying to figure out how to modernize their old systems to be greener and smarter and at the same time follow regulations and interact with the end customer. The other category of visitors is delegations from countries like the US or the Netherlands where district energy is a new concept. Depending on how the area looks like, we can suggest a path or approach on how to introduce district energy projects to them. We always ask our customers to find a suitable spot in the city where we can do a pilot project, so that we also show the citizens and the community that it is possible to build a modern district energy system.

Q: What is your take on different sustainable concepts, such as Smart Cities, Eco-Cities, and Future Cities?

I like the idea of Smart Cities. My experience having been involved in many discussions and projects across the world is that the ambitions sometimes are so high that you do not know where to start. We are involved in a number of smart city projects in Scandinavia and I can see that successful projects put the focus on the consumers. I have seen smart city projects that almost failed because they wanted to introduce technology that was too complicated and expensive for the

end-users. Taking that into consideration, in order to make a city smart, it is important to make things easier for the customers. You cannot expect a lot of interaction with the end customers. If you start out being realistic and do not expect your end customers to be the "smart client," then you have a good head start because then you are looking into solutions that can be integrated in the daily life of the citizens. It should be a service, and not be a burden for the end customers.

Q: Can you describe the importance of District Energy to achieve sustainable cities?

As I see it, district energy - being district heating and district cooling - is something that binds everything together. Even if we use more and more electricity, heating and cooling are still the major part of our energy consumption. It is very important to have flexible energy solutions and I find district energy extremely flexible. It can be utilized to store excess energy from, for example, wind power in district heating/cooling networks or thermal storages. I see district energy as a fundamental way of developing our cities across the world and a key element of smart and sustainable cities of the future.

Q: How do you see the future development for District Energy?

When I discussed with my European colleagues a couple of years ago, nobody was looking at district energy. Today everybody is asking how we are working with district energy in, for example, the Nordic countries. So, I see an increase in demand and awareness. For the Asia Pacific region, district cooling is vital. Also, energy companies are changing their business plans and are looking at delivering services like cooling and heating to the end customer and then it just makes sense to use district energy.



Q: How does ABB utilize the ongoing Digital transformation in its business?

ABB is investing in the digital transformation because we firmly believe that understanding the processes is what will drive efficiency growth and the possibility of delivering greener district energy solutions. Looking at well-managed district energy plants across the world, they could probably increase the efficiency by 20 to 30% by utilizing the digital transformation. It is not because companies are not good already, it is mainly because we did not have that possibility before. Collecting and understanding data have been extremely expensive and a very time-consuming process. Today it does not cost much, and we have AI to analyze the data. So the digital transformation is here to stay. The digital transformation goes all the way down to products such as pumps, valves, frequency converters and instrumentation. They will also collect data and communicate with each other. This enables them to work almost independently and understanding what is happening across the whole district energy platform. All of this is possible today, so I only see potential with the digital transformation.

Q: What is the strategy/next step for ABB (within District Energy) in the Asia Pacific region?

We will continue the work that we have started, and we will look at how to best serve our customers in the region. In the past, our projects were mainly in northern China, for example, a municipality that wanted to utilize excess heat from a coal-fired power plant. Today, projects are more like the ones we are doing in Denmark. We work with everything from how to include heat pumps, how to integrate gas-fired boilers and how to optimize the production. We will adapt to the changes in the region because we have the experience going from nothing to the state-of-the-art.



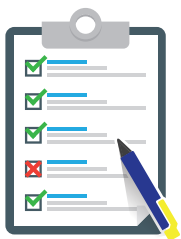
Accelerating the development of Sustainable Urban Energy Schemes

Asia Pacific Urban Energy Association (APUEA)



Energy Efficiency Investments to Increase in Asia

By Clay Nesler, VP, Global Sustainability and Regulatory Affairs & Renee Clair, Energy and Sustainability Program Manager at Johnson Controls



“

THIS YEAR MARKS THE 12TH EDITION OF THE ANNUAL ENERGY EFFICIENCY SURVEY WITH OVER 1,900 RESPONDENTS REPRESENTED FROM TWENTY COUNTRIES, INCLUDING OVER 400 LEADERS FROM CHINA, INDIA, JAPAN, AND SOUTH KOREA

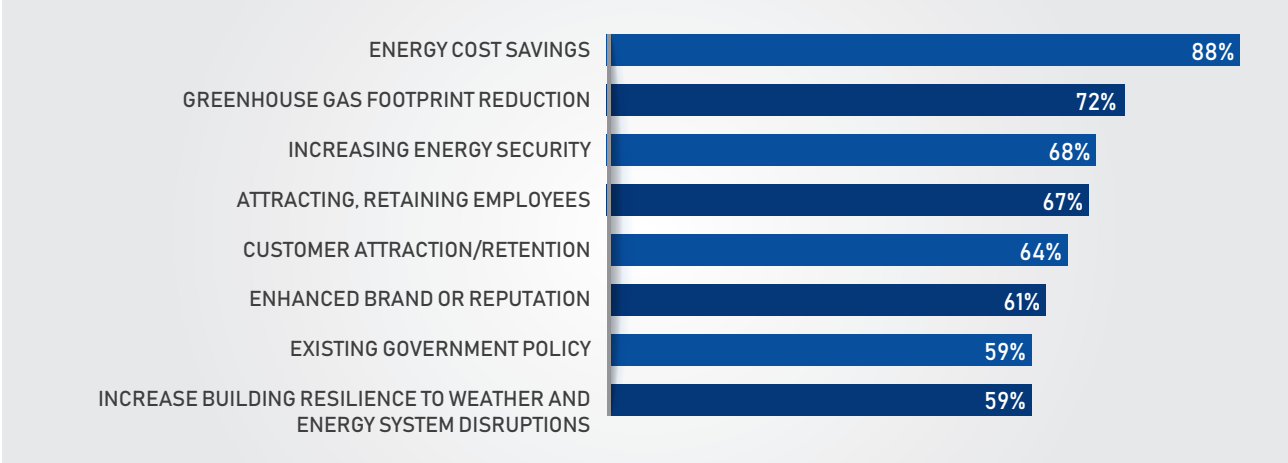
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Johnson Controls conducts an annual Energy Efficiency Indicator survey tracking current and planned investments, key drivers, and organizational barriers to improving energy efficiency in facilities. Since the first survey was released in 2007, almost 26,000 energy and facility management leaders have been surveyed. This year marks the 12th edition of the survey with over 1,900 respondents represented from twenty countries, including over 400 leaders from China, India, Japan, and South Korea.

Investment in energy efficiency, renewable energy and smart building technologies is on the rise. The survey found that 61% of organizations in Asia plan to increase investment in the next year (compared to 59% globally), with an additional 31% planning to keep investment levels the same. China is well above the Asia and global average, with 70% of facility management executives expecting increased investment over the next year.

While energy cost savings remains the biggest driver of investment in Asia, a number of other factors are important in decision-making around energy efficiency and smart building technology. In recent years, facility management executives are increasingly recognizing the multiple benefits of these investments. As such, factors like greenhouse gas footprint reduction, increased energy security, and attracting and retaining employees and customers are recognized in the survey as important factors to investment.

Organizations rating as extremely or very important:

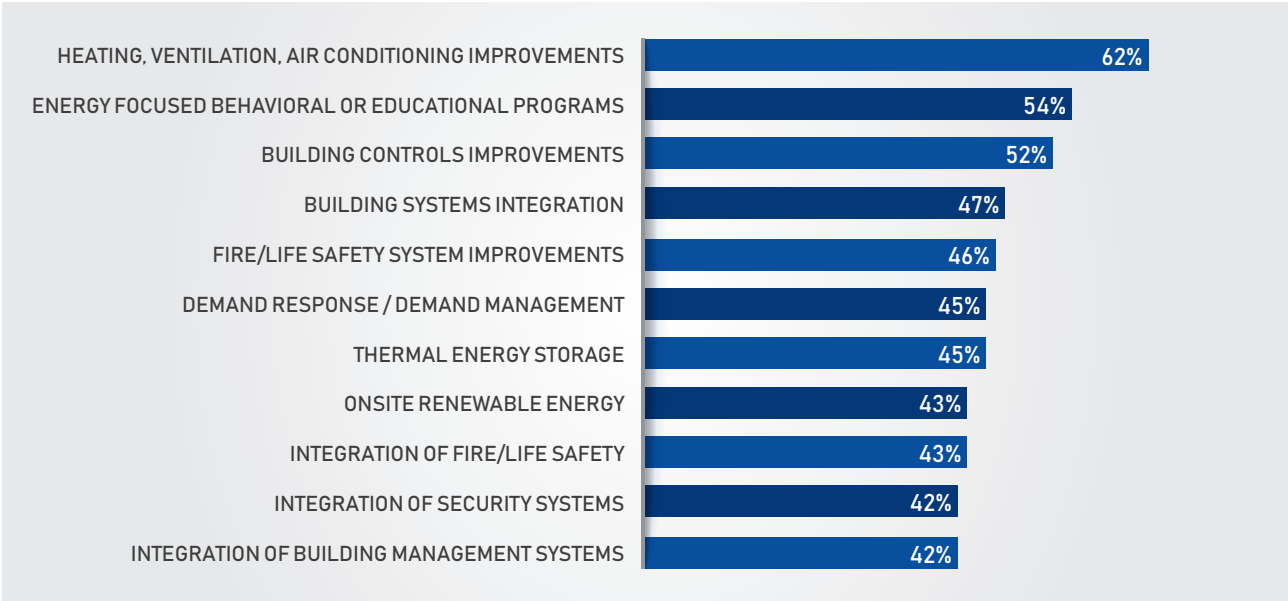


Interestingly, the top barrier to pursuing energy and building technology improvements is not a financial one. For 28% of respondents in Asia, the top barrier is lack of technical expertise to evaluate or execute projects. It is followed closely by uncertainty regarding savings and performance, which is the top barrier for 25% of respondents. This presents an opportunity for the industry to help organizations evaluate and execute projects, as well as to better understand the outcomes. Lack of funding to pay for improvements is the largest barrier for 17% of respondents.

Organizations are investing in a mix of well-established, traditional building improvement measures, as well as those that are gaining momentum with the move towards smart buildings. Heating, ventilation, and air-conditioning improvements were cited as the top priority among organizations in Asia, with 62% of respondents indicating they would invest over the next year. This is followed by energy focused behavioral programs, building controls improvements, building systems integration, and fire / life safety system improvements.



Organizations investing in the next 12 months:





Cybersecurity is increasingly top-of-mind for facility management executives. It was by far the technology issue that is expected to have the most significant impact on the implementation of smart buildings over the next five years, with 74% of respondents indicating it was extremely or very important. Systems integration is also viewed as an impactful trend, with 61% of respondents rating it as extremely or very important. In particular, the integration of fire and life safety, security, and building management systems are expected to see increased investment with over 40% of respondents in Asia planning to integrate them with other building technology systems over the next year.

With the occurrence of increasingly severe weather incidents around the world, the 2018 survey results highlight a growing focus on resilience and energy security. Sixty-nine percent of organizations in Asia believe the ability to maintain critical operations during severe weather events or extended power outages is extremely or very important when considering future energy and building infrastructure investments. As organizations look for ways to make buildings more resilient, they are considering off the grid alternatives. Almost half of the organizations surveyed are extremely or very likely to have one or more facilities able to operate off the grid in the next ten years. There is also strong interest in renewable energy and energy storage, with 59% and 37% of respondents in Asia planning to invest in the next year respectively.

Interest in green buildings is on the rise in Asia. Ten percent of respondents have already achieved voluntary green building certification, with an additional 43% planning to in the future. The interest in certified green buildings is also high for leased space. Green building certification is especially high in Japan, with 22% of organizations having a certified green building and 49% planning to in the future. In terms of leased space, 54% percent of the survey respondents in Asia are willing to pay a premium to lease space in a certified green building. The number is even higher in China, with 64% of respondents indicating they would pay a premium.

Beyond green buildings, organizations are increasingly making plans for net zero energy and net zero carbon buildings. In Asia, 46% of respondents indicated that they are extremely or very likely to have one or more facilities that are nearly zero, net zero or positive energy or carbon status in the next ten years. Again, Japan stands out with 56% of respondents saying it is extremely or very likely they will have a net zero or carbon status building in the next ten years.

Policy plays an important part in encouraging energy efficiency in the built environment. In Asia, performance benchmarking and certifications was viewed by organizations as the most important policy impacting energy efficiency, with 88% of respondents ranking it as extremely or very important. This was followed by government leadership in leasing, building design, and retrofits (86% ranking as extremely or very important) and building energy codes and product energy performance standards (78% ranking as extremely or very important). Policy makers should take note as they look for ways to encourage investment in energy efficiency and smart building technologies.



Johnson Controls is a global diversified technology and multi-industrial leader serving a wide range of customers in more than 150 countries. It has more than 120,000 employees creating intelligent buildings, efficient energy solutions, integrated infrastructure and next generation transportation systems that work seamlessly together to deliver on the promise of smart cities and communities. Johnson Controls' commitment to sustainability dates back to its roots in 1885, with the invention of the first electric room thermostat. The company is committed to helping its customers win and to creating greater value for all of its stakeholders through a strategic focus on buildings and energy growth platforms.

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From Buzzwords to Business Impact: Finding the Right Tools in the Digital Transformation of Power

By Yuan-Sheng Yu, Senior Analyst, Lux Research

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MOST STAKEHOLDERS IN THE POWER VALUE CHAIN UNDERSTAND THAT DIGITAL TRANSFORMATION IS A NECESSITY, BUT REMAINS AN ENORMOUS CONCEPT WITH NO SINGLE DEFINITION, AND MANY STRUGGLE TO GRASP WHAT THOSE CHANGES WILL BE.

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As digital innovations penetrate the physical industries, they threaten to upend the products, processes, value chains, and customer relationships of incumbents. In energy, the power industry is facing an era of rapid change, stemming predominantly from the transition to renewable and the proliferation of distributed generation and storage. Digital transformation is another change that incumbents must adapt to, but also an opportunity to tackle the challenges of the energy transition.

At the heart of the energy transition are renewables. While a critical technology for a sustainable society, power industry stakeholders must deal with several challenges – the infamous California duck curve showing the rapid ramp rate required for conventional generation as solar production slows in the evening, negative wholesale power prices at times of high wind production resulting in curtailment, difficulties in maintaining power quality and balancing the grid moment to moment – all of which will only grow more difficult as renewables continue to grow. But as renewables grow in the power mix, the fundamental architecture of the power grid is also changing in a big way. Distributed generation – such as rooftop solar and microgrids – introduces power generation at the edges of the grid, straining a power grid that was designed to manage one-way flows of power and introducing difficulties like voltage and frequency fluctuations. As if those two major changes are not enough, the market for electricity is also changing, as are external threats. Power customers increasingly expect choices in their source of energy, natural disasters are increasing in frequency and pose a looming threat to power infrastructure, and power consumption is slowing on the whole.

As the power industry evolves, digital transformation is both another change to adapt to and a saving grace. Most stakeholders in the power value chain understand that digital transformation is a necessity, but remains an enormous concept with no single definition, and many struggle to grasp what those changes will be.

To understand the digital transformation of power, Lux Research deconstructs digital transformation into the way it adds value across every function of a business by enabling six core outcomes. These six outcomes represent the building blocks of the universe of goals for digital transformation projects. Any digital transformation technology or implementation will aim to achieve one or more of these outcomes, which build toward specific business impacts.

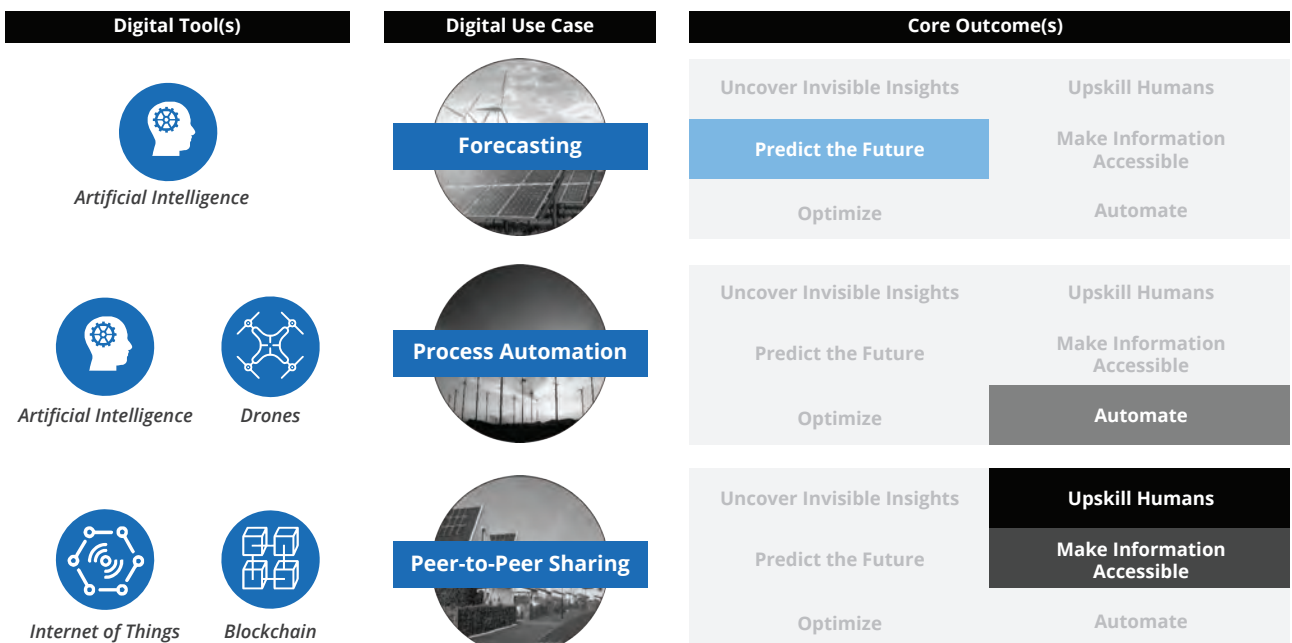
		EXAMPLES
Uncover Invisible Insights	Find an insight by analyzing a signal or set of signals that humans can't easily interpret	Identify emotions based on subtle changes in voice; determine a customer's age based on their purchases; use meter data to flag when a particular appliance turns on
Predict the Future	Determine the most likely outcome of a future situation – a particular type of invisible insight	Determine the likelihood that an insurance policy will pay out; forecast tomorrow's energy consumption; predict when a piece of equipment is likely to fail
Optimize	Find optimal setpoints given a set of constraints – a particular type of invisible insight	Determine when to charge and discharge a home battery to minimize power exported to the grid; determine how to allocate products to production lines while minimizing cost
Upskill Humans	Grant humans a skill they didn't have before	Make humans stronger with exoskeletons; enable mobility for nondrivers with autonomous vehicles; overcome distance to get remote expert assistance with AR
Make Information Accessible	Make information visible and apparent	Remotely track assets from warehouse to end user; find out upon delivery whether the cold chain was broken; visualize assembly instructions in the context of the world around you
Automate	Eliminate or reduce human involvement in a process, task, or decision	Use a robotic arm to automate a mechanical task; program a thermostat to heat a house when the temperature drops; deploy a chatbot to handle customer service requests

While these six outcomes can be applied across a business, it is critical to note that they are not unique to emerging digital technologies, are not mutually exclusive, do not recommend a particular technology to implement, but are universally applicable across a business and can drive improvements in both top-line revenue and bottom-line profitability.

Although we talk about digital transformation as a single concept, it is not a monolithic solution to an industry's problems – digital transformation is realized through the bit-by-bit application of diverse digital tools to uncover

invisible insights, predict the future, optimize, upskill humans, make information accessible, or automate. Each application of digital tools forms a use case, which aims to achieve one or a combination of these six core outcomes as building blocks to the business impact of the project.

With this framework, we illustrate the broad reach and diverse use cases that define the digital transformation of the power industry today by highlighting three digital use cases – the digital tools deployed and core outcomes.



- **Renewables production forecasting**

Renewables production forecasting typically uses weather data combined with historical site production data to predict the output of a solar or wind facility on a given timescale. This provides advance notice of what resources will be required to smooth variations in renewables output. This relies on machine learning, especially deep learning and neural networks, due to the complexity of weather forecasting. In some cases, machine vision may also be used to determine insolation levels from photographs of the sky on very short timescales. With an increasing share of the energy mix coming from solar and wind, intermittency is one of the core challenges of the energy transition. Aside from economic value to solar and wind operators, better visibility into intermittency means that other assets in the network can prepare to cover that void.

- **Robotic inspection of PV and wind**

Robots and drones automate the inspection of solar installations and wind turbines, capturing images of the infrastructure to be inspected and automatically identify physical anomalies, which are reported to a human technician. Inspection automation use drones to move cameras around the equipment, which enable technologies like environmental perception sensors and navigation algorithms. Further downstream, machine learning is implemented for identifying anomalies. Fundamentally, process automation is aimed at reducing costs, improving safety, or faster operation – such application in the power industry can achieve all three.

- **Peer-to-Peer energy trading**

Peer-to-peer (P2P) energy trading allows owners of distributed energy resources to sell their excess energy – upskilling them by providing a route for them to sell a service they couldn't otherwise sell. In addition to smart meters that record energy consumption and production, P2P energy trading has spawned the rise of numerous blockchain developers offering services for logging and settling transactions. Elements of P2P energy trading are highly valuable for the energy transition – specifically, creating market signals that incent customers with flexible consumption and energy storage to help balance out renewables fluctuations and reduce the strain on congested grid infrastructure.

These are only three of the many digital use cases that span across the power industry's value chain of planning and design, operations, and customer engagement. The convergence of the energy transition and the digital transformation of power will undoubtedly bring big changes to the industry – not only by ushering in more efficient planning, autonomous operations, and better customer engagement, but also in the roles that make up the value chain. Despite this transformation often times limited by sluggish regulation changes and the long lifetime of existing hardware, the disruptive potentials of these technologies are beginning to achieve tangible business outcomes and will play a key role in the energy transition towards a sustainable society.



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The background image for the APUEA report cover shows a modern, multi-story glass skyscraper on the right side, and a wide, tree-lined road with a few cars driving on the left side. The sky is blue with some light clouds.

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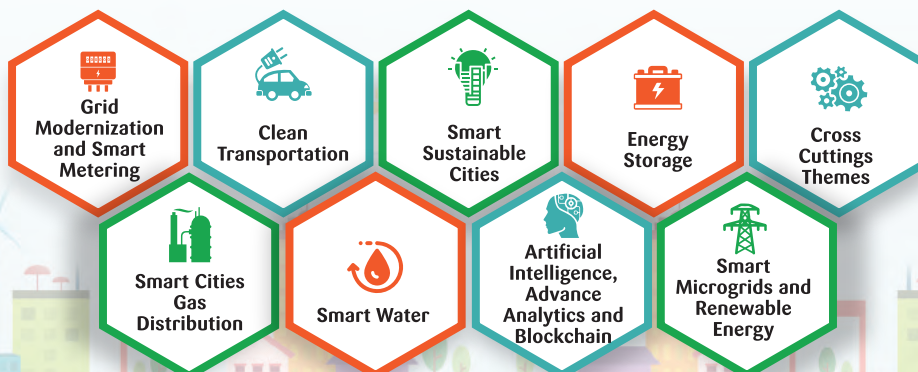
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District Energy – the Fast Track to Sustainable Energy

By Oddgeir Gudmundsson, Susanne Tull and Jan Eric Thorsen, Danfoss Heating Segment, Denmark

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GLOBALLY, HEATING AND COOLING IS EXPECTED TO REMAIN THE LARGEST ENERGY SECTOR, EVEN IN 2050 DECARBONIZATION SCENARIOS. CLEARLY, IF WE WANT TO ACHIEVE THE ENERGY TRANSITION, WE NEED TO DECARBONIZE HEATING AND COOLING.

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3 years ago, the 195 UN member countries adopted the so-called Paris Agreement at COP 21, setting the goal of limiting global warming to well below 2°C compared to pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C. To reach that goal, greenhouse gas emission must become net zero by 2050. This will require significant changes in our energy systems. One of the solutions that can truly fast-track the transition to a sustainable energy system is district energy.

In the three years since COP 21 many countries have entered the implementing mode. However, it has become apparent that in many countries there is a gap between commitment and actual policies. Since most countries are operating their energy systems on a commercial basis the role of policies to guide the market in the direction of energy efficiency solutions becomes important.

Decarbonizing heating and cooling

The share of the building sector in the final energy consumption varies between regions, in Europe it accounts for about 40%, in the Asia Pacific region around 30% due to a more energy intensive industry. In general space heating/cooling and hot water account for 60-80% of the building energy consumption. Globally, heating and cooling is expected to remain the largest energy sector, even in

2050 decarbonization scenarios¹. Clearly, if we want to achieve the energy transition, we need to decarbonize heating and cooling.

To decarbonize in a cost optimal way, taking a **holistic approach** is crucial. Two things go hand in hand: Improving the energy efficiency and make sure the remaining energy demand is covered by carbon neutral energy sources. The cheapest energy is the one we do not use. It is therefore important to look at the entire energy system, from source to sink, and identify energy efficiency potentials. For example, a simple, cost effective and often neglected measure is the optimization of the building heating and cooling installation, which reduces the energy consumption on average by 30%². Such no-regret measures can reduce the overall cost for decarbonization significantly.

While the decarbonization of heating is seen as one of the biggest challenges of the energy transition today, the solution is closer than you think: The key is the largely disregarded fact that **the required energy quality for space heating and cooling is very low**. In fact, it is so low that there is an abundance of suitable energy sources around us that can easily fulfil our space heating and cooling demand. Even so, the demand is today primarily met by high quality energy in the form of gas, oil or electricity - for different historical, logistical and financial reasons. Instead, we should use renewable sources, such as geothermal and solar thermal, as well as excess heat from industry and the tertiary sector (e.g. data centers, supermarkets). Amory Lovins, the American ecologist got it right when he said that the use of nuclear-powered electricity or fossil fuels to provide space heating and cooling, or hot water is like "using a chainsaw to cut butter".

Today, we have the knowhow, the experience and the technology to tap into these sustainable energy sources and supply heating and cooling in an efficient manner to the building stock through water-based distribution networks, known as district energy systems.

Best practice examples are showing the way

The share of district energy in the heat and cool supply varies between countries as well as regions within the countries. In the European Union district heating has an average market share of only 12%, although in some champion countries such as Denmark, Sweden and Latvia, district heating covers between 50% and 65% of the heat demand. The feasible share of district heating in the EU has been estimated to be around 50%³. District cooling is a relatively new solution compared to district heating and is projected to grow steadily in EU in the coming years. The market share of district energy outside Europe is not particularly well documented but it goes from 15% in South Korea to as high as 55% in northern China. District cooling is as in EU expected to have rapid growth in the coming years.

The development stage as well as efficiency of district energy system varies significantly between regions and today the most advanced and efficient systems are found in Scandinavia, where the district heating systems and the building heating installation are complementing each other, leading to the high overall energy efficiency of the building heating sector.

District energy systems have the unique feature that they allow **rapid and cost efficient decarbonization of the heat supply**, due to their heat source neutrality. A special case can be seen in Sweden where the heat delivered by district heating was decarbonized by 80% between 1980 and 2006 through introduction of biomass boilers. The experience in both Sweden and Denmark show that once district heating systems are established, decarbonization is just a matter of connecting environmentally friendly heat sources to the distribution grid.

As for district cooling it is a relatively newly applied solution but built on the vast experience acquired in the district heating field. A quick survey of existing district cooling schemes gives a clear indication on how promising the technology is. The installed schemes typically grow extremely fast until the cooling market in the area is saturated. Examples of successful district cooling systems in Europe can be found in Northern Europe Stockholm, Sweden and Helsinki, Finland, as well as Southern Europe Paris, France and Barcelona, Spain.

Water-based systems enable higher shares of renewable energy

In a decarbonized energy system, there will be a need for all kinds of available sustainable energy sources, including solar, geothermal, wind power, biomass, excess heat and free cooling. The commonality of sustainable energy sources is their intermittent nature, which causes large challenges for the traditional energy system, which is built on locked relationship between supply and demand. District energy enables decoupling this very relationship and hence enable an efficient use of these intermittent sources. District energy further enables cost efficient usage of low temperature heat sources, which commonly are located at remote location in respect of potential heat consumers. Modern district energy systems act as a **flexible energy infrastructure** where available energy sources can be "plugged in". The energy can then be distributed to buildings for immediate use or be stored for later use. The hot water can be stored for a few hours or days (e.g. in tanks), or for several months (in large pits or other storage facilities, such as old mines). Thermal storage is a huge advantage with intermittent renewable energy sources - including electricity.

¹ European Commission: EU Heating and Cooling Strategy, Staff Working Document, 2016

² Ecofys: Optimizing the use of technical building systems, 2017

³ Connolly D, Mathiesen BV, Østergaard PA, Möller B, Nielsen S, Lund H, Persson U, Werner S, Grözinger J, Boermans T, Bosquet M, Trier D. Heat Roadmap Europe: Second pre-study. Aalborg University, Halmstad University, Ecofys Germany GmbH, PlanEnergi, and Euroheat & Power, 2013

The well-known challenge with volatile renewable electricity is to match energy supply and energy demand. While the wind might not be blowing at times when the energy is needed most, at other times there will be an oversupply of wind power – a serious strain for energy systems. To deal with the excess power generation, either some wind turbines need to be stopped or new electricity usage models that do not add to the traditional demand need to be developed. The optimal solution, both in terms of cost and energy efficiency, is to **channel the excess electricity generation into district energy systems**. At times of excess electricity production heat can be generated using heat pumps and electric boilers, if the excess electricity exceeds the heat demand the energy can be stored with very high efficiency in thermal storages for later use. In a smart energy system district energy system can act as a virtual battery, in the way that the fuels that would otherwise be used for heat generation can be used for power generation when there is a lack of renewable electricity generation.

By coupling the electricity and heat sectors district energy does not only contribute to the decarbonization of the heating and cooling sector but significantly advances the energy transition as a whole. In Denmark, one of the countries with the highest shares of renewable energy, district energy is considered as the backbone of the future fully renewable energy system, not the least because of its ability to compensate the fluctuating nature of wind and solar.

To facilitate this role, district energy systems are undergoing a transformation to so-called **4th generation district heating (4GDH)**. 4G networks run on lower temperatures (40-60 °C), which means more efficient heat source operation, increased range of low-temperature energy sources and low distribution losses. With their advanced control functionalities, they are perfectly fitted for the job of connecting different parts of the energy system – electricity, heating, cooling, buildings, industry – and using different energy sources flexibly. In this context, digitalization brings interesting opportunities for gathering and evaluating data which can be used to improve the accuracy of energy consumption prediction and building thermal behavior, to optimize temperatures, shift loads by utilizing the building thermal mass as well as utilizing the storage capacities of the district energy infrastructure.

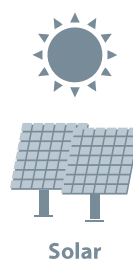
Ready to fast-track the energy transition?

With all its characteristics, district energy can truly fast-track the energy transition and contribute significantly to mitigating climate change. It allows grand utilization of renewable energy sources at feasible cost levels and is the only means to utilize excess heat from industry and commercial activities for heating buildings, thereby increasing the overall efficiency of the energy system significantly. In combination with heat storages it opens up for larger penetration of fluctuating renewable power sources such as wind and solar. In short, district energy increases the flexibility and the efficiency of the entire energy infrastructure.

To leverage the potential of district energy, it is crucial that policies support an integrated approach and see the district energy system together with the buildings that need to be supplied, consider all available energy sources, and connect heating, cooling and electricity. We need ambitious policies that support the take-up of innovative technologies, drive the decarbonization of heating and cooling and the modernization of heating systems. Let's enter into action mode and fast-track our journey to a sustainable energy system!

Examples of renewable and low-carbon sources that district energy can tap into:

Solar power and heat



The main challenges with solar energy are space, intermittency, both during the day and seasonal, and the low yield during the winter – when heat is most needed. This implies that it cannot fulfill the entire power or heating demand throughout the year. In combination with large scale thermal storages it is possible to store the heat generated during the summer months to autumn or even winter.

Wind power



The challenges with harnessing wind energy are its intermittency, both on a minute by minute basis as well as between seasons and large power fluctuations can be experienced within short periods of time. By integrating power and thermal grids, the surplus power can simply be “absorbed” by the heating and cooling sector. The heating sector acts as an energy user that balances the grid.

Geothermal energy



Geothermal energy is a stable and secure renewable energy source that can be used on large scale through district heating networks, as a base load heat supply. It is estimated that over 25% of the EU population lives in areas directly suitable for geothermal district heating⁴. In case of low temperature sources heat pumps can be used to lift the temperature to suitable levels. A great case can be found in Paris where a total installed geothermal capacity is 270 MWth.

Biomass



In the transition period from a fossil-based energy system to a renewable energy system it is expected that biomass will be used as a transition fuel, due to the relatively simple process of retrofitting existing coal power plants to biomass. Due to the generally lower efficiency of biomass plants it will be more

⁴ Report Developing geothermal district heating in Europe https://ec.europa.eu/energy/intelligent/projects/sites/iee-projects/files/projects/documents/geodh_final_publishable_results_oriented_report.pdf

important than before to operate the power plants in a combined heat and power mode and use the heat efficiently in a district energy system.

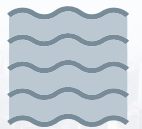
Excess heat from industry and commercial activities



Waste heat

Studies show that excess heat from industry is available throughout Europe⁵ and by utilizing this “by-product” huge amount of fossil fuels can be replaced. Excess heat from commercial activities, for example supermarkets, data centers and cooling of large commercial buildings, are further an untapped heat resource. The main issue is that the heat can be of low temperature, which would require lifting the temperature using heat pumps.

Free cooling



Free cooling

Commercial buildings have cooling demand more or less throughout the year. Depending on the location, free cooling from the sea, lakes or rivers can be utilized with district cooling networks. In warmer climates surplus heat from power generation could be used to fuel absorption heat pumps. The district cooling network is then used to transport the cold from the cooling source to the buildings. This can significantly reduce the power consumption for cooling purposes. In a smart energy system the district cooling network in combination with electrical chillers and thermal storages can decouple the cooling generation and cooling demand and hence reduce the strain on the power grid during peak load periods⁷.

Thermal storages



Thermal storage

Thermal storages are a simple and cost-efficient technology to decouple supply and demand. The use of thermal storage minimizes the need for peak generation from heat or cool units and helps integrate intermittent energy sources (e.g. in combination with large scale heat pumps and electric boilers to produce heat in periods with low electricity prices). For cooling thermal storages will further lead to higher efficiency of air cooled chillers as heat rejection is more efficient during the cooler night temperatures compared to day temperatures, leading to higher chiller efficiency. Heat storages come in various sizes, from big tanks at power plants 30.000 m³ to large pit storages of 200.000 m³, as realized in Vojens in Denmark, and the planned 1.800.000 m³ planned in Graz in Austria.



⁵ Urban Persson, Cycle de Formation Énergie – Environnement, Séminaire 2012-2013, Université de Genève, 18th of April, 2013



Danfoss is a global leader focused on energy-efficient solutions that save energy and costs, and reduce carbon emissions, offering a wide range of solutions, products and services in cooling food, air conditioning, district energy, heating buildings, controlling electric motors and powering mobile machinery. With over two decades of investment and operation in Asia, China already becoming Danfoss' second largest market. Danfoss is a global private partner with United Nations Environmental Program for District Energy (DES) as part of UN initiative Sustainable Energy for All (SE4ALL) to achieve Sustainable Development Goals, contributing to the construction of advanced green and safe DES infrastructure for cities and urban communities.



Case Study of the Tangshan - Hancheng City District Heating Project

By Guan Xin, Marketing Manager at Capital Heat

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THE PROJECT UTILIZES WASTE HEAT FROM POWER GENERATION IN THE CHINA RESOURCES POWER PLANT TO PROVIDE DISTRICT HEATING FOR 26 COMMUNITIES AND 15,385 HOUSEHOLDS IN THE AREA

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I. Project Overview

Hancheng City is located in the Lubei District of Tangshan City. Because of historical reasons, the residential district of this city has not connected to the city's district heating system. The area mainly relies on coal-fired boilers for heating, and the heat sources are relatively scattered. The emerging Tangshan Manufacturing Park, located in Hancheng City, is one of the key construction projects of Tangshan City. It is also the gathering area and growth pole for Tangshan to undertake Beijing's industrial transformation. The China Resources Phase III Thermal Power Plant is located in Tangshan Manufacturing Park, and in August 2016, the Hancheng City district heating project was officially launched. The project utilizes waste heat from power generation in the China Resources Power Plant to provide district heating for 26 communities and 15,385 households in the area. The project adopts a public-private partnership (PPP) business model and the contract period is 30 years. Tangshan City has 121 legal heating days in winter and 137 actual heating days.



II. Technical Essentials

A total of 46 kilometers of primary and secondary pipelines were laid in the project. One water treatment and energy management center, 40 heat exchanger stations, and 52 heat exchangers were built. The primary side pressure of the heat exchanger stations is 1.6 MPa, and the supply and return water temperature is 130 °C/70 °C, respectively. On the secondary side, the system pressure is 1.0 MPa for areas of low elevation and 1.6 MPa in higher areas. The supply and return water temperatures on the secondary side are 85 °C/60 °C for indoor heating and 60 °C/50 °C for the ground heating system. All circulation pumps are equipped with frequency converters.

Featured technical concepts in the project:

- Directly buried water distribution pipes for non-compensated cold installation
- A centralized water treatment system
- Standardized heat exchanger units
- Primary and secondary network hydraulic balance
- Intelligent operation of heat exchanger units
- Indoor temperature control

III. Scope and Conditions of Application

The annual average temperature in **Hancheng City** is 10.5 °C, and the extreme minimum temperature is -24.8 °C.

IV. Energy, Environment, and Resource Benefits

The project consumes 470,395 GJ of energy during the heating season. A total of 26 coal-fired boilers in Hancheng City have been banned, and the annual consumption of coal has been reduced by 61,901 tons, which has led to the reduction of 162,181 tons of carbon dioxide, 297 tons of sulfur dioxide, 182 tons of nitrogen oxides, and 373 tons of dust.

V. Economic and Social Benefits

The total investment of the project was 230 million yuan, including 129.4 million yuan for the distribution network (96.31 million yuan for the primary side and 33.09 million yuan for the secondary side). The residential heating price is 26 yuan/m², and the non-residential heating price is 34.3 yuan/m². The average indoor temperature of users in 2018 was 21.5°C.

VI. Heating Safety

The project includes real-time monitoring of the heat exchanger stations enabling the following:

- Analysis of problems that allows technicians to respond and resolve problems quickly
- Adaptation of the indoor temperature according to the outdoor temperature
- Communication with heat source units to ensure and optimize the heat supply
- Regular inspection to prevent accidents and ensure the normal operation of the heating network

VII. Service Guarantee System

The project offers convenient maintenance services, and personnel in each area will respond and give feedback on any problem that is related to the heating system within 24 hours from when it is reported from a hotline. The hotline remains open for 24 hours and can be used by all residents in the area.

VIII. Difficulties and Obstacles

The actual utilization of the district heating system in the area today is below 50%. To fully use the potential of the system and experience its benefits, special efforts need to be made to increase the utilization.

IX. Government Support

To minimize the negative impact on the local community during the construction of the pipe network, the local government supported the project by supplying project information and educating the citizens about the benefits of district heating. The local government also supplied safety education to project personnel as well as information on how to minimize the negative impact on citizens. Thanks to the support of the local government, the project was completed on time before the start of the heating season in 2017.

X. Company Profile

Tangshan Huida Heating Co., Ltd. is a project company of Beijing Pioneer Thermal Co., Ltd (a part of Beijing Capital Heat Co., LTD.) and was established in 2016 with registered capital of 50 million RMB. It is located in Tangshan Industrial Park, and the company's scope of business includes the development, maintenance, and management of district heating facilities and the promotion of heating technology in Tangshan City.



Beijing Capital Heat Co., Ltd. is a joint venture between Capital Stock and Hongyi Investment and Management Team. It is an integrated company that focuses on technological research and development, investment, construction, operations, and management. Based on the regional heating companies and through the organic combination of industry, government resources, and capital, the company builds the largest, most technologically advanced, and most market-oriented green district heating systems in China. The company has a registered capital of 1 billion RMB.



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District Energy Developments at Finnslätten CBD-area in Västerås, Sweden

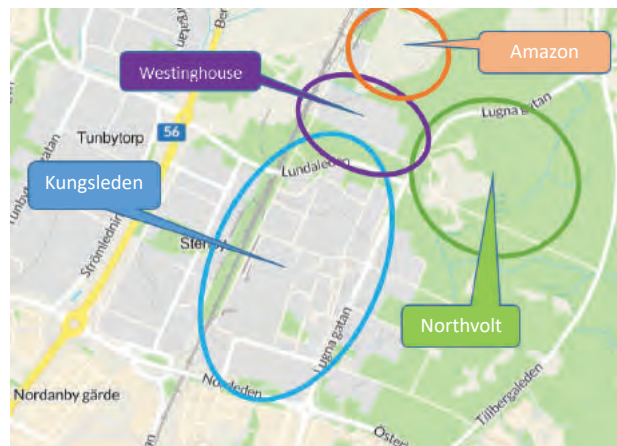
By Anders Einarsen Head of Distributed Energy stations at Mälarenergi

“
THE COOLING LOAD IN THE FINNSLÄTTEN AREA IS INITIALLY 20 MW, OF WHICH THE MAJORITY OF THE DEMAND COMES FROM THE COOLING OF INDUSTRIAL PROCESSES

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The Finnslätten Central Business District (CBD) area is an industrial area in Västerås, Sweden, which was initially built during the 1960s by the ASEA Company, which later became ABB when ASEA merged with the Swiss company Brown Boveri in 1988. During the 2000s, ABB sold its properties to Kungsleden, a Swedish property-owner, which took over the management of the area. The entire area (marked with blue) consists of about 20 industrial buildings.

In the mid-60s, ASEA also built a nuclear fuel factory which was later sold to Westinghouse (the area marked with purple). These two areas have long been connected to the district heating network in Västerås, but the areas have had their local production of district cooling. During the 2000s, ABB moved out of some of the premises in Finnslätten, and new companies have moved in, and today there are about 20 customers (district heating and district cooling) in the area.



New Developments, Northvolt and Amazon

During the past year, Northvolt has chosen to establish a research and development center and demonstration line for the production of batteries for electric cars in the area. Amazon has also chosen to establish a data center in the area which has a significant annual cooling demand. To meet the increasing demand for district cooling in the area Mälarenergi, initially, plan to buy production capacity from Kungsleden's existing cooling plant. Later, the plan is to build an entirely new district cooling production plant to meet the future needs of the new establishments of Northvolt and Amazon.

The district cooling system in Västerås is an important part of a sustainable city

The district cooling system in Västerås is a critical component in the energy balance to utilize energy in the most optimal way. The heart of the district cooling system is based at the CHP plant in Västerås, where our base production uses waste as fuel for the production of heat and electricity. Usually, all production of electricity and heat takes place in combination with back pressure production of district heating, where the heating demand controls the electricity production. During the summer months, we only have waste as fuel for our energy production, and most of the time, there is also a surplus of heat available, which can be used for cooling production through absorptive cooling. This means that by increasing the heat demand in the district heating network, we can produce more electricity without having to cool off excess heat from the waste incineration.

The cooling load in the Finnslätten area is initially 20 MW, of which the majority of the demand comes from the cooling of industrial processes. This means that the cooling we deliver is part of the manufacturing process of the industries and is not really affected by the ambient outdoor temperature. The cooling consumption is therefore distributed relatively evenly during the year.

In addition to Kungsleden's properties, we are currently connecting district heating and cooling to Westinghouse, and we are working to connect district heating and cooling to Northvolt and district cooling to Amazon. We are also looking into ways to recover and utilize the heat surplus that is generated in the area. Another important aspect is to reduce the power requirement on the electricity side since factories of this type consume large amounts of electricity.

As base production for the district cooling in the Finnslätten area, we will use heat-driven absorptive chillers. Electric chillers will be used for peak production. During winter, district cooling is primarily produced by free cooling using cold lake water, and in the long term, we aim to utilize the heat surplus in the area by using heat pumps that are connected to the district heating network.

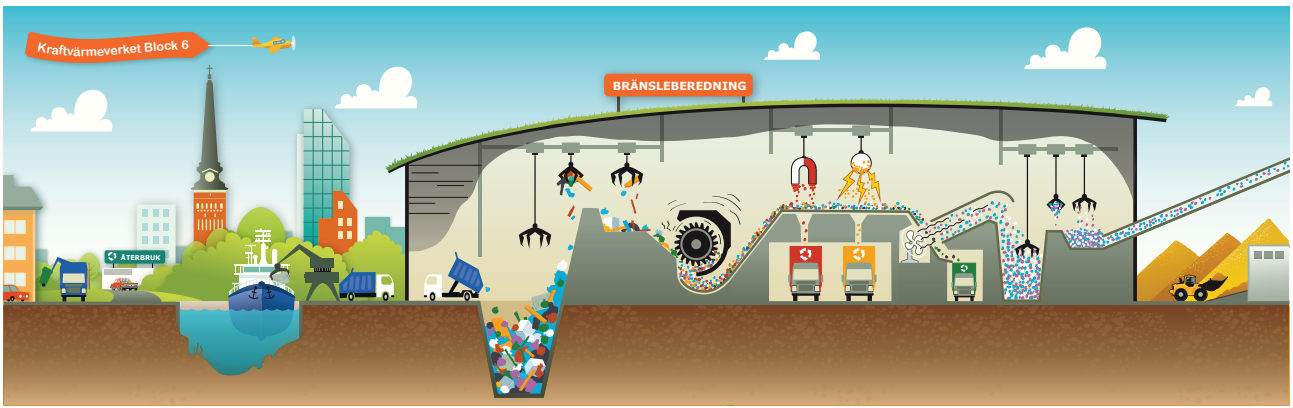
The reason why we are building a new district cooling network outside our existing cooling network is that district heating (hot water) is easier to distribute than district cooling (cold water). Since district cooling is operating with significantly lower temperature differences than district heating, at least 3 times, the volume is needed to distribute the same amount of energy. So, we will use district heating to distribute both heating and cooling to the area. This means that we always optimize the cooling production as part of the electricity and heat production.

Waste to energy

All waste we use as fuel to our CHP-plant goes through one of the world's most advanced waste sorting processes where we separate as much as possible of the waste for material recycling. Mälarenergi is now also part of the recycling circuit where we recover energy from some of the plastic that the recycling industry cannot handle (instead of being deposited or incinerated without energy recovery).

District Heating and Cooling pipes next to Northvolt's new battery factory in Västerås





The fuel preparation facility includes the reception, the separation of unwanted material, and the transportation of the fuel to the incinerator and is handling about 480,000 tons of industrial and household waste annually. The facility can store ready-to-use fuel as bales, equivalent to 5 to 6 days of full operation. All of the fuel preparation takes place indoors, and special filters are used to prevent bad smells in the surrounding area.

When the waste is not enough to fuel the CHP plant, we primarily use recycled wood products and wood chips from the forest. As a last resort, we use bio-oils that are mostly produced from pine tree oil.

For our customers, the environmental profile has become an increasingly important aspect, and by choosing the combination of electricity, district heating, and cooling, our new customers in the Finnslätten area will get the most sustainable energy solution from a global perspective with the least possible environmental impact.



Mälarenergi is an infra-service company with approximately 750 employees. We are located close to our customers in the Mälardalen area in Sweden supplying electricity, heating, water, cooling, and fast communication solutions with associated services. We offer energy efficiency services to corporate customers in the region, and also sell electricity to private and corporate customers throughout Sweden. The group is owned by the City of Västerås and has a turnover of approximately SEK 3 billion. By 2020, we will have phased out all fossil fuels and replaced them with renewable alternatives. Annual heat sales are about 1540 GWh, cooling about 30 GWh, electricity production about 422 GWh (of which 210 GWh comes from hydropower), and water sales at 11M m³.



Promoting Sustainable Urban Energy in Asia Pacific

Asia Pacific Urban Energy Association (APUEA)



Future Energy & Tech Investment Forum

March 27th, 2019

PwC Innovation Centre, Shanghai

HIGHLIGHTS

- A full day of insights, ideas and networking of future energy, tech and innovation in the industry.
- Learn about the latest trends and best practices in new energy industry.
- Broad media and internet platform exposure
- 15+ industrial leading speakers, 150+ participants from energy resources / tech / consulting / investment companies.
- Main forum, startup pitching, networking.

SPEAKERS & PANELISTS



Bella Zhang
Head of Energy and Sustainability
Program, China
Plug and Play



Crystal Zhou
CEO
Telloh Meinergy



Stanley Feng
Partner
PwC



Mikael Jakobsson
Executive Director
Asia Pacific Urban Energy Association



Dr. Ulf Henning Richter
Energy and Infrastructure Expert
Managing Director
Richterion Ltd



Milan Koev
CEO
Hexagon Peak



Vincent Bakker
Co-Founder & CFO
Positive Energy Ltd.



Johnson Zhu
Partner
Tsing Capital



William Feng
Angel Investor, Board Director
Vertech Capital



Dr. Joachim von Scheele
Head of Manufacturing Industries - Asia Pacific
The Linde Group

And more...

PARTNERS





Recent APUEA Activities

By Asia Pacific Urban Energy Association (APUEA)

“

THE WORKSHOP PROVED ONCE AGAIN THE VITAL ROLE THAT APUEA PLAYS IN CREATING PLATFORMS FOR THE EXCHANGE OF KNOWLEDGE AND IDEAS AS WELL AS PROVIDING A STARTING POINT FOR COLLABORATION AMONG INDUSTRY STAKEHOLDERS TO DEVELOP SUSTAINABLE ENERGY PROJECTS IN CHINA.

”

Qingdao Low-Carbon District Energy Workshop

APUEA co-hosted the Qingdao Low-Carbon District Energy workshop in Qingdao, China, on 12 December 2018 together with the Asian Development Bank, Qingdao Energy Conservation Association, NXITY, and Qingdao Energy Group. The theme for the workshop was “Multi Energy Systems and Energy Efficient Gas solutions,” and the event attracted more than 100 international and national district energy experts

BACKGROUND

Qingdao, a coastal city and a major economic hub in the Shandong Province, is going through a transformation of its energy infrastructure as the local government is aiming to replace the previously dominant energy source of coal with natural gas.

At the same time, the government has ambitious targets to modernize the energy infrastructure to maximize its benefits such as efficiency, cost, and reducing emissions and particles to minimize air pollution that contributes to global warming. The Qingdao Low-Carbon District Energy workshop aimed to provide a platform to explore collaboration and absorb and exchange knowledge with the aim to develop sustainable energy projects in Qingdao City and the Shandong region.

LIST OF SPEAKERS

- Mr. Mikael Jakobsson, APUEA
- Mr. Wang Wenqi, Qingdao Energy Conservation Association
- Mr. Jiang Dongming, Qingdao DRC
- Mr. Li Yanshu, Qingdao Energy Group
- Ms. Zhang Lipeng, UN Environment
- Mr. Anders Einarsen, Mälarenergi
- Mr. Martin B. Petersen, ABB
- Mr. Du Likun, Danfoss
- Mr. Terry Deng, Johnson Controls
- Mr. Dang Le, Solar Turbines
- Mr. Peng Ziyang, Wärtsilä
- Mr. Leon Gao, SPX Flow
- Mr. Kåre Stare Andreassen (EKF) Denmark's Export Credit Agency

MORNING SESSION

The workshop commenced with a welcome address by Mr. Mikael Jakobsson (Executive Director of APUEA), followed by opening remarks by Mr. Wang Wenqi (Qingdao Energy Conservation Association), Mr. Jiang Dongming (Director of the Foreign Economic Affairs Department of Qingdao DRC), and Li Yanshu (Vice General Manager of the Qingdao Energy Group).

The morning session focused on the latest development of district energy schemes and included presentations by Ms. Lipeng Zhang from UN Environment's District Energy in Cities Initiative, Mr. Anders Einarsen from the Swedish utility company Mälarenergi, Martin B. Petersen from ABB, Mr. Du Likun from Danfoss, and Mr. Terry Deng from Johnson Controls. The session was moderated by Mr. Wang Wenqi, Qingdao Energy Conservation Association.

AFTERNOON SESSION

The afternoon session focused on the modern utilization of gas and how to develop sustainable district energy and distributed energy projects. The session was started by a recognition of the new APUEA member, Solar Turbines, represented by Mr. Dang Le, who was given a membership certificate from APUEA Executive Director Mikael Jakobsson, and Head of Operations, Peter Lundberg.

The afternoon session included presentations from Mr. Dang Le from Solar Turbines, Mr. Peng Ziyang from Wärtsilä, and Mr. Leon Gao from SPX Flow. The presentations were followed by a panel discussion with the topic: "How to develop sustainable district energy and distributed energy projects." The panel was moderated by Mr. Mikael Jakobsson and included the panelists Mr. Martin B. Petersen from ABB, Mr. Anders



Recognition of new member, Solar Turbines, represented by Mr. Dang Le

Einarsen from Mälarenergi, Mr. Terry Deng from Johnson Controls, Mr. Kåre Stare Andreassen from EKF Denmark's Export Credit Agency, Mr. Li Yanshu from Qingdao Energy Group, and Ms. Lipeng Zhang from UN Environment's District Energy in Cities Initiative. The afternoon session was concluded with a Q&A session with the audience and the panelists.

WORKSHOP CONCLUSION

The workshop brought together more than 100 national and international experts to discuss and gather information on how modern district energy and distributed energy schemes, multiple energy systems, and efficient gas utilization can play a role in the development of energy systems in Qingdao City and in the Shandong region. We want to thank our co-hosts, Asian Development Bank, Qingdao Energy Conservation Association, NXITY, and Qingdao Energy Group, along with all the speakers for contributing to a very interesting and high-quality workshop. The workshop proved once again the vital role that APUEA plays in creating platforms for the exchange of knowledge and ideas as well as providing a starting point for collaboration among industry stakeholders to develop sustainable energy projects in China.



Financial Times Climate Finance Asia Summit

APUEA was a supporting partner to the first Financial Times Climate Finance Asia Summit in Hong Kong on November 21st, 2018.

The one-day summit brought together leading investors and companies in Asia to explore the developing trends and emerging opportunities in Asia's low-carbon transition. APUEA was represented by Head of Operations, Peter Lundberg, who attended the one-day event in Hong Kong. The summit gave insights into the climate economy in Asia and covered topics such as green bonds and loans, carbon markets, sustainable transport, and opportunities and risks in the energy transition in Asia.



Panel discussion during the FT Climate Finance Asia Summit



Singapore International Energy Week (SIEW) 2018

During 1-2 November 2018 APUEA participated at the annual Singapore International Energy Week.

🕒 1 November 2018

APUEA was a supporting partner at the **Innovations in Digital Energy Asia** event, which was hosted by Clarion Events. The focus of the event was to disseminate knowledge on how to increase energy-efficient measures to maximize energy savings and profits, by utilizing the ongoing digital transformation of the energy sector. The event attracted over 400 energy experts, who exchanged views on how digital transformation is changing the business. In the afternoon, the Executive Director of APUEA, Mikael Jakobsson, moderated a panel discussion on the topic "Decentralised and digital – what's next in energy services?" Mikael summarized the session by stating that the decentralization and digitalization trends in the energy sector are focusing on consumers, which allows energy retailers to offer new innovative services to their customers

🕒 2 November 2018

APUEA's Head of Operations, Peter Lundberg, joined the **Lux Research Executive Briefing**. The briefing, on the topic of "Decarbonizing Energy by Capture, Convert and Capitalize" gave an insight into the trends in energy innovation. It included interesting presentations, such as "The Lux Carbon Canvas – a framework for companies looking to prepare for the energy transition" by Chloe Holzinger, and "Milligrams to Megatons – following the innovation journey of carbon capture and utilization," by Runeel Daliah. The briefing provided important insights into how the energy industry can navigate while decarbonizing their processes and transition to a non-carbon business.

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(6)7-8 May
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Event Calendar

<p>12 MAR 2019</p>	<p>📅 12 - 16 March 2019 📍 New Delhi, India India Smart Utility Week APUEA Activity: Supporting organization</p>	<p>27 MAR 2019</p>	<p>📅 27 March 2019 📍 Shanghai, P.R. China Future Energy and Tech Investment Forum APUEA Activity: Supporting organization</p>
<p>06 MAY 2019</p>	<p>📅 6 - 8 May 2019 📍 Nantes, France Euroheat and Power Congress 2019 APUEA Activity: Supporting organization</p>	<p>09 MAY 2019</p>	<p>📅 9 May 2019 📍 Hong Kong Seminar: Exploring Trends Challenges and Opportunities Energy For Our Future Generations APUEA Activity: Supporting organization</p>
<p>20 MAY 2019</p>	<p>📅 20 - 21 May 2019 📍 Nanjing, P.R. China District Energy and Distributed Energy Conference APUEA Activity: Hosting organization</p>	<p>05 JUN 2019</p>	<p>📅 5 - 8 June 2019 📍 Bangkok, Thailand ASEAN Sustainable Energy Week APUEA Activity: Supporting organization</p>
<p>17 JUN 2019</p>	<p>📅 17 - 21 June 2019 📍 Manila, Philippines Asia Clean Energy Forum & APUEA2019 AGM APUEA Activity: Hosting organization</p>	<p>24 JUN 2019</p>	<p>📅 24 - 27 June 2019 📍 Pittsburgh, USA IDEA2019 Annual Conference and Trade Show APUEA Activity: Supporting organization</p>
<p>03 SEP 2019</p>	<p>📅 3 - 4 September 2019 📍 Kuala Lumpur, Malaysia Asian Utility Week 2019 APUEA Activity: Hosting organization</p>	<p>TBD OCT 2019</p>	<p>📅 TBD October 2019 📍 TBD Bangalore, India Asia Pacific Cooling Summit APUEA Activity: Hosting organization</p>
<p>29 OCT 2019</p>	<p>📅 29 October - 1 November 2019 📍 Singapore Singapore International Energy Week (SIEW) APUEA Activity: Supporting organization</p>	<p>TBD DEC 2019</p>	<p>📅 TBD December 2019 📍 Guangzhou and Shenzhen, P.R. China District Cooling Conference APUEA Activity: Hosting organization</p>

6TH GLOBAL DISTRICT ENERGY CLIMATE AWARDS

www.districtenergyawards.org

Don't wait -
Apply today!

#19GDECA
Deadline
15 JUNE 2019

DO YOU HAVE A STORY TO TELL?

We invite you to apply for the 6th Global District Energy Awards! Since they were launched in 2009, the Global District Energy Climate Awards have offered visibility and recognition to the many communities, cities and campuses around the world that have embraced District Energy as a vital part of their sustainability planning. Awards in six categories will be handed out at the Ceremony on 24th October 2019 in Reykjavik, Iceland. The awards provide global recognition for District Energy schemes demonstrating a high level of energy efficiency and innovation. The six award categories are:

- NEW SCHEME
- MODERNISATION
- EXPANSION
- EMERGING MARKET
- DEVELOPING COUNTRY
- 'OUT OF THE BOX'



We are once again looking for the **best in class installed systems**, so show us what you've been up to! Don't wait and apply today!

How to get awarded?

Application is open to systems that illustrate the overall importance of District Energy (heating & cooling) in providing sustainable energy solutions. Further details can be found on www.districtenergyawards.org

www.districtenergyawards.org

The **6th Global District Climate Awards Ceremony**
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Euroheat & Power (EHP)



Alliance to Save Energy



Capital Heat



Qatar Cool



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



China District Heating Association (CDHA)



Danish Board of District Heating (DBDH)



International Institute for Energy Conservation (IIEC)



Northeast Clean Energy Council (NECEC)



International Partnership for Energy Efficiency Cooperation (IPEEC)



District Energy in Cities Initiative



DEVCCO



Xian District Heating Company



Thai ESCO Association



Overseas Environmental Cooperation Center (OECC)



SPX FLOW



Solar Turbines

Partners and Supporting Organizations

- Sustainable Energy for All (SEforALL)
- Asian Development Bank (ADB)
- International Energy Agency (IEA)
- UN Environment

APUEA Registration Form - Membership

We, the under-mentioned organisation / company, hereby apply to become a member of APUEA:

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

Specify:

3 BILLING INFORMATION (if different from above):

Billing Address:

4 MEMBERSHIP CATEGORY (please check as appropriate below):

Member Category	Employees		
	≤ 1,000	1,000 - 10,000	≥ 10,000
Active Member	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Allied Member	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Affiliate Member	<input type="radio"/>		

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 membership@apuea.org

