

# APUEA

## Magazine

FLEXIBLE  
URBAN  
ENERGY

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# Editorial

Climate change has drawn historical attention recently, with climate strikes gathering millions around the world, the Climate Week in NYC taking place from 23 to 29 September, UN Secretary General's Climate Action Summit on 23 September, and the Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC) being launched by the Intergovernmental Panel on Climate Change (IPCC) on 25 September 2019.

SROCC describes climate change's impacts on ocean, coastal, polar, and mountain ecosystems, as well as its impacts on the human communities that depend on those ecosystems. It is reported that the ocean has warmed and absorbed 20-30% of total anthropogenic CO<sub>2</sub> emissions since the 80s. This has caused further acidification of the oceans, and it is very likely that the ocean is losing oxygen, with a loss of 0.5-3.3% from 1970-2010 (from the ocean surface to 1000m). Also, ice sheets on Greenland and Antarctica are melting and sea levels are rising.

In times with both climate deniers and alarmists, minor (or even irrelevant) uncertainties about the impact of climate change cause never-ending debates across the world. In the SROCC, however, it is remarkable that all of the scientists included (more than 100 of them) are "virtually certain" on several critical conclusions in the report. IPCC's scientists are virtually certain that the global mean sea level is rising and have high confidence that the increase is accelerating. The report describes horrific challenges ahead of us. Even though there are uncertainties regarding the magnitude of the impact of climate change and rising sea levels, is it worth waiting and seeing?

APUEA is calling for more actions and is intensifying activities that support cities across Asia Pacific. APUEA is keen to maintain successful collaborations with cities while simultaneously initiating new ones. Since the APUEA workshop in Qingdao in December 2018, APUEA members have been engaged in providing the city with sustainable energy solutions, and Qingdao Energy Group has joined APUEA as Active Member. In September 2019, the Qingdao Development and Reform Commission appointed undersigned Honorary District Energy Advisor. This proves that our activities are appreciated and are inspiring APUEA and its members to further support the Qingdao municipality's goal of a low-carbon economy. The collaboration has also continued in Xian since 2018, and APUEA was invited to support the International Clean Heating Summit Forum 2019 in Xian on August 27.

From 2-5 September, APUEA contributed to the Asian Development Bank's (ADB) 2nd International Forum on Low Carbon Development for Cities in Seoul in the Republic of Korea. APUEA highlighted the benefits of integrating energy systems and

presented modern city-wide energy management systems. In parallel, from 3-5 September, APUEA shared insights on the key challenges for urban energy systems during Asian Utility Week/PowerGen Asia in Kuala Lumpur, Malaysia.

In October, APUEA will co-host a workshop together with Asian Development Bank, Danish Board of District Heating and IVL Swedish Environmental Research Institute during the Asia-Pacific Forum on Green Low-Carbon Development 2019, 16-18 October in Changsha, China. On 15-17 October, during Asia-Pacific Urban Forum 7 (APUF7) in Penang, Malaysia, APUEA will co-host a Deep Dive Discussion on Sustainable Energy in Cities with United Nations Economic and Social Commission for Asia and the Pacific (ESCAP). More on APUEA's upcoming activities can be read on this issue of the APUEA magazine.

We hope you will enjoy this issue of the APUEA Magazine, where you can read about renewable energies, low carbon technologies and case studies. We thank ABB, Australia Geothermal Association, Engie, International Institute for Energy Conservation (IIEC), Lux Research, Muhammad Ali and Impact Solar for contributing to the Magazine.



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



# Secretariat

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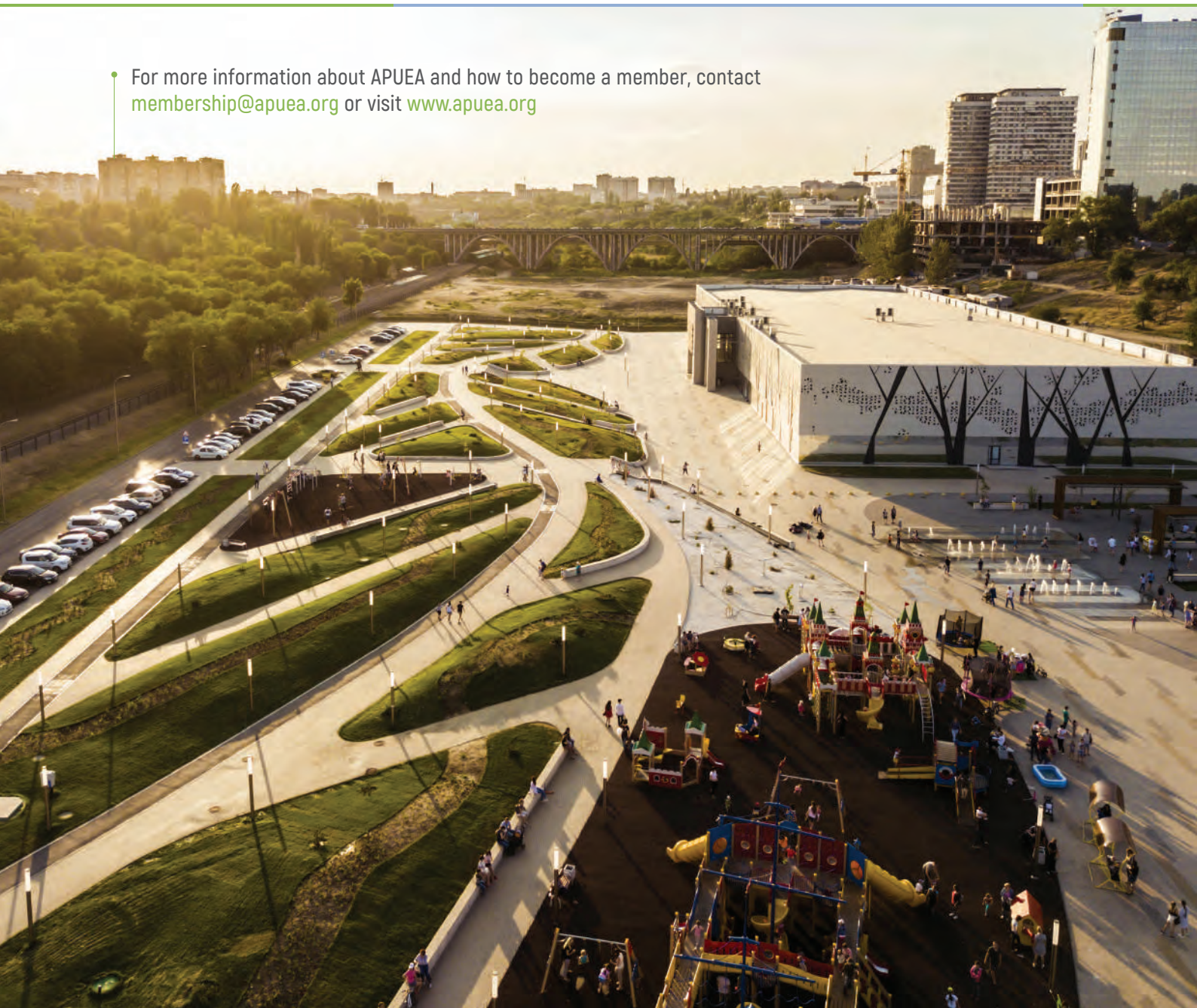


## Asia Pacific Urban Energy Association

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](mailto:membership@apuea.org) or visit [www.apuea.org](http://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





# Finding a Way Forward for Hydrogen: Lessons Learned from Energy Storage

By Tim Grejtak, Analyst, Lux Research

“

AS MORE AND MORE WIND AND SOLAR IS INSTALLED ON THE GRID, THE DEMANDS ON ENERGY STORAGE INCREASE, PUSHING THE NEEDED ENERGY STORAGE DURATION FROM MINUTES TO HELP MANAGE THE FREQUENCY OF ASYNCHRONOUS RENEWABLES GENERATION, TO HOURS TO BALANCE INTRADAY SUPPLY AND DEMAND, TO EVEN DAYS TO COMBAT TIMES OF BOTH LOW WIND AND LOW SUN.

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One of the most crucial developments in the stationary energy storage market over the past two years was not new technology, but new policy, specifically the **policies that enabled a single energy storage asset to secure multiple revenue streams by providing different grid services – a practice called application stacking**. Stationary energy storage has always been more expensive than energy storage for transportation and will likely remain that way. Application stacking changes the economics and allows stationary storage to profitably participate in markets where any single value stream wouldn't be enough to merit deployment. The result has been a wider adoption of stationary storage and, more importantly, a more stable grid to accommodate higher renewables penetration.

As more and more wind and solar is installed on the grid, the demands on energy storage increase, pushing the needed energy storage duration from minutes to help manage the frequency of asynchronous renewables generation, to hours to balance intraday supply and demand, to even days to combat times of both low wind and low sun as wind and solar capacity increase from 10% to 30% to 60%. When combined solar and wind penetration pass 80%, which regions like Europe are expected to as early as 2040, **the demands on energy storage to manage overgeneration during mild spring and fall months become so significant** that there is considerable debate around what should be done to accommodate such high renewables penetration, or whether such penetrations should even be permitted. In some regions, local grid conditions have already put pressure on grid operators to cut



back wind and solar deployments; in Japan, the Ministry of Economy, Trade and Industry (METI) is reducing feed-in tariffs by up to 50% to slow deployment and address the challenges posed by solar on the island's grid, even while solar only constitutes less than 18% capacity.

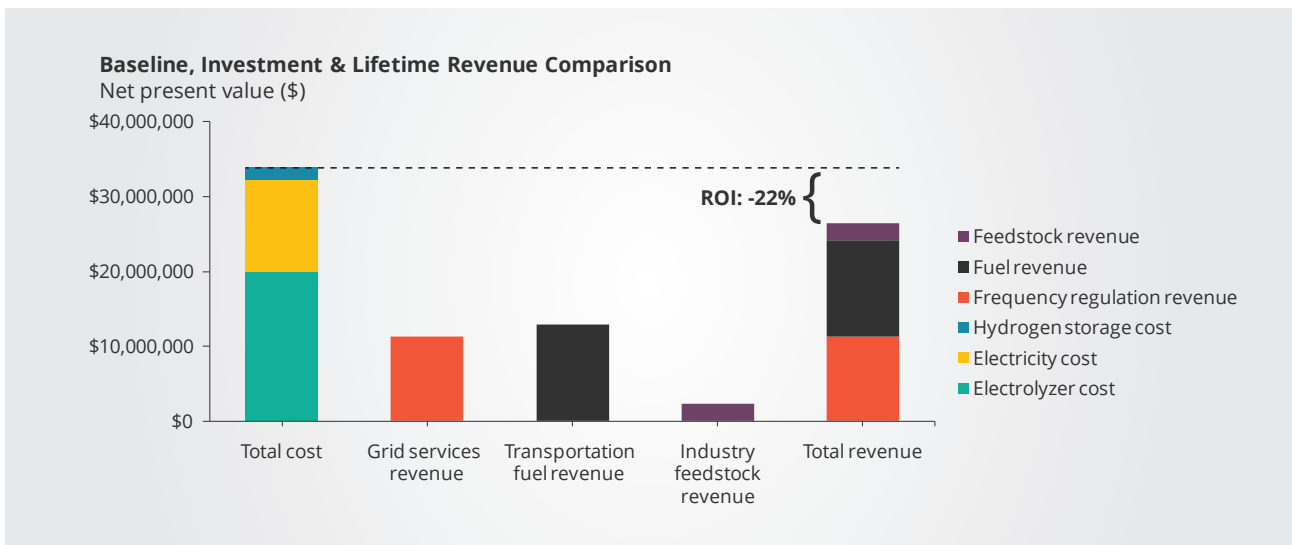
A common answer is to move from more traditional electrochemical batteries to storable fuels in the form of hydrogen produced from excess renewables. Japan has famously adopted hydrogen as a formal energy policy and has carved out significant IP position around hydrogen technologies. The issue is that **hydrogen as an energy storage solution is far too expensive to be practical**. At \$2,000/kW, electrolyzers are too costly not to be run at peak capacity for as long as possible, which is the exact opposite way an energy system using hydrogen as an asset to manage overgeneration events would want to operate an electrolyzer. Ideally, an electrolyzer would operate at reduced capacity for most of the year, but then when supply of wind and solar energy is very high and demand is low, ramp up to maximum capacity and store excess energy as fuel to be used later in the year.

Proponents argue that hydrogen is a versatile energy pathway that can provide multiple services, from storing excess renewable energy to providing fuel for transportation and a zero-carbon feedstock for industry. In many ways, hydrogen is in the same position stationary energy storage was in before application stacking, and governments are responding similarly – by evaluating the policy changes necessary to let hydrogen tap multiple revenue streams across the economy simultaneously. To understand the economics of this industrywide application strategy – a concept called sector coupling – Lux Research employed the same analysis method used for stationary energy storage, but looked at three different revenue streams: frequency regulation services for the grid, fuel for transportation, and natural gas feedstock replacement for industry. Lux Research considered a scenario set in Japan with a 10 MW proton exchange membrane (PEM) electrolyzer and used Japanese transportation fuels and



industry feedstock prices. The hydrogen fuel and feedstock split is arbitrarily set at 50%, such that half of the hydrogen is sold for fuel for heavy-duty trucking at prices where total lifetime costs are equivalent to those of a diesel truck, and industry feedstock prices are equal to that of methane on a molecular weight basis. The graph below depicts the stack of electrolyzer, storage, and electricity costs versus the revenue streams provided by the three different applications, as well as the calculated return on investment (ROI) over the 15-year system lifetime.

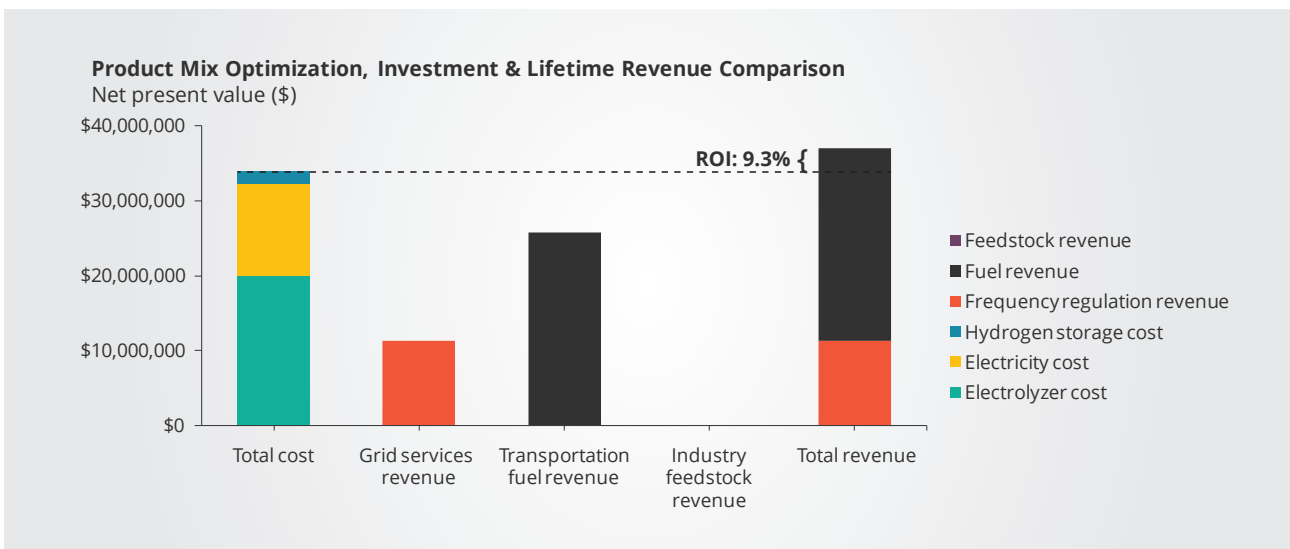
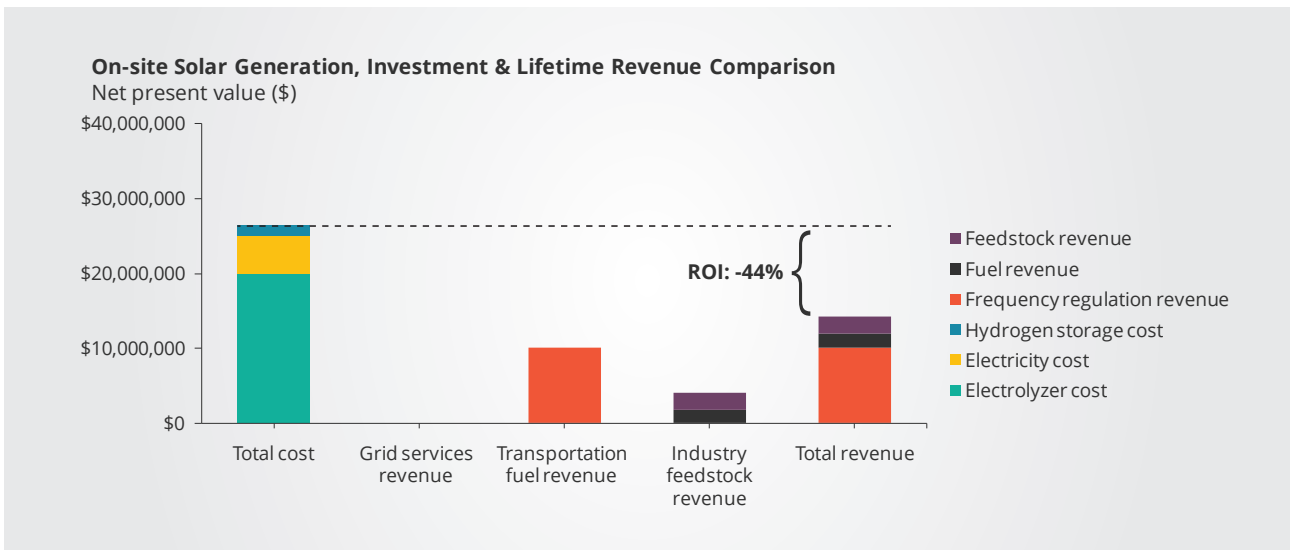
With a calculated -22% ROI, **there is currently little economic incentive to build out electrolyzers to capture excess renewable energy for transportation and industry**, but the stacking of multiple revenue systems dramatically improves the situation relative to if only one particular application were targeted. There are a number of different strategies a developer could target that may improve the situation:



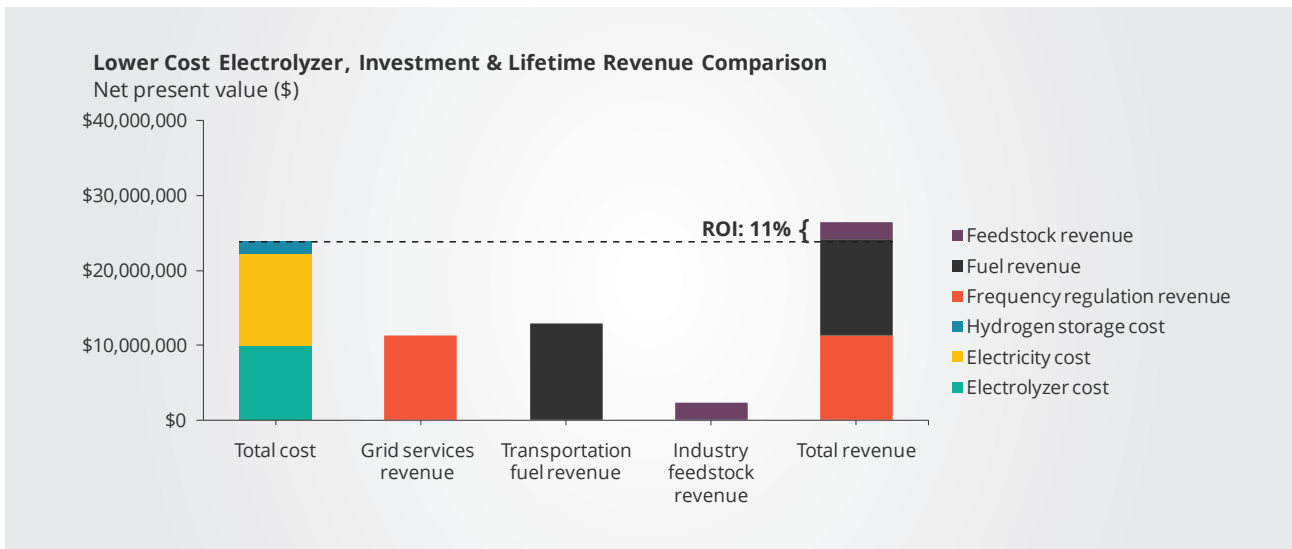
- 1. Target the high cost of electricity by tying on-site solar directly with the electrolyzer.** In the base scenario, electricity is purchased at grid rates 90% of the time; the remaining 10% of the time, output is ramped up to capture low-cost excess wind and solar. However, utility solar prices have dropped considerably over the year to below \$0.04/kWh, although not necessarily for Japan. While obtaining electricity supply from co-located solar does reduce electricity costs by eliminating grid electricity purchases, it makes the system ineligible to participate in grid services, reducing revenues.
- 2. Change the fuel mix to target the higher-value transportation fuel segment.** The competitive price for hydrogen as a fuel in Japan is \$8/kg, while the competitive price for

hydrogen as a feedstock is \$140/kg. This could be an effective near-term strategy, as it could take considerable time to decarbonize industrial processes, whereas Japan has a large heavy-duty vehicle fleet with a turnover rate of less than 15 years.

- 3. Wait until electrolyzer prices drop.** Current electrolyzer costs are around \$2,000/kW, but are forecasted to reach \$1,000/kW after 2030 as volumes increase and performance improves. Because the electrolyzer itself is the largest component of system costs, the impact on economics is considerable.







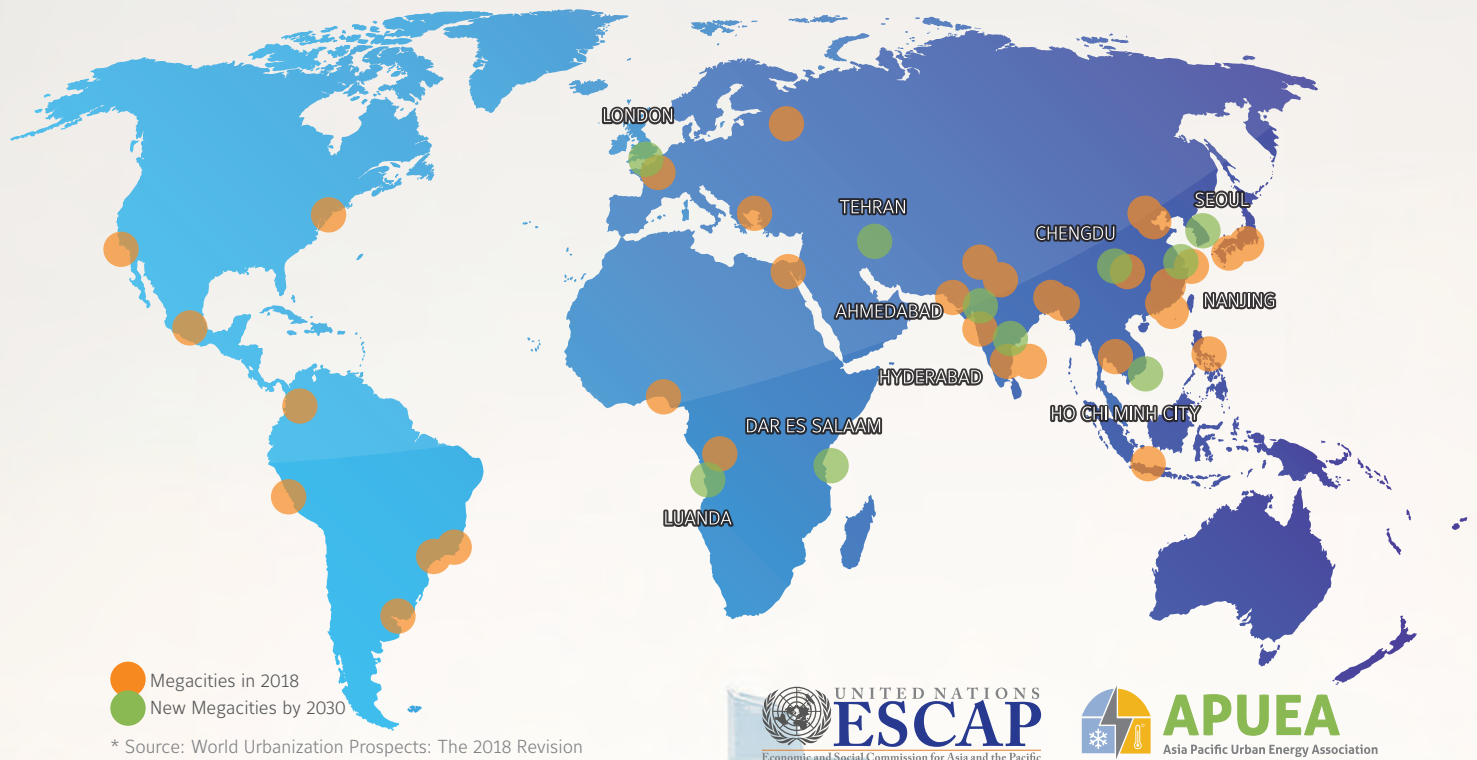
The most effective strategies are optimizing the revenue mix between fuels and feedstocks, a useful near-term strategy, and waiting until electrolyzer prices fall, a more cautious mid-term strategy – both result in roughly 10% ROI. **It may not be significant enough for mass adoption, but it could spur early deployment.** Paradoxically, pairing with on-site solar significantly worsens the value proposition, speaking to the importance of electrolyzers being able to participate in grid services and overgeneration risk reduction in addition to fuel and feedstock supply. An electrolyzer is a more valuable asset when it can provide grid balancing, even at the expense of foregoing cheaper electricity.

Approaching hydrogen as a future energy resource in a renewables-dominated grid makes very little economic sense if approached from isolated use cases, much like stationary storage makes very little economic sense if approached from individual applications. **Adopting sector coupling as a strategy drastically changes the economics of hydrogen from renewables.** The industry will likely continue to see early pilot projects over the next few years focus on specific use cases that rarely make economic sense in that particular instance, with the build-out of a limited hydrogen network geared toward industry and heavy transportation; sector coupling could enable those early pilots to find a pathway to profitability. Key opportunities present themselves in areas that intersect heavy industry and heavy transport, like shipping ports, industrial centers, or densely populated islands. While these will likely serve as early testbeds for successful trials of sector coupling, it will still take time for the grid, the heavy transportation sector, and the industrial sector to all be ready and aligned to adopt the zero-carbon technologies necessary for hydrogen to finally find a pathway for success. **For a long while, hydrogen has been seen as a curiosity and a mere consideration in the future portfolio of energy technologies, but with sector coupling showing a pathway to profitable operations, hydrogen now has a firm central role in decarbonizing the broader economy.**



Lux Research is a leading provider of tech-enabled research and advisory solutions, helping clients drive growth through technology innovation. A pioneer in the research industry, Lux uniquely combines technical expertise and business insights with a proprietary intelligence platform, using advanced analytics and data science to surface true leading indicators. With quality data derived from primary research, fact-based analysis, and opinions that challenge traditional thinking, Lux clients are empowered to make more informed decisions today to ensure future success.

Analysis you trust. Opinions you rely on. Make better decisions, faster. For more information visit [www.luxresearchinc.com](http://www.luxresearchinc.com), connect on LinkedIn, or follow @LuxResearch.



# Asia Pacific Urban Forum-7 (APUF-7) Future of Asia and Pacific Cities, SETIA SPICE Convention Centre

🕒 15-17 October 2019 📍 Penang, Malaysia

**Deep Dive Discussion: Sustainable Energy in Cities – Opportunities and Challenges** | Function Room 6, 16 October 2019, 15:30-17:00 PM

United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) and Asia Pacific Urban Energy Association (APUEA) are pleased to share this invitation to the Deep Dive Discussion (DDD): Sustainable Energy in Cities – Opportunities and Challenges. The DDD will be held during the Seventh Asia Pacific Urban Forum (APUF-7) on 16 October 2019 in Penang, Malaysia. The session will explore the emerging issues, opportunities, and challenges local governments and city planners are facing in enhancing the sustainability of energy generation and use in the urban context.

## Key Discussion points during the DDD:

- Cross-sectoral efforts are required to achieve sustainable, resilient, and liveable cities; how do we stimulate cross-sectoral urban planning?
- Digitalization enables end-user engagement; what's new in energy services?
- What is the impact of (and solutions for) increasing energy demands in cities as a result of continuous urbanization in combination with rapid electrification, including EV's

During the session, international and regional experiences will be shared, aiming to provide insights in cross-sectoral development of sustainable energy for cities.



## Draft Program:

15:30 – 15:40 PM	Opening remarks and Setting the scene	<b>Michael Williamson</b> , (M) ESCAP
15:40 – 16:30 PM	Panel discussion on Sustainable energy in cities – opportunities and challenges	<b>Moderator:</b> <b>Michael Williamson</b> , (M) ESCAP  <b>Panelists:</b> <b>H.E. Maxim Egorov</b> , (M) Deputy Minister, Ministry of Construction, Housing and Utilities, Russian Federation <b>Teruhisa Oi</b> , (M) Principal Energy Specialist, South Asia Department, Asian Development Bank <b>Mikael Jakobsson</b> , (M) Executive Director, Asia Pacific Urban Energy Association (APUEA) <b>John Steed</b> , (M) Marketing Director for EV-Charging, ABB <b>Ksenia Petrichenko</b> , (F) Economic Affairs Officer, UNESCAP
16:30 – 16:50 PM	Q&A	All
16:50 – 17:00 PM	Closing Remarks	<b>Michael Williamson</b> , ESCAP

For questions, more information and registration, please visit the APUF-website, <https://www.apuf7.org>, or contact Mikael Jakobsson at [mjakobsson@apuea.org](mailto:mjakobsson@apuea.org)

## ABOUT THE ASIA-PACIFIC URBAN FORUM (APUF)

The first APUF was held in Bangkok in 1993 and is held every 4-5 years. The Forum is the largest regional gathering of urban stakeholders, engaging policymakers from local and national governments, financial institutions, civil society, the academia, the urban training-research community, and private sector to discuss innovative solutions, identify common actions and objectives and strengthen effective partnerships to achieve sustainable urban development.



The goal of the Seventh Asia Pacific Urban Forum (APUF-7) is to mobilize partners from across the region to focus on accelerating implementation to achieve a sustainable future for cities throughout Asia and the Pacific. APUF-7 will bring a diverse array of cities, expert speakers, and thought leaders who are shaping the region's urban future.

15-17 October 2019  
Penang, Malaysia

**Asia-Pacific Urban Forum 7**  
**Future of Asia and Pacific Cities:**  
**SETIA SPICE Convention Centre**



# Interview with Mr. Somboon Lertsuwannaroj Impact Solar Limited

The solar PV industry today hardly needs any introduction as it fills the headlines of the news more or less every day with updates on projects all over the world. With a clear trend of dropping prices, it is clear that solar PV systems are getting more traction in the energy market. To get an insight into the solar PV industry in Thailand, we met up with Mr. Somboon Lertsuwannaroj, who is the Managing Director of the Bangkok-based energy company, Impact Solar Limited. During the interview, we discussed the solar industry in Thailand, touching on policy, regulation, business models, barriers, the future and more.



**Mr. Somboon Lertsuwannaroj**  
Managing Director at Impact Solar Limited,  
Bangkok, Thailand



## **Q: Can you give an introduction to Impact Solar Limited?**

Impact Solar Limited is a privately-owned Thai company based in Bangkok and is a subsidiary of Impact Electrons Siam (IES), which was founded in 2011 with a focus on clean energy development. Our business includes solar farms and wind farms, and we sell power to the state-owned utility companies and private companies through long-term Private Power Purchase Agreements (PPA) in Japan, Thailand, and Laos. Our project portfolio in Thailand has an installed power capacity of more than 70 MW.

In 2015, Thailand had a policy for rooftop solar PV systems which allowed for the sale of excess electricity from Solar PV systems back to the grid. It was the first time for the Energy Regulatory Commission (ERC) to fully manage and control the whole bidding process for Solar PV projects instead of the Electricity Generation Authority of Thailand (EGAT), Provincial Electricity Authority (PEA) and Metropolitan Electricity Authority (MEA) who was responsible for this in the past. However, the selection process was disappointing as the final selection at the final application round was made by lucky draw. The government did not select from readiness, skill, or track record because they did not want to be sued by companies that fail in the bidding process. Due to this fact, we believed that it would be a good idea to start selling power by ourselves to roof owners. Our evaluation showed that due to the cost and the technical solution of solar PV systems in Thailand as well as the fact that solar radiation is very high in the whole country. We believed that we could bring down the cost to compete with the government at the time.



We were also the first Thai company to go to Japan in 2012 after Fukushima when we learned that they had introduced a Feed-in-Tariff policy for solar PV systems. At that time, it cost 40 Yen/MWh (at 50 cents to the dollar), which was very high.

**Q: What is your perspective on the policy for Solar PV systems in Thailand today?**

Solar energy today, including business models and policy, is very different compared to ten years ago when it started in Thailand. I started working in the business on the Lop Buri solar PV project, which was the largest project of its kind in Thailand at that time. At the time, all solar PV projects were solar farms because they were under subsidy from the government with a so-called feed-in-tariff (FIT). Government subsidies for solar PV projects were the trend everywhere in the world. However, subsidies mean that solar PV projects are not self-sufficient and are not a sustainable solution in the long term.

Now, however, everything is changing. We are providing the first business modeled—called "Private Power Purchase Agreement (PPA)"—in Thailand. The Private PPA means that we invest in solar PV systems for customers and sell them power at a discounted tariff compared to what they usually pay when they buy power from the grid. This shows that solar PV systems are cheaper than in the past and that there is no need for subsidies today. I think that the solar PV policy in Thailand should catch up with this fact. We don't need subsidies anymore. We can provide electricity from solar PV systems that is cheaper than electricity from conventional power plants (gas or coal). However, stakeholders like EGAT, PEA, and MEA are still trying to understand what the private sector is doing and how this business model will impact the whole electricity infrastructure that was created by the government a century ago.

**Q: The current policy for solar PV systems to the industry only allows for self-consumption, and surplus electricity cannot be fed back to the national grid. How does this fact influence the PPA business model?**

The PPA business model is still attractive, and many national and international companies are interested. The ERC has initiated a new sandbox project with the purpose of the exchange of energy between companies, and there are a few ongoing pilot projects. The idea is that any company with excess electricity production from solar PVs can sell to other consumers via the national grid. This means that there is a green light for virtual power plants. If the electricity grid is opened to commercial solar PV systems, it will improve the PPA business model even better, so I am optimistic about the future. The electricity grid functions the same as the gas grid used to do, through a monopoly situation. I think the same will happen with EGAT, MEA, and PEA. It is just a matter of time.

**Q: How does the solar industry try to influence the government and the Ministry of Energy in terms of policy?**

When we started the PPA business model, we initiated a specific team with the mission to talk with the ERC. They



***We are providing the first business modeled—called "Private Power Purchase Agreement (PPA)"—in Thailand. The Private PPA means that we invest in solar PV systems for customers and sell them power at a discounted tariff compared to what they usually pay when they buy power from the grid.***



instructed us on what we could do in terms of the legal framework in Thailand. We could apply with the specific license for our business model with the ERC. Then we could show to our customers that what we were doing was approved by ERC. By doing this, we believed that we wouldn't have any legal constraints. After 2015, when we started to implement our business model, we spend a lot of effort to educate customers who believed that industries have to purchase power from the national grid. We needed to convince the customers that what we are doing is legal in Thailand. Then, after we established a pilot project, we faced many companies trying to copy our business model. This is fair enough because it should be competitive. After many companies started to adopt this business model, the government began to get concerned because it saw that the projects using this business model were adding a substantial capacity (MW) to the grid and that EGAT would have to reduce the power generation as customers purchased power directly from private companies. There were discussions in the government about charging a backup fee for this business model, but this led to an aggressive social backlash on how the government collects a fee or levy on solar energy. The reason for these discussions was that government was concerned about its revenue loss and how to compensate that. They were also concerned about bad publicity and how, as a developing country, to operate the power grid including distributed generation sources. We at Impact Solar Limited think that it is important to understand how the government needs to evaluate to adapt to the changing industry, and I believe that the government tries to understand the private companies as well.

**Q: Is the solar industry trying to show the government that the impact of connecting solar PV systems to the grid will not be that big?**

Yes, we try a lot. First thing, when the government compares the installed capacity (MW) between wind, solar, and conventional power production, it compares them one to one. When installing 100 MW of renewable energy, it doesn't mean that it loses 100 MW of conventional power production. A better comparison, is to compare the produced amount of energy (MWh). I think that many within EGAT, PEA, and MEA understand the effect of renewable power production. However, if they announce their support of the PPA business model, they cannot step back. So, they have to think carefully. And if this business model opens, the market will spread very



quickly and probably lead to other business models as well. I think they understands what we are doing. I think they are positive about the impact of the PPA business model, but they cannot make a quick decision because they cannot go back once they have made the announcement.

**Q: How are other companies working to promote the PPA business model?**

As you can see in the newspapers, there are many attempts to influence policy change from other companies like Banpu Infinergy, Gunkul, Bangchak, and many foreign companies who are also using the PPAs business model. They explain that this business model is not harmful to the operation of the power grid and that the business is helping the industry and the private sector to reduce electricity costs and infuse clean energy into the business operation. I believe that the government understands this, but it is a political decision, and the government has to be careful.

**Q: Do you look at international experience that Thailand can adapt to?**

Yes, for example, Germany and Denmark operate power grids very well. In 2016, we held a private forum called "Wind Day" in Thailand. We invited a speaker from Energinet Denmark, which is a state- owned power grid operator. He explained the whole story of the solar PV development in Denmark, which, in the past, looked like Thailand today. However, Thailand is 20 years behind Denmark, when the grid still has a single buyer structure. Today, the electricity grid in Denmark is open to solar PV systems, and they have high grid reliability, including a high percentage of power from renewable energy.

**Q: What do you think about the future? How will you develop your company and business model?**

Things are slowly changing, but to modernize and make an impact in the energy sector, the first thing that has to change is the whole structure of Thailand's energy sector. If we still have PEA, EGAT, and MEA using the single buyer model, there is no way we can move forward.

Singapore and the Philippines have open energy markets, meaning that they can welcome many solutions and technologies as electricity producers. When you have an opportunity to receive many ideas and solutions, that's the underline secret of how things develop. However, if the government unlock the market by, for example, starting from the retail or distribution side, you will see a lot of ideas flowing to the Thailand market. If looking at other countries in South East Asia (SEA), there is potential for improvement as many countries have similar energy markets like Thailand (100% government control). And with a population of 600 million in SEA, there will be many business opportunities when the markets are opened.



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*We at Impact Solar are putting a lot of work into analyzing the market from a customer perspective so that we can educate our customers about the full benefits of our products. This means that the customers understand all of the benefits and don't come back to us after one or two years and complain or raise questions about the system.*

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I think the grid should be unlocked bit by bit. As a first step, the government should consider opening the last mile (the lowest voltage) that links to retail, households, and manufacturing. In Singapore, companies like Microsoft, Apple, and Facebook have their regional headquarter. These companies want to use renewable energy, and I think this could be interesting for the Thailand market as well. This could lead to many interesting opportunities. EGAT, PEA and MEA is speeding up to disrupt themselves with many energy technology adaptations compared to a few years ago. This proves that everyone wants to survive into the future and that enlightenment is the first step of transformation.

**Q: In May 2019, a pilot program for 100 MW Solar PV systems dedicated to household rooftops was presented. The program includes projects with a capacity of 5-10 kW each. Will you go into this market?**

Yes, we plan to enter this market. We think that it has potential as the Power Development Plan (PDP) stretches over 20 years and will allow 100 MW per year for first 10 years and a total of 10,000 MW. The price for selling back to the grid is 1.6 Baht/kWh. This is not a good price but considering that the retail electricity tariff is about 4.4 Baht/kWh, using solar PV systems for self-consumption will make the plan attractive. We at Impact Solar are putting a lot of work into analyzing the market from a customer perspective so that we can educate our customers about the full benefits of our products. This means that the customers understand all of the benefits and don't come back to us after one or two years and complain or raise questions about the system. We feel that there is a lack of end-customer perspective in the market, so communication is very important.

The next thing we will look into is energy storage and digital platforms. This will allow us to adapt to the customers' needs and prepare for the future as electricity can be sold on the grid to other industries. Energy storage will improve our flexibility to deliver excess electricity to consumers and will, on the whole, lead to more sustainable power production/consumption. Digital platforms will enable the distributed generation technology and business model to be widely adopted.



# ASIA PACIFIC FORUM ON LOW CARBON TECHNOLOGY 2019

## Sino-Asia Pacific-Scandinavian Urban Energy Workshop

🕒 16-18 October 2019 📍 Changsha, China

Today, the majority of China's population lives in urban areas and will reach to 75% by 2050. In order to keep pace with the growing demand for energy infrastructure and the ambitious targets set by the Chinese government to combat climate change, while striving to meet the requirements for livable and environmentally sustainable cities and maintaining economic growth, local governments need new energy schemes.

To achieve sustainable and resilient energy schemes and the future demands of energy services, integrated energy systems are required. Multi-Energy Systems (MES) is all about integration; of electricity, gas, heating and cooling, to enable more renewable energy, higher degree of energy efficiency and take full advantage of i.e. electrical vehicles and prosumers.

Asia Pacific Urban Energy Association (APUEA) and Danish Board of District Heating (DBDH) are hosting the "Sino-Asia Pacific-Scandinavian Urban Energy Workshop" during the Asia-Pacific Forum on Green Low-Carbon Development 2019, in Changsha during 16-18 October 2019. The theme of the workshop is Multi-Energy Systems and Future Energy Services, and will cover District Energy 4.0, Distributed Energy, Heat Recovery, Asset Management, Financing, among other topics.

The workshop will feature leading international and national experts from the industry, sharing experiences from real-world cases, enabling an excellent opportunity to share ideas, get intelligence and discuss relevant topics and business opportunities. The expected audience will include government officials, planning agencies, utility executives, financial and legal experts, planners, developers, design institutes, investors, academia and domestic and international sector associations.



For registration please contact Peter Lundberg at [plundberg@apuea.org](mailto:plundberg@apuea.org)





# ENGIE Expands Its Renewable Portfolio in South Australia

By ENGIE

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**IN TOTAL ENGIE HAS MORE THAN 800MW OF WIND-FIRMING CAPACITY AVAILABLE IN SOUTH AUSTRALIA MAKING A CRITICAL CONTRIBUTION TO THE STATE'S ENERGY SECURITY AND STABILITY.**

”

ENGIE has opened its Willogoleche Wind Farm in Hallett, South Australia. One of the largest renewable energy projects completed in the state, Willogoleche has a generating capacity of 119MW, capable of delivering renewable energy to 80,000 homes. ENGIE is already playing an active role in Australia's renewable energy transition, with the country currently generating about 20% of its electricity from renewable sources.

The wind farm was opened by The Hon Dan van Holst Pellekaan, South Australian Minister for Energy and Mining, ENGIE's Asia Pacific President and CEO, Paul Maguire, and the company's Australia & New Zealand CEO, Augustin Honorat. They were joined at the launch by representatives from Mitsui & Co, the joint venture partner in the project.

Speaking during the launch, Mr Maguire highlighted that the Willogoleche Wind Farm was the latest project in the company's ambitious plans to provide more renewable energy to customers.

“At ENGIE, we strive to be a leader in the zero-carbon transition and we've set ourselves an ambitious target of bringing 9,000MW of renewable power into the global energy market by 2021. Its amazing to see sites in Australia like Willogoleche making a strong contribution to that goal.”

Consisting of 32 turbines, Willogoleche is the fourth largest wind farm in South Australia. It is also the first onshore wind farm in the world to install and commission GE's 3.8MW turbines at scale, and its 65 metre rotor blades can operate through a range of wind speeds, allowing ENGIE to maximise the capacity of each turbine.

Power from Willogoleche will be delivered to customers via ENGIE'S retail arm, Simply Energy, which has more than 700,000 customer accounts.

Augustin Honorat said that: "Willogoleche is the latest demonstration of ENGIE's long-term commitment to South Australia and Australia. It's also a great way for us to bring green energy and affordable energy directly to our customers in the state."

The Willogoleche Wind Farm represents an SAUD250 million investment by ENGIE and follows a \$75 million upgrade to its 500MW Pelican Point Power Station, one of the most environmentally friendly of its type in Australia. In total ENGIE has more than 800MW of wind-firming capacity available in South Australia making a critical contribution to the state's energy security and stability.



In addition to Willogoleche, ENGIE operates the 46MW Canunda Wind Farm in South Australia and has renewable energy projects under development in Queensland and New South Wales.

ENGIE continues to focus on co-creating smart solutions to increase energy efficiency, provide renewable energy and improve the quality of life, together with governments, citizens, customers and businesses. We believe in accelerating the energy transition – through investments to develop smart solutions, with more decentralised, increasingly digital, zero carbon economy for the region. By doing so, we create opportunity for organisations across the region to collaborate even more efficiently, further accelerating the world's transition to greener energy.



"ENGIE Asia Pacific is a leading energy and services company focused on three core activities: low-carbon power generation, global networks and client solutions. With our regional headquarters in Singapore, we operate low-carbon power plants that focus on natural gas and renewable energy across Asia Pacific. Apart from our suite of renewable technologies including wind, solar, and hydro plants, our retail arm is based mainly in Singapore and Australia.

We are also growing our services business, largely in Singapore, Philippines, Malaysia and Australia. With the energy mix and fast-growing demand for power in Asia-Pacific providing significant opportunities for growth, we are striving towards our zero-carbon ambitions."





# UPS Energy Storage Options One Technology Does Not Fit All

By ABB

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**UPS SYSTEMS ARE A VITAL BUSINESS SAFEGUARD THAT IS, UNFORTUNATELY, OFTEN INSTALLED AND FORGOTTEN. AGING EQUIPMENT MAY BE SHORTCHANGING YOU ON THE PROTECTION YOU CAN GET FROM NEW TECHNOLOGIES THAT OFFER ATTRACTIVE TOTAL COSTS OF OWNERSHIP.**

”

There is only one area of universal agreement regarding UPS systems in data centers – you most likely need one. How that solution looks, however, can vary from data center to data center.

There is no real agreement as to what works best because there is no one answer. The good news is that there are several solid energy storage options that can reliably ensure your uninterrupted operation and the integrity of your data. You simply need to weigh the benefits, costs, risk and performance characteristics of each one to pick the best solution for your unique data center needs.

## **Cost, Duration, Longevity**

Your five UPS energy storage choices are sealed Lead Acid batteries (VRLA), wet cell Lead Acid batteries, NiCad batteries, Lithium-Ion batteries and Flywheels. While all deliver seamless power when your main source is interrupted, they are very different technologies in terms of initial cost, the length of time they can deliver clean backup power, maintenance and how long you can rely on them before you need to install replacements.

## **Lead Acid (VRLA) Batteries**

You get the peace of mind that comes from a proven technology that's readily available and normally covers power interruptions from five to 15 minutes. Although designed to perform for ten years, these older battery technologies realistically give you four to five years of protection before you need to replace them. You usually find Lead Acid batteries in small data centers or data rooms that are willing to trade off lifecycle duration for significant capital-cost savings.

### Wet Cell and Ni-Cad Batteries

Wet cell battery plants have a battery design life of 20 years, but jar failures actually start between years ten and 12. A large footprint, heavy weight and expensive capital costs (close to Lithium-Ion) have made it fall out of favor with data center users. NiCad batteries are also quite expensive for the performance they provide. They are also seeing market share declines as Lithium-Ion preference grows.

### Lithium-Ion Batteries

You can realize a major step up with Lithium-Ion batteries, but those improvements in duration, performance and technical specs come at a price. Lithium-Ion batteries cost 20-30% more than VRLA battery power equivalents. Why consider spending more up front? That larger capital cost delivers equivalent backup power but lasts two to three times longer than VRLA batteries. Lithium-Ion also takes up 10-30% less space, weighs 30-50% less, recharges in less than one-third the time and can operate effectively for 1,000 to 3,000 discharges, vs. 200-400 discharges for traditional VRLA batteries. Their higher initial cost pays for itself over time and is becoming the standard in large, mission-critical data centers.

### Flywheels

Flywheels are very different from battery backup. They store energy by spinning a mass and converting kinetic energy into electricity. They are ultra-reliable machines for delivering 15 to 60 seconds of backup time. While they carry a high initial cost, they should operate reliably for 20 years, with almost no maintenance other than oil changes for the pump. They require a small footprint and, unlike batteries, have no environmental considerations. Flywheels are a green, sustainable energy storage alternative without eventual disposal challenges. Flywheels work best as power-glitch protection on critical processes or in data centers that are comfortable with standby generator backup commencing within ten seconds of losing grid power.

### Total Cost of Ownership

Understanding the capital-cost differences between UPS battery technologies is easy. Using VRLA batteries as a baseline cost X, expect NiCad batteries to cost 1.3X more, Lithium-Ion batteries to cost 1.2-1.5X more, wet cell batteries to cost 1.7-2.0X more and Flywheels to cost 2.3X more. But when looking at a 15-year total cost of ownership, the expense profile changes. Factoring in labor, maintenance, and replacement costs, Lithium-Ion batteries and Flywheels look far more attractive. Also keep in mind assembly and installation costs. VRLA batteries and Flywheels typically come as preassembled solutions, with only simple cable connections needed onsite. Lithium-Ion, NiCad and wet cell battery plants need considerable site assembly, which can affect system reliability if not done correctly.

### Making the Right Choice for Each Facility

As with most good business decisions, the right UPS module and UPS battery choice will be a matter of balance. You need to balance your operating profile, critical data needs, capital budget availability, maintenance resources and reliability

needs. Some larger datacenter users may choose Lithium-Ion for its design life, compact convenience and significantly lower total cost of ownership over time. Budget minded users can still get adequate protection with older battery technology that costs less today.

### Where to Shop for Advice

How do you determine the best solution for your facility or facilities? You need to take the time, weigh the risks, analyze the data and balance the Capital vs Operating Cost differentials. Larger organizations may have the resources to crunch the numbers in house. Others may enlist the help of consultants or UPS vendors. Any of those strategies can work – with a strong caveat.

UPS manufacturers and distributors tend to have a bias towards the solutions they make or sell. Lithium-Ion UPS suppliers are most likely quite sure Lithium-Ion is the choice for you. The same with Flywheels, Lead Acid or NiCad batteries. Suppliers are biased towards the technologies they understand and have experience with.

When working with consultants, ask for samples of their past projects and recommendations. If they all come to the same conclusion and recommend the same solution, despite facility differences, you may want to find another consultant. When using the free advice of manufacturers and distributors, be sure they offer all these energy storage technologies and have installed them all recently. Then you know you're getting the best advice that considers all the alternatives equally and without bias.

### When Is the Last Time You Checked?

UPS Systems are a vital business safeguard that is, unfortunately, often installed and forgotten. You check the box and move on. When your UPS modules reach eight years of service or your UPS VRLA batteries reach year five, it's time to reevaluate your protection. Aging equipment may be shortchanging you on the protection you can get from new technologies that offer attractive total costs of ownership.



ABB (ABBN: SIX Swiss Ex) is a pioneering technology leader in electrification products, robotics and motion, industrial automation and power grids, serving customers in utilities, industry and transport & infrastructure globally. Continuing a history of innovation spanning more than 130 years, ABB today is writing the future of industrial digitalization with two clear value propositions: bringing electricity from any power plant to any plug and automating industries from natural resources to finished products. As title partner of Formula E, the fully electric international FIA motorsport class, ABB is pushing the boundaries of e-mobility to contribute to a sustainable future. ABB operates in more than 100 countries with about 147,000 employees.





# The Potential of Integration of Renewable Energy in Buildings

## Introduction to the programme for integration of renewable energy technologies in India

By Ms. Disha Sharma, Project Manager, IIEC and Ms. Sumedha Awasthy, Project Manager, IIEC

“

**THE PROGRAMME OBJECTIVES MAINLY FOCUS ON DELIVERING THE DESIGN, SHOWCASE AND MONITOR PILOT BUILDINGS FOR INTEGRATED RENEWABLE ENERGY TECHNOLOGIES, WHICH ARE SUITABLE TO AND AFFORDABLE IN THE LOCAL CONDITIONS.**

”

The integration of renewable energy in buildings has high potential to complement the efficient designs of high-performance new buildings to achieve low energy comfort by reducing the energy requirements from conventional technologies to a minimum. The most common examples of building integrated renewable energy sources are solar PV and solar thermal systems in roofs or facades, small biomass boilers, small wind turbines or geothermal energy or even green district cooling/heating. Buildings have different applications of energy for heating, cooling, hot water, electricity, etc. New buildings offer huge potential to integrate renewable energy. Studies conducted by National Renewable Energy Laboratories (NREL) in the USA, suggests that there is a large potential of reducing the electricity consumption in new buildings by using clean technologies coupled with energy efficiency measures. Internationally, buildings are being designed with a low energy demand, which is met by renewable energy sources. Model building bye laws 2016 of India, also conforms to the requirement of integrating renewable energy, specifically solar technology in buildings. Depending on the location, purpose and the type of building (residential or commercial), suitable renewable technologies can be identified and integrated.



Distribution of load with the use of renewables or achieving net zero or zero energy buildings presents unique challenges as well as opportunities for improving the efficiency of buildings in India. A key challenge is the scope of the effort, requiring integrating renewable energy and energy efficiency optimization in both new and existing buildings. However, integration of renewable energy can be more cost-effective at a campus or community scale than for a single building because it opens opportunities for both cost-effective renewable energy and economies of scale in technology procurement and deployment. Also, different buildings (commercial and residential) with different occupancy patterns, and different time of energy use, can be balanced to flatten load profiles across a portfolio.

The integration of renewable energy in buildings can be made easier by analysing how different clean energy technologies work better at different scales, and the potential to use large scale renewable energy options. For example:

- Renewable energy in individual buildings, such as solar panels, building-integrated solar panels, or small-scale wind.
- Cogeneration plants that run on biomass or waste to meet both the electricity and heating needs.
- Larger-scale and higher-efficiency solar options on unbuildable brownfield sites or community lands, leveraging lands that are commercially undevelopable.
- Geothermal energy development within the vicinity of the buildings or the group of buildings.

Integration of renewable technologies will sometimes have additional up-front costs, although in some cases the life-cycle energy cost of the building may be lower than for a standard code-compliant building. Financing models that can help with the additional up-front cost of renewable integration should be adopted to transform the market and to build the confidence of the developers.

### Programme for integration of renewable energy technologies in India

The International Institute for Energy Conservation (IIEC) led consortium is implementing a Swiss Development and Cooperation (SDC) funded programme for integration of renewable energy in buildings. The Global Programme Climate Change and Environment (GPCCE) of the Swiss Agency for Development and Cooperation (SDC) has recognized the urgency of acting in the building environment. The new strategy (2017-2020) focuses on low emission development and has a specific focus on buildings in addition to other core areas of interventions.

The programme objectives mainly focus on delivering the design, showcase and monitor pilot buildings for integrated renewable energy technologies, which are suitable to and affordable in the local conditions. "Integration of renewable energy in buildings" will contribute to various global processes in the areas of climate change mitigation, urban development and resources efficiency improvement. This programme is also expected to contribute towards the 2030 agenda for sustainable development, which includes:



source: <https://www.un.org/>

- Goal 7: Affordable and clean energy
- Goal 8: Decent work and economic growth
- Goal 9: Industry innovation and infrastructure
- Goal 11: Sustainable cities and communities
- Goal 13: Climate action and, the Paris agreement

### Expected Outcomes

The project aims to develop local skills in India for up-scaling and capacity building of stakeholders at the governmental as well as non-governmental level. The specific outcomes of the programme are:

- Demonstrated technological interventions for building integrated renewable energy
- Delivered research, monitoring methods and manuals to measure the performance of systems established during the implementation of the project
- Delivered business models and trainings to support the implementation of pilots
- Disseminated knowledge products and case studies to scale-up the implementation of programme



The International Institute for Energy Conservation (IIEC) was founded in 1984 to dramatically increase the use of energy efficiency as an important clean energy approach in developing countries. We believe local presence is the best way to bring about results, and through our regional offices all over the world, we have been effective in bringing about progress in energy efficiency policy and implementation that has both reduced energy consumption by thousands of MWs and fostered economic development in the countries we serve. The IIEC works with stakeholders across all sectors to connect international best practice with the unique needs of the communities in which we operate, combining sound energy efficiency, Demand-side management (DSM) and renewable energy policy with hands-on implementation in order to reduce greenhouse gas emissions and encourage sustainable development.







# YOUR NEXT BIG IDEA

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# Interview with Dr. Donald Payne, Australian Geothermal Association (AGA)

**Dr. Donald Payne**  
who recently Co-Led the Australian Geothermal  
Association (AGA) Census

*Geothermal energy is a renewable energy source with significant potential. It is estimated that geothermal energy, including power and heating, has the potential to provide up to 5 percent of the global demand in 2050\*. To get an insight into the current status of geothermal energy in Australia, APUEA Australasia advisor Muhammad Ali sat down and had a conversation with Dr. Donald Payne, who recently Co-Led the Australian Geothermal Association (AGA) Census.*

*By Muhammad Ali, APUEA Australasia advisor*

## **Q: Can you provide us an overview of the Australian Geothermal Industry?**

The Geothermal Industry spans the use of deep ground (3-5km) for electricity generation, intermediate ground (500-1000m) for direct use of the planet's heat, and shallow ground (0-100m) as a thermal battery for Ground Source Heat Pumps (GSHPs). Australia had a boom in activity and investment in deep geothermal resource development in the late 2000s, peaking in 2010 and attracting a cumulative investment of circa \$900 million by the end of 2013. The investment did not yield any new geothermal power plants and Australia's only and longest-running geothermal power station of 120 kWe at Birdsville Queensland was decommissioned in 2018 and replaced by solar PV and battery storage. Direct-use geothermal and GSHP adoption has been steadily rising over recent decades and is further propelled by rising gas prices which are a fundamental economic driver for GSHPs in any economy. A census of geothermal installations conducted by the Australian Geothermal Association (AGA) in 2018-9 identified 86 MWt of installed capacity (direct-use and GSHPs) including 61 MWt of GSHPs. This represents a substantial increase on prior summaries in the annual International Energy Agency Geothermal Implementation Agreement (IEA-GIA) reports.

## **Q: Is geothermal Industry gaining popularity and acceptance in the local market?**

Deep geothermal investment in Enhanced/Engineered Geothermal Systems (EGS) faded after 2013 due to economic, technical, geographic, financial, and policy-related challenges. Falling costs of solar-wind-battery systems dampen the relatively unique advantage of geothermal being both renewable and capable of reliable base-load generation. Deep geothermal bores failed to exhibit flow

\* Source: Craig, William; Gavin, Kenneth (2018). Geothermal Energy, Heat Exchange Systems and Energy Piles. London: ICE Publishing. pp. 41-42.

required for economic viability. Large separation and thus transmission costs between potential geothermal resources and existing or planned population centres hindered viability. Direct-use application in pools and hot springs is experiencing significant growth. Australia's longest-standing, albeit presently decommissioned direct-use system at Portland Victoria garners enthusiasm from local government but requires state/federal support to finance re-commissioning. Direct-use systems have been installed in 13 aquatic centres in Western Australia and GSHP applications include housing estates (e.g. ~900 homes in Western Sydney, NSW), government buildings (e.g. Geoscience Australia), aquatic centres (particularly in Western Australia), libraries, schools, a prison, a substation, community centres, and ski lodges.

**Q: What are the different types and capacities of geothermal systems installed in Australia?**

Direct-use and GSHP systems range in capacity from a few kWt in a residence to a few hundred kWt for commercial buildings and aquatic centres to 1 MWt for Geoscience Australia to 72 MWt in a district energy system at Barangaroo (Sydney, NSW). Over 99% of GSHP systems globally involve circulation of water (sometimes with antifreeze if required) through High-Density PolyEthylene (HDPE) pipes inserted and grouted vertically, diagonally, or horizontally in the ground or in a pond, lake or river. A portion of the remaining 1% of GSHP systems circulate refrigerant under pressure through copper pipes likewise inserted and grouted – those with loop lengths below 30m are referred to as Direct Exchange (DX) whilst those with lengths above ~50m Deep-Well Direct Exchange (DWDX). Australia has an anomalous proportion of DX/DWDX systems.



Dr Donald Payne with the Minister for the Environment and Heritage, Albert Paul Jacob, during the inauguration of geothermal system for Kalgoorlie Goldfield Oasis Leisure and Aquatic Centre

**Q: With all these ups and downs, does the geothermal industry have a future in Australia?**

Gas prices are projected to continue to rise in Australia and this is projected to motivate further uptake of direct-use and GSHP systems. AGA's census indicates a near doubling of direct-use and GSHP installed capacity to 151 MWt over the coming 5-10 years. Further likely developments in Australia's geothermal industry include: small Organic Rankin Cycle (ORC) electricity plants in western Queensland up to ~1 MWe; establishment of additional hot-spring spas; district-heating systems in a new development or precinct; and further direct-use application in aquatic centres (mostly in Western Australia). Geothermal power plants on the horizon include a 310 kWe ORC power plant in Winton Queensland, a small plant in Thargomindah and possibly others in Quilppi, Normanton and Longreach (all Queensland).

**Q: Are there subsidies and government support for geothermal installations?**

There is no national policy targeting update of geothermal systems. Australia's Renewable Energy Target (RET) of 33,000 GWh/yr is already met by existing and planned solar and wind projects leaving little incentive for geothermal projects. Further, GSHPs are not included in the RET despite legacy inclusion of Solar hot water and Air Source Heat Pumps (ASHPs) and a number of years of lobbying by peak geothermal industry bodies. Selected state and federal programs have funded geothermal projects over the last decade: e.g. Victorian Government AU\$1.6 million to University of Melbourne, Direct Energy & Geotech; ARENA AU\$500k to Climate-Kic Australia for a study of Deep Well Direct Exchange (DWDX) GSHPs in a housing development in Western Sydney; and Federal (CEEP) and Western Australian (LEED) Government funding of \$1.156 million for a GSHP, solar PV and solar-thermal retrofit to Kalgoorlie's aquatic centre and \$2 million for Mandurah's aquatic centre. Green building requirements are driving specification of geothermal systems in government and allied buildings.



Geo Radial Drill (GRD) for Radial Drilling



**Q: Is there any established Geothermal research in Australia?**

Geothermal research has been undertaken at CSIRO, Geoscience Australia (GA) and various universities over the last couple of decades. Following the fall of the geothermal power industry, CSIRO and GA have ceased their formal geothermal research groups leaving various University research groups including: University of Adelaide’s research on aspects of deep geothermal wells; University of Queensland’s geothermal energy resource identification and GSHP demonstration; University of Melbourne’s GSHP research group; University of New South Wales courses in geothermal engineering; University of Technology Sydney (UTS) and Curtin University partnership with Climate-KIC on the ARENA-funded monitoring of geothermal housing development; and Newcastle University research.

**Q: Can you inform about the major players in the market?**

Geothermal designers and installers over the last three decades have generally been private proprietary limited companies. Utilities have entered Australia’s GSHP market twice (Origin Energy in 1998 with water-source GSHPs and Alinta Energy in 2018 with DWDX GSHPs). Present players include AusGeothermal, Alinta Energy Geothermal, Direct Energy Australia, and Geoexchange Australia as major contributors to the local market.



Vertical Drill for Vertical Drilling



*Geothermal systems have a role to play alongside solar photovoltaic (PV), solar thermal, wind and battery-storage systems. Such integrated energy systems are necessary to address Australia’s ongoing power requirements and rising gas prices.*



**Q: You are facing challenges in exploiting the geothermal resources. What are those?**

Macro-policy exclusion, low awareness and understanding of the existence and benefits of geothermal systems alongside the higher capital costs (due to relatively low volumes of drilling to sustain dedicated geothermal drilling contractors) are barriers for Australia’s geothermal industry. AGA and industry participants are attempting to increase awareness through education and outreach. As is too often the case in burgeoning industries the potential opportunity presented by rising gas prices attracts unscrupulous installers of geothermal systems who over-sell and/or under-design to attract work their way. Australia’s geothermal industry experiences a globally unique risk in the penetration of a particular type of GSHP system which represents below 1% of global GSHP installations.

**Q: What are the geothermal technologies transferred to Australia from overseas?**

Geothermal systems have been researched and implemented for decades globally. Australia has been importing GSHPs since the introduction of the Water Furnace in the early 1990’s and engineering-design experience from overseas for larger and more complex projects.

**Q: Where do you place Geothermal in comparison to solar and wind in regards to importance as renewable energy source?**

Geothermal systems have a role to play alongside solar photovoltaic (PV), solar thermal, wind and battery-storage systems. Such integrated energy systems are necessary to address Australia’s ongoing power requirements and rising gas prices.

**Q: Are these lessons learned taking industry in a direction?**

Australia’s geothermal power industry’s rise and fall gave rise to many lessons whose value is hopefully realised in coming decades. Lessons are ongoing in the direct-use and GSHP parts of Australia’s geothermal industry.



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**ASIA CLEAN ENERGY FORUM 2019**  
 10-12 September 2019  
 The Bangkok International Trade and Exhibition Centre (BITEC)

**Deep Dive Workshop:**  
 Integrated Solutions for Livable Cities in Asia Pacific:  
 Multi-Energy Systems and Sustainable Buildings

**Mikael Jakobsson**  
 Executive Director  
 Asia Pacific Urban Energy Association

<b>1. Sambit Nayak</b> Mitigation Specialist Asia Pacific Climate Technology Center and Network	<b>2. Teruhisa Oi</b> Senior Energy Specialist, South Asia Department ADB	<b>3. David Morgado</b> Senior Energy Policy Specialist Asian Infrastructure Investment Bank
<b>4. Jacqueline Lam</b> Deputy Regional Director for East, Southeast Asia and Oceania C40	<b>5. Wilhelm Van Butselaar</b> Area Manager Energy Storage Wärtsilä Energy	<b>6. Tristan Ocampo</b> Technical and Design Manager ABB

# Recent APUEA Activities

By Asia Pacific Urban Energy Association (APUEA)



**SINCE THE LAST AGM IN JUNE 2018, THE APUEA MEMBER BASE HAS INCREASED BY 44%, AND NINE EVENTS HAVE BEEN HOSTED OR SUPPORTED. FOR THE FULL YEAR 2019, THE MEMBER BASE HAS CONTINUED TO INCREASE AT THE SAME PACE, AND THIRTEEN EVENTS ARE HOSTED OR SUPPORTED.**



**THAILAND** 📍 5 - 8 June 2019  
 📍 Bangkok, Thailand

## ASEAN Sustainable Energy Week

During June 5-8, APUEA was a supporting partner for the ASEAN Sustainable Energy Week, organized by UBM, now Informa Markets, at the Bangkok International Trade and Exhibition Centre (BITEC). This year, the event attracted more than 24,000 visitors from 52 countries, including nine country pavilions from China, Germany, Japan, Korea, India, Singapore, Switzerland, Taiwan, and the USA. The show had more than 500 individual exhibitors, including the APUEA exhibition booth. During the event, over 80 seminars and workshops were held, and these events were attended by more than 5,000 delegates. APUEA is planning to increase the collaboration with Informa Markets for the ASEAN Sustainable Energy Week 2020.







### Lux Executive Briefing

On June 6, and during ASEAN Sustainable Energy Week, APUEA co-hosted the Lux Executive Briefing together with Lux Research and UBM/Informa Markets. The Lux Executive Briefing brought together more than 50 selected executives for discussion and debate of ideas on the theme of Emerging Technologies in Energy. The briefing aimed to help leaders to takeCe. The session also aimed to help leaders to prepare for the future with insights into the next wave of technology and to set strategic plans, long-term strategies, and visions and build a foundation for sustained growth.

**PHILIPPINES** 🕒 17 - 21 June 2019  
📍 Manila, Philippines

### Asia Clean Energy Forum (ACEF)

APUEA participated in the Asia Clean Energy Forum in Manila June 17–21. This year's edition of ACEF attracted more than 1,600 participants from 78 countries to take part in the conference's 20 themes, listen to over 300 speakers, and participate in 22 Deep Dive Workshops.

- Deep Dive Workshop - Integrated Solutions for Livable Cities in Asia Pacific: Multi-Energy Systems and Sustainable Buildings

On June 19 APUEA co-hosted a Deep Dive Workshop titled “Integrated Solutions for Livable Cities in Asia Pacific: Multi-Energy Systems and Sustainable Buildings.” The workshop was co-hosted by Asian Development Bank (ADB), UN Environment, the UK government’s Department for Business Energy & Industrial Strategy (BEIS), and the

Wuppertal Institute. The workshop aimed to unlock the potential of sustainable energy and building solutions to making cities more livable by discussing challenges and opportunities for innovative cross-sectoral solutions and increasing the awareness of integrated and multi-source energy schemes.



The workshop also presented great opportunities to share international and regional experiences and connect sectoral public and private stakeholders in order to foster the development of partnerships. The workshop included speakers from ADB, Ren21, Adenergy, Wärtsilä Energy, ABB, the UK government, International Finance Corporation (IFC), and the Wuppertal Institute. The workshop also included a panel session, moderated by APUEA’s Executive Director, Mikael Jakobsson, which also included panellists from the Asia-Pacific Climate Technology Center and Network (CTCN), the Asia Infrastructure Investment Bank (AIIB), C40 Cities, Wärtsilä Energy, and ABB. The workshop attracted an audience of around 100 energy professionals to participate, network, and engage in the discussions.







Prior to the Deep Dive Workshop, APUEA members, supporting organizations, and collaboration partners were invited to the Annual General Meeting (AGM). The meeting allowed the participants to discuss and provide feedback on the development of the Association, geographical focus, the APUEA tracks, and activities. In the past year, APUEA has released the APUEA Magazine every quarter, and news has been published weekly through the APUEA website ([www.apuea.org](http://www.apuea.org)) and LinkedIn channel ([www.linkedin.com/company/apuea](http://www.linkedin.com/company/apuea)).

Since the last AGM in June 2018, the APUEA member base has increased by 44%, and nine events have been hosted or supported. For the full year 2019, the member base has continued to increase at the same pace, and thirteen events are hosted or supported.

- **Deep Dive Workshop - The Future of Cooling: Promoting Sustainable Cooling through Technology and Policy Innovation**

On June 21, APUEA's Head of Operations, Peter Lundberg, was invited by the International Energy Agency (IEA) to speak at the Deep Dive Workshop - The Future of Cooling: Promoting Sustainable Cooling through Technology and Policy Innovation. The workshop was organized by IEA, GIZ, Sustainable Energy for All (SEforAll), UK Department for Business, Energy and Industry strategy, and the Kigali Cooling Efficiency Program (K-CEP).



Peter's presentation was titled "Unlocking the potential for District Cooling", and it focused on the importance of district cooling systems in sustainable cities. Other speakers during this session included ADB, SEforAll, K-CEP, GIZ, the Philippines Department of Energy, Arc Finance, UK Government, the Asia-Pacific ESCO Industry Alliance, and the World Bank. The event attracted more than 100 energy professionals and provided many valuable insights on Cooling in the Asia-Pacific region, as well as pointing out the challenges faced by it in becoming more sustainable.



# Promoting Sustainable Urban Energy in Asia Pacific

Asia Pacific Urban Energy Association (APUEA)



# ASEAN SUSTAINABLE ENERGY WEEK

Thu. - Sat.

**11-13 JUNE 2020**

**BITEC, Bangkok, Thailand**



ASEAN's Largest International Exhibition and Conference on Renewable Energy, Energy Efficiency, Environmental and Electric Vehicle Technology

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**BOILEX ASIA AND  
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# Event Calendar

<b>15</b> OCT 2019	<p>🕒 15 - 17 October 2019</p> <p>📍 Penang, Malaysia</p> <p><b>Asia Pacific Urban Forum – 7</b></p> <p>APUEA Activity: Co-hosting Organization</p>
<b>16</b> OCT 2019	<p>🕒 16 - 18 October 2019</p> <p>📍 Changsha, P.R. China</p> <p><b>Asia Pacific Forum on Low Carbon Technology</b></p> <p>APUEA Activity: Co-hosting Organization</p>
<b>23</b> OCT 2019	<p>🕒 23 - 25 October 2019</p> <p>📍 Seoul, Korea</p> <p><b>KIREC Seoul 2019</b></p> <p>APUEA Activity: Participating</p>
<b>25</b> OCT 2019	<p>🕒 25 - 27 October 2019</p> <p>📍 Xiamen, P.R. China</p> <p><b>World Economic Forum's International Energy Community – China</b></p> <p>APUEA Activity: Participating</p>
<b>TBC 12</b> DEC 2019	<p>🕒 12 December 2019 (TBC)</p> <p>📍 Shenzhen, P.R. China</p> <p><b>District Cooling Conference</b></p> <p>APUEA Activity: Co-hosting Organization</p>







# Member Directory

## Founding Members



ABB



Engie



Johnson Controls

## Members



International District Energy Association (IDEA)



Euroheat & Power (EHP)



Alliance to Save Energy



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



Thai ESCO Association



Overseas Environmental Cooperation Center (OECC)



SPX FLOW



Solar Turbines



Chongqing Renewable Energy Society



Lux Research



Aden



Qingdao Energy Group



Fengxi New Energy



NXITY



SIVECO China

## 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](mailto:membership@apuea.org)*



