CLP.CONNECT

Time for Action

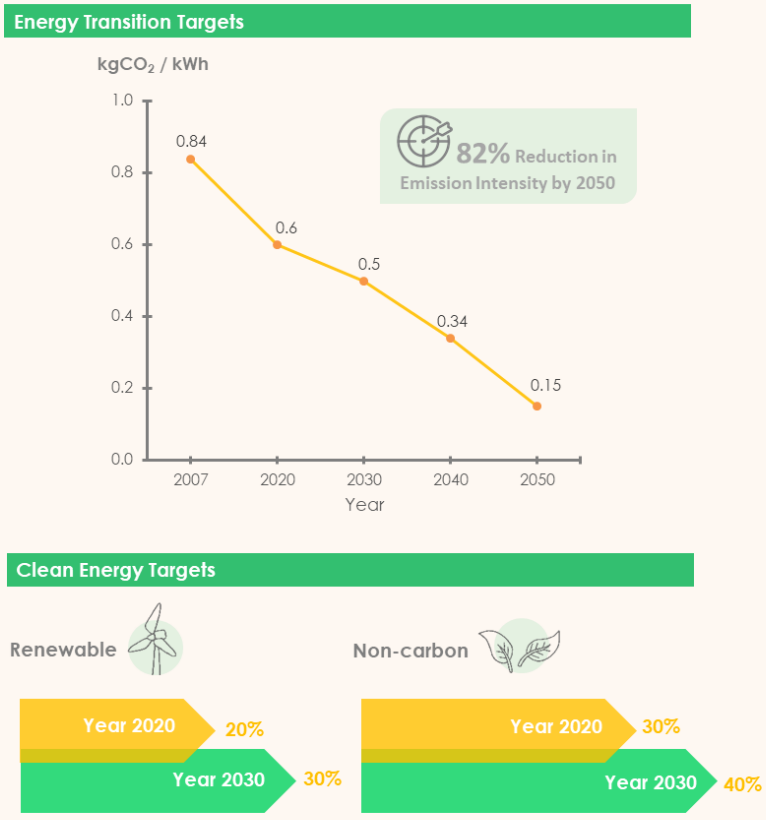
Dear colleagues,

Welcome to the fifth issue of CLP.CONNECT. The coming few months are usually the busiest time for our company as many of our customers in this part of the world crank their air conditioners up to escape the summer heat. And we have to standby to ensure the power is on. Our summers in recent years seem to be getting hotter and hotter. This leads me to a singularly important topic very close to my heart, both as a citizen of the globe and as a player in the energy business. I refer, of course, to climate change.

I am sure all of you are well aware of CLP's commitment to the environment. I was there at COP21 climate talks in Paris back in 2015 and witnessed firsthand the commitments of the different global leaders. It was clear to me that to deliver on the Paris Agreement, those of us in the energy sector have to be part of the solution. That's why we have spent more than a year reviewing our Climate Vision 2050. As a result, we have set even more ambitious targets. They will not be easy to meet, but we are determined to do just that. I hope this shows we are walking our talk.

CLP's Climate Vision 2050 – Our New Targets

- Tightening our carbon intensity reduction target from 75% to 82% by 2050 compared with 2007
- Developing new interim carbon intensity reduction targets of 40% by 2030 and 60% by 2040 compared with 2007
- Establishing a renewable energy target of 30% and a non-carbon emitting target of 40% by 2030



Many years ago, our former chairman Lord Kadoorie had the foresight to invest in Daya Bay Power Station and started our journey in nuclear energy – a highly reliable fuel source with virtually zero carbon emissions. Three decades on, Lord Kaodoorie's son and grandson, Sir Michael and Philip, are following his footsteps – literally. In May, they visited Yangjiang Nuclear Power Station for the first time after we bought a stake in the company last year. Their visit not only underlines our commitment to the Guangdong province, but also our confidence in the important role played by nuclear power in the world's transition to a low-carbon future. You can read more about their visit in this issue of CLP.CONNECT.

Speaking of investment, last year, we became one of the first companies in the world to launch a framework that sets out how we may issue bonds to raise funds for investment in projects that are consistent with our strategy to respond to the climate change challenges. As our CFO Geert Peeters explains, CLP's Climate Action Finance Framework reinforces our sustainability leadership and commitment to energy transition as manifested in our revised Climate Vision 2050. In his interview with CLP.CONNECT, you can also read more about why he is so passionate about green financing and his journey from an engineer to a CFO.

There are more stories outlining our latest efforts in bringing a cleaner future such as our green education initiatives in Hong Kong kindergartens, CLP India's first solar farm and innovation at our power plant, etc. I urge you to get behind our efforts for, as I always emphasise, we must all do our share. There's a lot we can do as individuals, and not just as corporation.

Try to get out and about this summer – it's good for our health. Better still, you can consider what many of our colleagues do – educating the next generation about the challenges of climate change. They are, after all, the ones who will pay the price if we don't get things right.

Happy Reading!

Richard Lancaster

Chief Executive Officer

CLP.CONNECT

Seeking New Frontiers in Green Energy

“When I walk along with two others, they may serve me as my teachers.” This famous Confucian saying that hangs in the office of CLP Chief Financial Officer Geert Peeters reflects the hunger for knowledge and experience in his three-decade career in the energy industry.

Whether it is building a power and desalination plant in the middle of a desert in the Middle East, running the finance function of a FTSE-100 company in London, or charting the way forward for CLP’s decarbonisation journey, Geert has never lost his passion for new challenges.

Out of Africa

Geert grew up in Kigali in Rwanda where his parents were teachers in a missionary school. He remembers life in Africa as basic and sometimes challenging with the beautiful nature and kindness of the people as main sources of happiness. He learnt from a young age that electricity was a precious resource. Air-conditioning was non-existent and his parents always kept candles in the house to avoid being plunged into darkness during the frequent blackouts.

When he was 18, Geert returned to his home country of Belgium to study engineering. He started working as an engineer for a nuclear power company but later switched to banking for the world travel he yearned. After learning the ropes at a small bank, he joined GDF SUEZ for the international exposure that the company offered. “I wanted to do project financing because I was still an engineer at heart, and even more my dream was to one day be a project manager,” he says.

For the young professional with wanderlust, it was a dream job. Geert travelled the world for several years, visiting Africa, Asia, and Latin America. A high point came in 2001 when he was made construction manager of a 2,000MW gas-fired generator in Abu Dhabi. For two years, he led a team to build a power plant as big as CLP's Castle Peak Power Station along with a huge desalination plant.

It was an intense experience, not least because the plants were deemed possible targets for terrorists in the wake of the 9/11 attacks. “At the age of 38, I was construction manager of this project in the desert with 3,000 people. It was the most enriching experience of my career,” Geert says.

New frontiers

Geert’s globe-trotting continued after Abu Dhabi. The adventurer in him took him to Houston, Mexico, and Paris before he landed in London to become CFO of a FTSE-100 company. In 2014, he was named CFO of CLP Holdings and he continues to seek out fresh challenges after moving to Hong Kong.

“In my life, one of the things that comes back over and over is that I very much like to do new things,” he says.

Over the past four years, he and his team at CLP have tried out a variety of financial instruments from perpetual capital securities and export credits financing to the first green bonds in India – all with impressive results. Geert praises members of the Group Treasury team for their willingness to step out of their comfort zones and test new frontiers.

“Soon after I arrived here at CLP, I found a team of very professional colleagues and realised very quickly that there was not much that I needed to do or could do to help them do their jobs,” he says. “Maybe what we could do, however, was to be more open in pushing for new things.”

Pushing for change

With his wealth of experience, Geert knows that getting bankers to agree on any financing deal is never easy. So their initial push-back last year when CLP launched the Climate Action Finance Framework (CAFF) did not surprise him. Although the demand for green financing has soared as the industry switches to low-carbon energy sources, some financial institutions are reluctant to extend the green label to non-renewable projects.

That did not stop Geert and his team. In July 2017, CLP issued its first Energy Transition Bond under CAFF to finance the new gas-fired generating unit at Black Point Power Station.

“We did not want to give up,” he says. “So we came up with Energy Transition Bonds, and we explained to the banks that this was CLP's approach in reducing our carbon intensity, and it was very objective and transparent. Eventually we did it and it worked very well.”

According to Geert, CAFF’s well-structured mechanism, CLP’s excellent credit profile, and the company’s reputation of good governance were the main reasons why banks warmed to the idea and investors from around the world bought the bonds. Following the success of CAFF, Geert says the company is contemplating more issuances under the framework. Projects such as the landfill gas generation and the proposed LNG floating terminal are possibilities being considered.

Shareholder trust plays a fundamental role in enabling the company to pursue a climate strategy that embraces other low-carbon options in addition to renewables to reduce emissions, Geert believes.

“Our shareholders know where we are coming from. They saw how brave we were in 2007 in taking on a trajectory that would require us to reduce our carbon intensity but not our dividends. They follow and stay with us as long as we are truthful to our values,” he explains.

Encouraging initiative

Geert's desire for new experiences has driven him to take on challenge after challenge throughout his career. He is grateful to the managers who were willing to put their faith in him. Now as a member of the CLP management team himself, Geert feels it is his turn to make that happen for others.

"I have been lucky that several times in my career, bosses of mine have agreed to take a risk with me in trying something new," he says. "It is now my job to provide those opportunities and give other people the confidence to try new things."

Embracing a Low-carbon Lifestyle

Geert and his wife have embraced a low-carbon lifestyle in Hong Kong. They recycle their rubbish, use public transport to get around town, and spend holidays cycling and hiking. It is a long way from his childhood in Africa when solar power had not yet been introduced to his first exposure to the technology when he received a solar-powered watch to mark his first Communion.

Geert's Hong Kong flat does not allow him to use solar panels (unlike his brother in Belgium), and he acknowledges that is the case for most of us living in Hong Kong. But he is convinced the concept will gain momentum with the help of the Feed-in Tariff and CLP promotion, and help open the door to the adoption of greener living in a more general sense.

"Even if they don't contribute that much in volume, just seeing solar panels in Hong Kong will have a societal consequence," he says, adding that his next wish is for marine vessels to switch to LNG. "Pushing for things like this is my contribution to the green energy movement."

CLP.CONNECT

Laying the Foundations for a Greener Energy Future

On a viewing platform high above the Yangjiang Nuclear Power Station, CLP Chairman Sir Michael Kadoorie looked out on a spectacular panoramic view of the gigantic complex sprawling below him.

Armies of construction workers busily installed the last two generating units of the six-unit plant, which will throw out 6,516MW of power when the station goes into full operation next year, providing clean energy across Mainland China's Guangdong province.

The visit was Sir Michael's first to Yangjiang after CLP completed its investment in the project last year – the company's second foray into nuclear power after the Daya Bay Nuclear Power Station. The investment underscores CLP's confidence in the key role nuclear power plays in China's decarbonisation journey and its transition to a low-carbon economy.

Projects like Yangjiang are unfolding across Mainland China. The country now has 38 nuclear power reactors in operation and around 20 more under construction.

It was with great enthusiasm, therefore, that Sir Michael and other senior CLP executives visited the station in May 2018. They observed how a 2.5-kilometer long breakwater along the edge of the station will serve as a first line of defence in the event of disasters like tsunamis. Later, Sir Michael put on a safety outfit and visited one of the control rooms where he listened attentively to engineers explaining how the advanced nuclear reactor housed next door in a huge containment dome generates pollution-free electricity.

In his father's footsteps

Sir Michael is no stranger to nuclear power stations and their technology. In 1985, he accompanied his father, Lord Kadoorie, to Beijing for the signing of the joint venture agreement for Daya Bay, which pioneered the use of nuclear power for commercial use in Mainland China. Today, the power station meets around a quarter of Hong Kong's energy demand, making a significant contribution to the city's cleaner air and emissions reduction efforts.

Lord Kadoorie's visionary initiative at Daya Bay was Mainland China's first large-scale commercial nuclear power project and its biggest single foreign investment project at the time. The joint venture also marked the start of the decades-long partnership between CLP and CGN from Daya Bay to Yangjiang.

That partnership was celebrated during Sir Michael's visit to Yangjiang where he and his delegation were hosted by Chairman of China General Nuclear Power Corporation Mr He Yu and where the two sides renewed the Strategic Partnership Agreement which was first forged in 2007.

A greener future

Sir Michael says: "Standing here in Yangjiang brings back memories of 1985 when I accompanied my late father to Beijing to witness the signing of the Daya Bay joint venture agreement. Our participation in Yangjiang reflects strongly on the commitment of my family to this partnership which enables us to

explore further opportunities and promote closer ties between Hong Kong and Mainland China."

As he looked out over the bustling new power plant and the South China Sea behind it sparkling in brilliant May sunshine, Sir Michael could reflect on a project that symbolises not only a pioneering partnership stretching back 30 years but also hopes of a brighter, greener future for generations to come.

CLP.CONNECT

An Electrifying Encounter with Hong Kong's Past

Photographer Heather Coulson vividly remembers the moment more than 30 years ago when she stood on a smokestack 250 metres above the ground with a CLP engineer called Danny during the construction of Castle Peak Power Station. Even though she had all the training and equipment to keep her safe, it was a hair-raising experience.

"His hair was standing on end and I shouted to him 'Danny don't come anywhere near me'," she recalls. "He shouted back 'So is yours'. I'll never forget the rush that filled me when I reached the top of that smokestack."

Scaling heights

Heather's exhilarating encounter helped record the historic moments that one of the world's largest and cleanest coal-fired power stations took shape. Since then, Castle Peak has stood watch over Hong Kong's remarkable economic acceleration during the 1980s and 1990s and continues to play a part in contributing to the city's supply reliability.

Castle Peak loomed large for Heather and her husband Colin after they moved to Hong Kong from the UK in the 1970s. Colin, a civil engineer, helped design the power station, while Heather took up photography and was commissioned to photograph a number of Hong Kong's megaprojects including Castle Peak.

The couple returned to the UK in 1988 where Heather continued her work, photographing the new terminals at London's Gatwick and Heathrow airports. In 2015, Heather donated hundreds of photographs to the University of Hong Kong and in March this year she returned to the city with Colin for an exhibition of her work.

Capturing history

"It was an absolute pleasure to be able to witness and be a part of these important development projects for Hong Kong, and it is an absolute thrill to see how these developments have turned the city into the world-class metropolitan it is today," Heather says.

Heather harbours warm memories of Hong Kong and says the 1970s and 1980s were wonderful times to be a photographer in the city with so many important projects under way. Asked what the most important quality to being a successful construction photographer is, she has a simple answer: Patience.

"You've got to be very patient," she explains. "The weather changes or something breaks down, then you have to wait, and for many reasons you may not be able to do what you've set out to do," Heather says.

Affectionate return

Both now in their 80s, Heather and Colin remain keenly interested in Hong Kong, and eager to find out more about its latest major infrastructure projects. Their visit included a nostalgic return to Castle Peak.

Colin recalls the challenges of transporting a boiler steam drum weighing 290 tonnes within the tight confines of the station. The outlook of the newly completed turbine hall also remained fresh in Colin's mind.

"The generation units were brand new and the colours of the paint covering the various details of the units had a bright sheen to them," Colin says. Although many years have passed, they felt a strong affinity with Castle Peak. "We're so excited to be back," Colin exclaims.

They also visited Black Point Power Station to see the additional gas-fired generation unit currently being built. "This is the first time I've laid eyes on a gas-fired generation unit," says Heather. "It would be wonderful to visit the power station again once the new generation unit is complete."

CLP 中電
CLP.CONNECT

Kid Power to Help Save the Earth

“Do you want to help save the planet?” CLP Power graduate trainee Crystal Kwan asks the children at a kindergarten in Shatin. In a split second, more than a dozen hands shoot up into the air as the boys and girls cry out in unison: “Yes, I do. I do.”

Similar happy scenes have been repeated in kindergartens across Hong Kong as CLP young engineers and graduate trainees talk to youngsters about power generation, energy saving, and what it’s like to be an

engineer. The response from the toddlers has been overwhelmingly enthusiastic everywhere they have gone.

“The kids are all so sweet,” says Crystal. “They want to learn about everything – how electricity is produced, where energy comes from, and what engineers do.”

Sowing seeds

The kindergarten visits are part of CLP Power’s public education initiatives spanning the entire education pathway from kindergarten to university. They aim to raise awareness about the challenges of climate change among young children, teaching them about low-carbon lifestyles and sowing the seeds for green living from an early age.

The visits were introduced after the successful launch of the POWER YOU Kindergarten Education Kit in 2016. The kit, comprising story books, finger puppets and other engaging learning tools, taught children about energy efficiency and has been warmly welcomed by more than 180,000 youngsters in 1,000 Hong Kong kindergartens. Power Kid – the iconic character created for the kit – steals the show every time he joins the visit, says Crystal. “He is like a hero,” she says, describing how a sing-along with Power Kid makes the day for the pupils, many of whom know his theme song *Please Come and Save the Earth* by heart.

James Lam, another CLP Power graduate trainee taking part in the programme, says the kindergarten visits are special as they reach an audience who can make a genuine difference to the future.

“When I was their age, I knew nothing about protecting the environment. Now they have the opportunity to learn, and I am excited to be able to share my knowledge with them and talk about things like renewable energy,” says James.

“We tell them stories about energy – from generation to power systems, and harnessing the power of wind and the sun to generate electricity. You can see the spark in their eyes when they compete to answer questions.”

James, who has been interested in science and technology since he was a teenager, says he is impressed that many of the children – boys and girls alike – want to become engineers when they grow up.

Crystal and James believe the equipment they bring with them for the visits such as safety helmets, reflective vests, and eye protectors help capture the children's imagination.

"That equipment looks so cool and it is new to the kids," says Crystal. "They are amazed when I show them how my safety shoes can protect me from electric shocks."

Personal touch

Lee Mei Yuk, principal of TWGHs Lui Fung Faung Memorial Kindergarten, says the visits are effective compared to regular classroom lessons because they allow children to find out about the world of energy and meet engineers in person.

"The experience is invaluable as they can have a better understanding about electricity and renewable energy," Lee says. "Through the visit, they have the chance to look at the engineers' equipment and even a small part of a real electric cable. "

"The visits are great opportunities to reach out to the kids. It would be even better if the visits could involve parents too, because the green message should not stop at school but should go to the families too."

Home learning

Chief Corporate Development Officer of CLP Power Quince Chong says green education is the key to promote environmental protection and a centerpiece of the company's community initiatives.

"The sooner the better. We believe that green education starts in early childhood can have powerful long-lasting impacts. That's why CLP is committed to promoting awareness of environmental protection through continued public education. We have already introduced a host of environmental education activities for primary and secondary schools as well as university and college students," Quince says.

“We hope visits to kindergarten students will give them a basic understanding of electricity and energy conservation. We also hope it will motivate their family members and the community at large to adopt energy saving habits and low-carbon lifestyles. When it comes to climate action, small steps can lead to big changes.”

CLP.CONNECT

Our All-action Heroes Engineer an Incredible Future

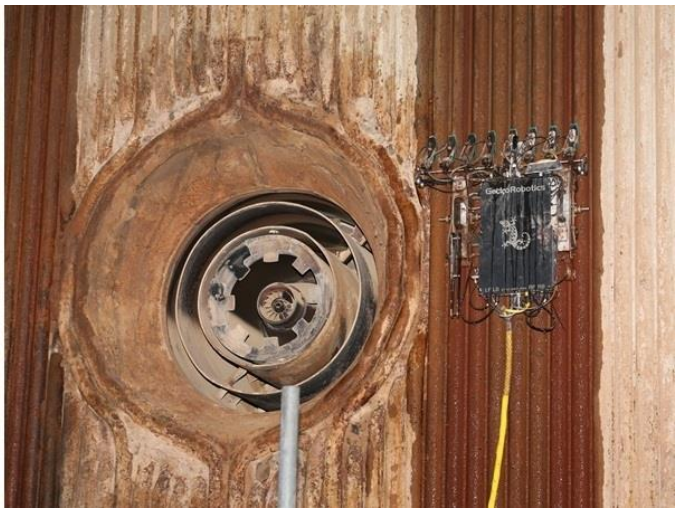
Where can you find a 'Spider Man' robot, an augmented reality welding simulator teacher, and a futuristic printer? No, not in a sci-fi movie but at CLP's Generation Business Group (GBG) where a host of innovative solutions have been devised to make our operations, safety, and training even better.

Frontline engineers and other employees at GBG have for more than a year researched cutting edge technology to enhance the operation of our older power plants and to streamline work processes. While we are investing in lower emissions generation technology, it is important to keep our baseload machines performing as well as possible during the transition to a low-carbon future – and some of the technology we are discovering not only boosts efficiency but can save lives too.

"Our goal is to apply the best available technology and ideas in our operation to make sure that our generation fleet performs at the highest standard. This is a part of our innovation journey as we look for practical and cost-effective solutions – big and small – that can be adopted seamlessly into our system," says Lo Pak Cheong, CLP Power Senior Director – Generation."

'Spider Man' to the rescue

To generate electricity, a boiler turns water into steam to drive turbines. Traditionally, boiler inspections are done manually by engineers checking the water tubes for weak spots and uses ultrasonic devices to measure their thickness for corrosion and erosion. But manual inspections are costly and time consuming because engineers have to use scaffolding or suspended platforms to reach the boiler. The engineers also have to work at height and in confined spaces, exposing them to great danger. With the use of a robot, the engineers can work safely from a more secure platform.



"Our boiler is as tall as a 30-storey building," says Kelvin Sa, a member of the boiler inspection team. "With the robot that can crawl up the boiler wall in no time like 'Spider Man', we can significantly reduce the use of manpower which means a great improvement in safety."

An added advantage of a robot check is the greater coverage it can achieve. Manual inspections can sample only 5% of the water tubes because of the huge areas involved. A robot, on the other hand, can do 10 times more because it works continuously and completes the task in much less time.

GBG engineers are considering other applications such as the underwater inspection of discharge outlets and welding. For example, a mini robot could probe inside the water tubes.

"We now use a 'Spider Man' robot to inspect the water tubes from the outside. We are researching if we can find an 'Ant Man' to go inside the tubes for inspections. We have been in touch with some local companies and universities to see how feasible this is," says Kelvin.

Into a new frontier

Augmented reality (AR) training is another new tool introduced by GBG engineers to enhance training and safety. In Hong Kong, welders who join an apprenticeship system spend many years learning the trade. With the additional burdens of harsh working conditions and a less-than-glamourous social status, few young people join the profession.

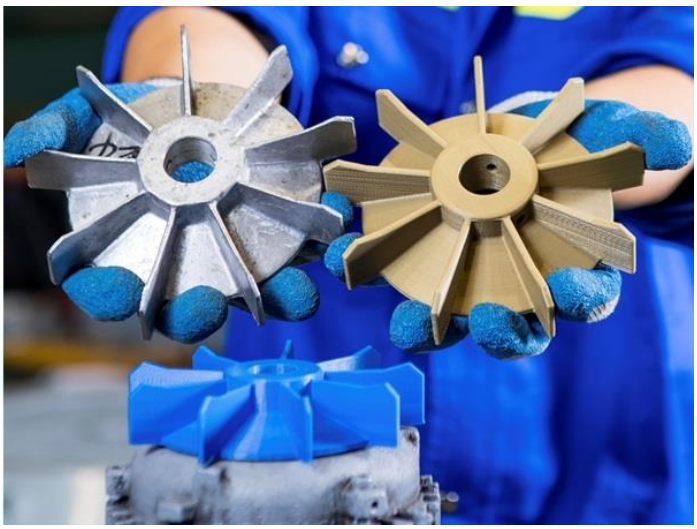
GBG introduced AR welding training after some welders from the company took part in a

competition in Shanghai last year where they experienced it for the first time at a demonstration. When they returned, they did more research and an AR training system was later installed at Castle Peak Power Station.

The system simulates welding in an AR environment, combining the efficiency and economy of classroom learning with the effectiveness of hands-on welding experience and giving beginners an opportunity to learn the skill in a safe environment. “The heat and the sparks generated by welding are not for the faint-hearted. The system makes it easier for beginners to overcome fear,” says GBG engineer Wong Ka Wai.

Close encounter of the third kind

Finding replacement parts for old machines is often a headache as many parts are no longer produced. This is especially true for power plants where generators and equipment normally last for decades.



GBG engineers first experimented with 3D printing in December 2016. Since then, they have applied it in making parts for cooling fans, switches and insulators.

“We research the relevant quality standards after we have made the prototypes,” says Technical Assistant Tommy Yeung, “This is important because every part we use must meet the industry standards for safety reasons.”

Tommy is confident 3D printing has great potential and looks forward to its wider use. “As well as making replacement parts, we can enhance them by applying our structural engineering knowledge so that we can do a better job,” he says.

CLP 中電
CLP.CONNECT

Solar Project Brings Bright Prospects to Rural India

Krishanaiah used to struggle to feed his family with his meagre earnings from odd jobs on farms near his home in Veltoor in the southern Indian state of Telangana. Paid on a daily basis, he never knew for certain what the next day would bring.

The 33-year-old's life has now been transformed after he was hired as a helper to look after solar panels on Veltoor Solar Farm, CLP's first solar power project in India. "I am happy working here because I don't have to worry if I will have a job tomorrow," he says.

Leading the way

The 100MW solar project is a milestone for CLP India, which entered India's energy market 16 years ago and commissioned its first wind farm in Khandke, Maharashtra, in 2009. Its renewable portfolio is now almost 1GW in generation capacity and the company is one of India's larger wind developers. CLP India also became the first power company in South Asia and Southeast Asia to issue green bonds in 2015. These steps all helped towards the CLP Group's strategy of transitioning to cleaner power generation.

"Our business philosophy has always been about reducing our carbon footprint by increasing the share of non-carbon emitting generation in our portfolio, in line with our Climate Vision 2050," says Rajiv Mishra, Managing Director of CLP India. "I am certain that renewables will continue to make a vital contribution to CLP's growth plan for India.

"There are very few companies in this country or within the region which have set targets for the next 50 years. We are one of those, and the principles laid out are ones that guide every decision we make."

Transforming lives

For villagers like Krishanaiah, the Veltoor Solar Farm has changed life in many ways. Apart from providing job opportunities, CLP India launched Project Suryodayam – meaning sunrise – when construction of the plant began a year ago. The project includes programmes from water resources management to free computers for local students and is designed to benefit more than 18,000 people who live in the eight villages near the farm.

As Veltoor lies in one of India's drought-prone areas, water resources are a lifeline for villagers. CLP India has built storage tanks capable of holding 2,000 litres of water in three villages nearby. "Families in these villages can now fetch water easily without any hassle," says Hari Kumar Sama, Manager – New Energy, who helps run the solar farm.

Cutting-edge technology

The Veltoor Solar Farm is also a trendsetter in the use of new technology. Its single-axis sun tracking solar panels, capable of following the sun's path through the day to maximise efficiency, are the most advanced of their kind in the CLP Group. In addition, Veltoor is the first CLP solar project to be certified by Norway's Det Norske Veritas (DNV), demonstrating its long-term quality and performance. Veltoor's DNV certification also helps set new standards for the solar power industry in India.

Coming home safely

However, it is Veltoor's safety performance that CLP India's Chief Operating Officer Paulo Rocha is most proud of. The solar farm was completed without any lost-time incidents even though it took more than one million man hours to build.

"Safety is our first and foremost concern at CLP. We do not believe any work is so important we should sacrifice safety for it. It is our personal responsibility that every employee, contractor, and visitor returns home safely to their families at the end of the day," Paulo says.

"We have introduced initiatives such as assigning staff who are well versed in the different dialects spoken by the workforce on ground at different supervisory levels to host safety briefings. In addition, we have implemented programmes like the Sunset meetings and safety walks to ensure that a culture of safety is inculcated and the highest standards are maintained."

This emphasis on employee wellbeing not only gives Veltoor an impressive safety record but also provides peace of mind to Krishanaiah, who goes home safely to his family at the end of every working day. "I know I am in good hands," he says with a smile.

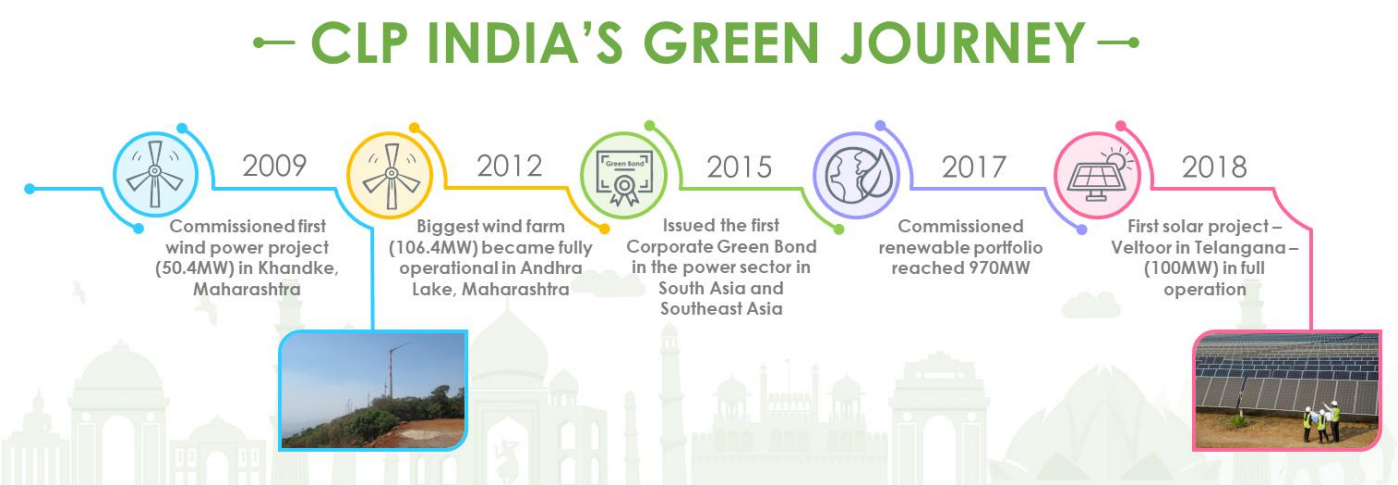


Photo credit: Neoen

Lighting Up Lives with Clean Energy

In the brilliant sunshine of an Australian autumn day in rural New South Wales, visitors and guests are mesmerised by a traditional welcome ritual performed by Aboriginal dancers.

The dazzling ceremony in March marked the start of construction at the Coleambally Solar Farm which will supply EnergyAustralia with 105MW of renewable energy under a 12-year power purchase arrangement (PPA).

More than 500,000 solar panels are being installed on 500 hectares of land, supplying enough emission-free electricity to power more than 50,000 households when the project is completed later this year.

Green shoots

The Coleambally farm is the fifth PPA signed by EnergyAustralia since December 2016 as part of a programme to develop more than 500MW new wind and solar projects across eastern Australia.

Australia has invested heavily in renewable energy as it shifts to a low-carbon future. Renewable energy accounts for around 17% of Australia's electricity, and the ratio is expected to rise as more projects like Coleambally come on stream.

These innovative projects play an increasingly important role in Australia's energy mix as a number of the country's older coal-fired plants are retired. They also make a vital contribution towards meeting Australia's commitment to the Paris Agreement to reduce emissions by between 26% and 28% by 2030 compared to 2005 levels.

Dynamic reserves

Renewables are one important piece of the energy puzzle. According to Catherine Tanna, Managing Director of EnergyAustralia, a new, modern energy system is taking shape, based around a range of technologies including solar, wind, demand response, pumped hydro and battery storage.

To contribute to the building of a new energy system, EnergyAustralia announced in March the signing of agreements worth around A$50 million to operate two utility-scale battery storage systems at Gannawarra and Ballarat in the state of Victoria.

The two battery systems represent a combined storage of 80 megawatt-hours (MWh). Under the agreements, EnergyAustralia has rights to charge and dispatch energy from the two systems into Australia's National Electricity Market (NEM) until 2030 and 2033, giving EnergyAustralia the largest battery trading portfolio of any retailer in the NEM.

"Renewable energy is an obvious contributor to filling the gap left by the retirement of coal power plants, but it has to be available when it's needed, even at cloudy and windless times," explains Catherine. "That's where battery storage comes into its own, with its ability to store wind and solar energy for quick release, keeping the lights on and costs down.

"With utility-scale batteries, demand response, pumped hydro, and energy recovery, all the ingredients are there for a modern energy system that can deliver reliable, affordable, and cleaner energy for customers. The challenge is planning – getting the right balance and mix of energy, and doing it at the least cost."

Turning tides

Employees at EnergyAustralia are rolling up their sleeves and planning for a number of new projects to meet Australia's future energy demands. These include a seawater pumped hydro energy storage project in Cultana in South Australia, a first for the country. The project has been granted A$500,000 in government funding for a second phase of works which will determine its long-term viability.

"While we remain optimistic about the project, there's a lot of work to do and hurdles to clear before we can make a final investment decision," says Julian Turecek, EnergyAustralia's Head of Assets.

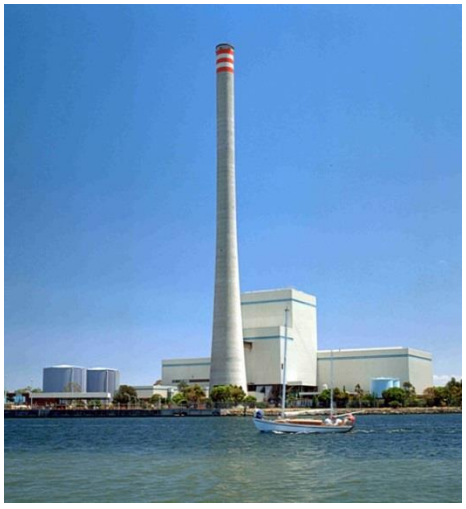
A decision on the project is scheduled for 2019. If it goes ahead, construction is expected to take around three years, meaning the seawater pumped hydro facility could be in operation by 2023.

The idea underpinning pumped storage is simple. It works using two bodies or reservoirs of water, one at a high elevation, and another at a lower elevation. For seawater pumped hydro, the lower reservoir can be the sea itself. Water is pumped from the lower reservoir to the higher one when energy is cheap. Then, when demand for power is high and prices rise, the water is run down again and put through a turbine to generate electricity.

"Pumped hydro has great potential to integrate an intermittent renewable supply into the grid in a way that delivers reliable, affordable energy," Julian says.

"Last year we confirmed the project was technically viable. This year the rubber will hit the road as we stress test the project through front end engineering and design works, navigate regulatory steps, and seek contract partners for the services the project can provide."

Powerful portfolio



EnergyAustralia also recently announced its acquisition of Ecogen Energy, which owns the Newport and Jeeralang gas-fired power stations in Victoria. EnergyAustralia has had an off-take agreement for electricity produced by both plants since 1999.

The acquisition provides EnergyAustralia with the certainty of direct ownership and the flexibility of intermediate and peaking gas-fired generation. "Gas-fired generation has an important role to play

supporting the integration of renewable energy, which makes Ecogen a great addition to our asset portfolio," Catherine says.

CLP.CONNECT

Company News

Record Crowds Flock to our AGM

CLP Holdings' 2018 Annual General Meeting (AGM) attracted 2,100 shareholders, setting a new record for shareholder participation. CLP Holdings Chairman Sir Michael Kadoorie acknowledged our solid financial performances in 2017, and introduced the Group's low-carbon investment plan. Chief Executive Officer of CLP Holdings Mr Richard Lancaster and Group Director and Vice Chairman for CLP Power Hong Kong Mrs Betty Yuen spoke about the progress and direction of our Hong Kong and overseas businesses, reiterating CLP's commitment to curb the impact of climate change and strengthen shareholder confidence.

Cherishing our Employees

CLP Power has been named Most Attractive Employer in the Randstad Employer Brand Awards. Around 4,300 employees and job seekers took part in voting and more than 65% chose CLP Power out of 75 of Hong Kong's largest companies as the most attractive employer. It was a second triumph for CLP Power in the awards since they began in 2013. CLP Power Managing Director Mr T K Chiang received the Award at the presentation ceremony.

Leading the Way in Cyber Security

CLP Holdings has been honoured alongside global companies including American Express and Prudential in the CSO50 Cyber Security Awards 2018. Awarded to 50 elite businesses, the accolade recognises our commitment to maintaining top-tier cyber security and protecting critical infrastructure while providing a first-class power supply to our customers. Mr Nick Charnley, Deputy Director – Group Cyber Security, (right) accepted the Award.

Daya Bay Sets New Standards in Nuclear Safety

Daya Bay Nuclear Power Operations and Management Company (DNMC) has won first place of two categories of the 2017 safety challenge competition held by Electricite de France (EDF). DNMC has won 38 top prizes in the competition over the years with the Daya Bay Nuclear Power Base, comprising the Daya Bay and Ling Ao nuclear power stations, winning more first prizes than any other competitor. Deputy Chief Engineer of Daya Bay Nuclear Power Station Mr Ken Cheung (right, front row) attended the awards ceremony in France.

EnergyAustralia Makes It Easy to Go Carbon Neutral

More than 110,000 EnergyAustralia customers have chosen carbon neutral electricity for their home since the launch of EnergyAustralia's *Go Neutral* programme in November 2016. Under the programme, EnergyAustralia is committed to buying enough carbon offset units to fully offset the carbon emissions associated with the enrolled customers' home electricity but at no extra cost to them. The units are sourced from a range of local and overseas carbon reduction projects. One of these projects

is Bachat Lamp Yojana in India, which funds the replacement of old incandescent light bulbs with efficient energy-saving ones. So far, the project has distributed 22 million light bulbs to low-income households in India. EnergyAustralia aims to have one million customers signed up to its *Go Neutral* programme by 2019.

CLP Shares Technology Intelligence with Start-ups

CLP has joined Free Electron, a global accelerator programme nurturing start-up companies using innovative digital energy technologies. Senior Director of Innovation Mr Austin Bryan shared CLP's experience in innovative issues such as the development of future energy and data analytics with more than 10 start-ups companies from the UK, Germany and Switzerland at a meeting in Sydney. Other members of the programme include Tokyo Electric, American Electric and Origin Energy from Australia.

CLP.CONNECT

The Shared Point

CLP is a big family and we operate in countries across Asia Pacific. Our employees come from different cultural and ethnic backgrounds. Understanding your dreams and aspirations cements the bonds between us. We sincerely invite you to share your interesting stories and tell us about the things that touch your heart on this platform.

Taking the Energy Industry into the NextGen

by Karen Buckman, Opportunity Specialist, NextGen - Energy Products & Solution, EnergyAustralia

I started in the energy industry with PwC, helping facilitate the financing of the new brown coal generation. That was 2008 and needless to say, the industry has changed a lot since then.

I moved to EnergyAustralia (TRUenergy at the time) because I wanted to be part of the industry, rather than consulting on it. That was five years ago. I could not have picked a better time to move. The internal and external change has been extraordinary.

For an industry that has traditionally evolved at a fairly slow pace, this change has been the complete opposite. I had an active role in these changes as part of the Corporate Strategy team, working on

developing EnergyAustralia's new strategy with a focus on the case for change.

There has been an increase in customer service expectations as the digital era has enabled customers to have greater control and transparency over their energy use and the way they engage with their provider. With this shift, the size and capability of our digital team has exploded in a short period of time.

This shift toward giving customers greater control has been a constant throughout my time in the industry. In 2009, while at PwC, I helped a Victorian distributor roll out smart meters. I then spent time leading the smart meter project for EnergyAustralia, and it's only now we're starting to see a competitive, market-led rollout in the other National Electricity Market states. Smart meters enable the industry to offer innovative products that give customers a greater ability to manage energy consumption.

The biggest disruption to the industry on a global scale has been the emergence of new sustainable energy technologies, particularly distributed energy resources and energy efficiency solutions. The traditional energy companies are transforming to remain relevant and meet customers' changing needs.

This disruption is creating exciting opportunities, and this has become my professional focus. I'm now in EnergyAustralia's NextGen New Products and Solutions team. We are responsible for identifying and launching new and innovative products and services that meet our customers' needs today and in the future. I identify potential opportunities and I am constantly searching for new innovation.

It's exciting to work in this dynamic environment. So far, we have launched the Tesla Powerwall, an embedded networks business, and, more recently, we partnered with Redback Technologies, an Australian startup that developed a smart hybrid inverter coupled with a battery. We're always exploring new offerings and piloting and trialling new products and services. Watch this space for our next thrilling idea.

Powering Innovation, Welcoming Change

by Debmalya Sen, Manager – New Energy, CLP India

"...while you are reading this, other future dwellers are frustrated by the offerings that your industry is providing them, and they, too, are involved in subversive activities, in an effort to push your own industry a bit further into a more acceptable future. If only you could find them, then you too would have an edge into the next level of competition"

– American economist Eric von Hippel

Disturbing, isn't it? Well, it's time for change.

There is an urgent obligation to think what we can do differently to change the future, because if we don't, as Professor von Hippel of MIT Sloan School of Management says, other people may already be doing it.

Leading CLP India on innovation and new energy projects over the past year has given me a new perspective on the power sector. We often concentrate our thoughts on the tasks we need to complete, but this job has offered me the opportunity to nurture new ideas and give them space to grow. What follows is a summary of my thoughts on innovation and how it has impacted our sector.

Power paradox

For over a century, the power industry has focused on conventional fuel sources, mainly coal and to some extent natural gas. Innovation, if any, has been predominantly on ways to improve the process of converting the coal to electricity generation. There was no disruptive innovation in the power sector and the industry was overtly a B2B (business-to-business) industry. As the demand for power increased, the number of power plants across globe has grown. It was as simple as this.

Then came the 21st century when a new entrant came into the market in the form of renewables. The industry initially brushed it aside, saying it was too feeble to disrupt conventional sources of power production. Wind and solar, primitive at that stage, were considered no more than tax-saving initiatives. The dismissiveness was understandable as the cost of power from wind and solar energy were way above that of coal-fired power generation. But things have changed, and what a change it has been. By 2010, the cost of wind and solar power started falling exponentially. The world began talking about renewables, and all of a sudden conventional power generators saw their balance sheets going the other way.

Renewable energy has entered the market in a big way, displacing the prevalent sources of energy. Countries like Australia, Germany, France, China, and Norway have been the pioneers of these changes. The power industry, which had enjoyed a stable form of business through the years, was suddenly asked to compete with a technology which was being updated every day. That disruption continues today, and within just a few years, even renewables may be under threat too, as the next generation of power sources is already at the door in the forms of batteries, fuel cells, hydrogen cells, a new generation of nuclear reactors, and many more innovative technologies that are even more compact and efficient.

New normal

There was a time when investors would wait, test the market with their new products, observe their long-term performance, and then carefully plan their market entry strategies. The story today is very different. It's all about taking charge, and making and leading change. So, in today's market, it's essential to embrace change and accept that change is the only normal in order to maintain a sustainable competitive advantage.

This is a great time to be in the power market, which is racing ahead and looking bright. It is innovating every day and there are many new entrants to the market. At the same time, the market transition from B2B to B2C (business-to-customer) is happening fast, giving greater bargaining power to suppliers and customers. Amid all these changes, the definitions of power generation are broadening dramatically.

Welcoming change

So, what is it all about?

It is about searching for those people in the industry who are already living in the future in terms of innovation. If we can find them, we may keep the edge over our competitors. It is about treating each new project uniquely, it is about creating virtuous teams for special projects and helping them to fly, and it is about innovating while keeping things simple, compatible, adaptable, observable and trialable. It is about making the benefits overweight the costs. It is about branding, trendsetting, and communicating to the right people at the right time and in the right way. It is about dreaming big and being agile, inclusive, and deliberately diverse in thoughts. It is about design innovation, and above all, it is about welcoming change.

CLP.CONNECT

In the Frame

Memories are for sharing – so share your favourite photographs with the CLP family. Send us your pictures of special moments with colleagues and friends and we will feature them in this section of the newsletter. You will receive a souvenir from us when your picture is published. Here is our latest selection.

Bringing fun to the community … Look who turned up at the Tai Kok Tsui Temple Fair. Power Kid and Captain Nick greeted residents and shared green tips through interactive games, and knowledge of green living in a fun way. Everyone had a great time.

Life-saving skills … We did an excellent job in the 2018 Security and Property Management Industry First Aid Competition, winning several top prizes. What a wonderful team.

A different kind of Tweet … I recently took the opportunity to take some pictures of birds found near our power plants in India and China. Here are some of the incredible species that I discovered. These beautiful creatures bring life to our assets and help enrich the biodiversity of the environment.

What a lovely surprise… My colleagues organised this surprise party for me in our office. The birthday cake was simply delicious. I love you all.

Welcome home... The CLP team in Nanning celebrated their move to a new office in the city's Qingxiu district with customers and partners. It was a very happy homecoming, as you can see.