Driving Sarawak's Green Economy

Sarawak Economic Development Corporation (SEDC) takes on the task in revolutionising the renewable energy sector

BY RITA JONG



DECARBONISING OUR planet is one of the main goals that many countries have in tackling climate change.

According to the BP Statistical Review of World Energy in 2019, Malaysia's carbon monoxide emission amounted to 250.5 million tonnes in 2018, an increase from 241.6 million tonnes in 2017. The primary sources of emissions were energy (electrical consumption), mobility (vehicles) and solid waste.

In recognising the need to move towards a green economy, Sarawak is embracing hydrogen's role in driving towards its agenda, an idea mooted under the State's foundation of Sarawak Corridor of Renewable Energy (SCORE) as a growth strategy for powering development through renewable energy.

Through SEDC, the State had taken steps towards its goals by having the first hydrogen fuel cell buses, vehicles, and integrated hydrogen production, storage, and refuelling station in Southeast Asia.

Its chairman Tan Sri Abdul Aziz Husain said SEDC had played a significant role in driving the State's hydrogen agenda.

"In line with this vision, the corporation has been actively pursuing the Sarawak Hydrogen Agenda in collaboration with other agencies such as Sarawak Energy Bhd and also other private organisations to explore the potential of hydrogen gas development in the State," he said.

"As such, Sarawak is on the right path to capitalise on this opportunity and become a pioneer in advocating the Green Hydrogen Agenda."

In a recent interview with @*green*, Abdul Aziz shared how Sarawak was driving the hydrogen economy since it begun its pilot projects and its plans in moving forward their green energy agenda.

Success factors in moving towards a green economy

Sarawak began investing in pilot projects of hydrogen such as fuel cell buses and cars and refuelling station last year.

Abdul Aziz said from these pilot projects, there were five critical factors in moving forward the hydrogen economy.

The five factors are policy formulation, infrastructure development, industrial promotion, application and technologies, and education and capacity building.

Tan Sri Dr Abdul Aziz Husain, Chairman, Sarawak Economic Development Corporation.

"We need to look at government support and policies which will encourage and promote the Green Hydrogen Agenda. We are looking to collaborate and work with SEDA (Sustainable Energy Development Authority Malaysia) and other relevant agencies," he said.

"This is to include hydrogen economy or agenda as part of the national policy objectives for renewable energy and to provide the budget for hydrogen research and development, subsidies for hydrogen production facilities and infrastructure and the abolition or reduction of import duties for FC (fuel cell) vehicles imported into Malaysia."

He said the State government's support also played an essential role in promoting, stimulating, facilitating the development of hydrogen as the renewable energy of choice.

"To ensure the agenda is a success, laws and guidelines on hydrogen standards and regulations for the production, storage and distribution of hydrogen must also be formulated, as well as to recommend reforms to existing non-compliance standards," said Abdul Aziz.

"Another critical factor is infrastructure development. Most developed countries have started to build infrastructures to meet the demand of consumers who have made the changeover to FC (fuel cell) vehicles.

"In Sarawak, we had already begun the initiative by piloting an integrated hydrogen production, storage, and refuelling stations. These infrastructures are not cheap compared to traditional fuel's facilities."

Hence, he said, to encourage private sector investments in the building of this new infrastructure, subsidies from the government would be required, particularly in the early stage.

The success of the green agenda relies on investors participation in hydrogen production projects.

"To encourage private sector participation in new ventures, we would have to provide tax incentives, customs and excise duty exemptions, and other fiscal incentives applicable to such investment," he said.

"These incentives, coupled with easy access to funding, will create a favourable investment climate to attract industry players to participate in hydrogen economy development."

Abdul Aziz also said to ensure the hydrogen agenda benefitted the general public, including those in the rural area, they would need to diversify the application of FC and hydrogen technologies in several areas.

"For instance, the Automated Rapid Transit (ART) transportation system will benefit the urban population. Developing FC to power small boats and express boats will help users of the riverine transport.

"On the other hand, the development of the stationary power generator by integrating FC with solar panels will benefit people living in isolated areas not served by the grid," he said.

Education, Abdul Aziz added, was also of utmost importance as there was a need to educate the people to embrace the idea of a green hydrogen economy.

"People must be made aware of its benefit, especially to the environment, and that hydrogen is safe to use in vehicles. In Sarawak, we started this process by making our hydrogen fuel cell buses available to the general public since January 2020. However, more promotion and awareness are needed to garner public support for this agenda.

"In terms of capacity building, we should have a dedicated training and development centre to cater for developing our talents in this new field. It should cover the tertiary education institution as well as vocational and technical schools.

He also said more grants were required to conduct research and development on FC and electrolysis development and FC application and integration. This included the establishment of a community of practices and centre of excellence comprising people from various backgrounds such as government agencies, private sectors, academia, and so on.







Top: The Chief Minister of Sarawak Datuk Patinggi (Dr) Abang Abdul Rahman Zohari Openg demonstrated hydrogen refuelling of hydrogen fuel cell vehicle, Hyundai Nexo, in May 2019.

Above: The flag-off for hydrogen fuel cell buses operation by the Chief Minister in January 2020.

Establishing a solid framework

Abdul Aziz said these key factors would set up a solid framework to serve as a guide in achieving the State's aspiration towards a green hydrogen economy.

"From there, we need to establish a roadmap with a specific timeline so that we are appropriately guided on the goals that we want to achieve. These goals, in the end, must be aligned with Sarawak Government's aspiration, which is to be a developed state by 2030.

"For instance, now we have taken small steps towards our goals by having the first hydrogen fuel cell buses, vehicles, and integrated hydrogen production, storage, and refuelling station in Southeast Asia. From these pilot projects, we will move further with more hydrogen-related projects in our pipeline," he said.

Under the Kuching Urban Transportation System (KUTS) project, SEDC adopted the ART system, which will utilise hydrogen fuel cells to power trackless rolling stocks.

He said the ART network targetted to start its revenue service in 2025 will initially cover a total distance of over 50km in its first phase development and will be supported by feeder buses powered by hydrogen fuel cell.

"If successful, the system will be extended to cover other parts of Kuching, making public transport available to residents in Kuching and its suburbs. Plans are also being made to develop the ART system in other towns in Sarawak," said Abdul Aziz, adding that the project is being undertaken by SEDC's wholly-owned subsidiary, Sarawak Metro Sdn Bhd.

"As part of our strategy to create the refuelling infrastructure to promote the usage of more fuel cell vehicles, we will also construct six multifuel refuelling stations in Sarawak.

"The multifuel refuelling stations will carry our partner's brand name, PETROS (Petroleum Sarawak Berhad) and will provide conventional fuels, electric cars charging facilities, and hydrogen refuelling kiosk. The first station is set to be constructed this year in Kuching and the others in the next two years. The facilities for hydrogen supply component will be planned for all the stations and installed when there is the demand for the fuel."

He also said as car manufacturers in Korea, Japan and China started to mass produce EV (electric vehicles) and FC vehicles, the price of such vehicles will come down drastically, and may even be more competitive than the traditional internal combustion engine.

"By the time FC vehicles are available to the public in Sarawak, we would be able to supply them with the required green hydrogen fuel," he added.

SEDC has also received a grant from the State to start the study together with their consultants, AVL, an Austrian-based research and development organisation, on the feasibility of setting up facilities for the integration and assembly of fuel cells in various mobile applications such as in vehicles, carts, tractors, boats, ships and other mobile apparatus.

They will be looking at the development of self-contained stationary power generator integrating solar panels, with electrolysers and fuel cells which can be used in areas where electricity from the grid is not available.

This study is expected to be completed next year, and it will help to chart their next steps in expanding the application of hydrogen fuel cell in Sarawak.

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Pursuing his sustainable passion

Born and bred in Kuching, Abdul Aziz has always been passionate about green technology and how technology itself can help make lives better.

While he acknowledged that there have been scenarios where the development of technology can also jeopardise the environment, he said it is a different case for hydrogen gas and hydrogen fuel cell technology.

This is because many scientific studies have shown that hydrogen is considered the most viable storage for electric energy and thus, holds the prospect of sustainable energy where the production of power can be done without releasing harmful gases to the atmosphere.

Recalling the first encounter with fuel cell, he said: "I remember the first time I saw my first fuel cell in Houston, Texas, in 2009 for a 10kw cell. It was huge compared to the FC used in vehicles today, which has many times more power and produced at a much less cost.

"Since then, tremendous technological development and improvement had been achieved, making the technology more viable."

Abdul Aziz emphasised the current reliance on fossil fuel to power industries and vehicles was unsustainable, both environmentally and economically.

"Not only are the fossil fuels diminishing and irreplaceable, but they are also causing environmental damage and directly contributing to global warming.

"Several countries have initiated the move to cut down the use of fossil fuels by legislation to restrict carbon dioxide emission and turn to other renewable energy including hydrogen as their alternative," he said.

Hence, one possible solution to address environmental effects caused by greenhouse gas emissions, is that hydrogen can be seen as a viable option since carbon emissions can be decoupled from energy use and power generation.

When used in a fuel cell, the only emission is water vapour. To achieve total emission-free hydrogen, the production must be from renewable energy such as water, solar, and wind.

"In our case, we are blessed with an abundance of renewable energy that can be utilised to achieve this goal," he said.

In Sarawak, renewable energy accounted for 78 per cent of the State's energy mix in 2018. Currently, the total installed capacity of its large hydro plants is 3,452MW. By 2025, it will have an additional 1,285MW available from Baleh Hydroelectric Project, which is still under construction, bringing its total installed capacity to 4,757MW.

"With its abundant source of renewable energy, Sarawak can provide low tariffs for electricity. With these in mind,



One of the fuel cells displayed during the UNDP Hydrogen Industry Conference in Foshan, China in October 2019. The advancement of technology today enables the fuel cell to have more power and produced at a much less cost. Tremendous technological development and improvement have been achieved, making the technology more viable.

Based on the report, clean hydrogen is currently enjoying unprecedented political and business momentum, with the number of policies and projects around the world expanding rapidly. We can foresee that the time to scale up technologies and bring down costs to allow hydrogen to become widely used has finally arrived and it will materialise soon."
• Abdul Aziz



Sarawak's Hydrogen Agenda becomes an attractive proposition," said Abdul Aziz, adding that Sarawak has several key competitive advantages as a potential green hydrogen producer.

"Firstly, it has affordable energy resources which are far greater than its own domestic requirement. Secondly, most of those resources are renewable, in the form of high levels of current hydropower generation capacity and future hydropower generation potential.

"As with any power generating system, Sarawak power company SEB (Sarawak Energy Berhad), has to maintain a reserve margin to ensure uninterrupted supply to their customers. This margin is anywhere between 14-19 per cent of the annual peak load. In most cases, this power is wasted. However, current technology has enabled the production of H2 (hydrogen gas) by electrolysis from an intermittent power supply, making it possible to use the reserve energy for large scale hydrogen production."

Thus, it makes both economic and environmental sense for Sarawak to follow the electrochemical route, using green electricity from hydropower to produce green, guaranteed carbon-neutral hydrogen.

Abdul Aziz also said according to a publication by Linde Gas on hydrogen solutions, many countries were testing the use of both hydrogen combustion and hydrogen power generation for their suitability for everyday use.

While the focus of the study and testing is on the mobile use of hydrogen as a vehicle fuel, he said the fundamental objective for exploring hydrogen to power vehicles was based on the assumption that hydrogen market volume held enormous potential for the future and possessed significant positive effects for humankind and the environment as a whole.

"The International Energy Agency (IEA) had produced a report on the future of hydrogen at the request of the government of Japan under its G20 presidency last year. This landmark report analysed the current State of play for hydrogen and to offer guidance on its future development.

"Based on the report, clean hydrogen is currently enjoying unprecedented political and business momentum, with the number of policies and projects around the world expanding rapidly.

"We can foresee that the time to scale up technologies and bring down costs to allow hydrogen to become widely used has finally arrived and it will be materialised soon," he added.

Moving forward

Recognising the future of the hydrogen technologies and sustainability, Sarawak is well-placed in capitalising on a future export hydrogen market.

Abdul Aziz said SEDC Energy Sdn Bhd was studying the feasibility of large-scale hydrogen production to meet both domestic and export market. With prospective partner and investor, they are planning a 1000 tonnes per year facility in Bintulu which would be ready in 2025 to meet the needs of potential buyers.

This plant, he added, is scalable and can be expanded to 10,000 tonnes per year in the future.

"Recent developments in the industry have shown how Sarawak could benefit from the international green hydrogen trade as we are not the first to venture into this area. Both Australia and Brunei have exported hydrogen to Japan using the using toluene as the carrier.

(Hydrogen is added to toluene to create methylcyclohexane, a liquid that can be shipped safely in containers at room temperature to Japan where hydrogen is extracted at their dehydrogenation plant. As the project is are still under research and development, there would be further development, especially in cost reduction).

"Hence, Sarawak should reduce its dependency on oil and gas sector, and commercialisation of green hydrogen as an export commodity will help us to achieve this target."

Sarawak, he said, had the potential to become a key player in the export of green energy due to its geographical advantage, as it was located close to existing energy-hungry markets.

Markets with existing or near-future demand for green energy include Japan, Korea and China. In the longer term, Southeast Asian neighbours such as Indonesia, Thailand, Singapore, the Philippines, Vietnam and Peninsular Malaysia would also be potential markets for green hydrogen.

In addition, green hydrogen may also provide a valuable boost to Sarawak's existing chemical sector through its value as an industrial feedstock.

"We acknowledged that blue hydrogen can play a pivotal part in the energy transition towards green hydrogen. If we look at the European countries, they are aiming to be net-zero carbon across all sectors by 2050," he said.

"Hydrogen is likely to play a substantial role in getting carbon out of those hard-to-reach sectors like heavy industry and freight. For example, Germany's own national hydrogen strategy had left the door open for blue hydrogen even though the government considers only hydrogen that has been produced using renewable energy to be sustainable in the long term.

"Meanwhile, the United Kingdom also backed blue hydrogen as a means to help scale-up the hydrogen economy quickly in tandem with, not instead of, the development of green hydrogen."

Looking at global development, green hydrogen remains the fuel of the future in a sustainable long-term energy solution.

While there are many comparative analyses between EV and FC vehicles, Abdul Aziz believed both technologies had their respective strong points.

"For Sarawak, we see the development of hydrogen economy as a long-term initiative. I don't see any issue in terms of comparing one technology over the other. Both technologies have their strong points, and I see them being adopted and deployed for numerous applications," he said.

"I personally do not believe that batteries will replace fuel cells or vice versa, but I think that they can complement each other. Right now, cars and smaller vehicles could benefit much more from electric batteries, and that larger vehicles will be better served by adopting hydrogen fuel cell technology.

Furthermore, recent advancement in both areas have improved efficiency of BEVs and FCEVs. Better batteries have enabled BEVs to run further and longer in a single charge. Currently, the Tesla Model S can run 379 miles, equivalent to 610km on a single charge. Improvement in fuel cell design have also been significant. The Hyundai Nexo SUV recently drove 484 miles or 779km across France, setting a new world record for the longest distance travelled in a hydrogen fuel cell vehicle on a single refueling. I expect that hydrogen fuel cell vehicle will be able to go up to 1000km with a full tank in the near future.

And who knows, he added, that a few years from now, what other application would be able to function better and greener with these two technologies. – @*green*