Sarawak Field Report

Transformation via New Urban Transport System and Hydrogen Power

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During our recent visit to Kuching, Sarawak, we gathered first-hand information on: (i) the new Kuching Urban Transportation System (KUTS) project using a hydrogen-powered autonomous rapid transit (ART) system, and (ii) the new hydrogen economy plan spearheaded by two large-scale hydrogen plants in Bintulu, namely, H2biscus and H2ornbill. Sarawak is in a unique position to harness the economics of hydrogen power given an existing hydrogen ecosystem by virtue of its natural gas industry. The state's investment in the KUTS project and hydrogen technologies will generate tremendous spillover effects throughout the economy. The immediate beneficiaries are civil contractors, engineering consultants and suppliers of building materials, followed by landowners and property developers along the ART alignment, etc.

We recently met up with personnel from Sarawak Economic Development Corporation (SEDC), Sarawak Metro Sdn Bhd (Sarawak Metro), **BPURI (Not Rated)** and **KKB (Not Rated)** in Kuching, Sarawak, to gain first-hand information on: (i) the new KUTS project using a hydrogen-powered ART system; and (ii) two large-scale hydrogen plants in Bintulu, namely, H2biscus and H2ornbill.

KUTS

We sensed strong commitment in ensuring successful implementation of the RM6b Kuching Urban Transportation System (KUTS) project (Phase 1), entrusted to Sarawak Metro, a unit of SEDC. The project will transform public transport and hence liveability, minimise traffic congestion and opening up new growth corridors in the capital city of Sarawak.

Phase 1 of the KUTS project involves 69.9km consisting of three major lines (red, blue and green) and 31 stations as follows:

- **Red Line** – This line spans 12.3km with the alignment from Kuching Sentral to Pending, to be serviced by seven stations.
- **Blue Line** – The first package of the line extends over 15km, running from Rembus to Stutong, and will feature eight stations along its route. The second package covers a distance of 12.6km, with its alignment stretching from Stutong to Hikmah, incorporating a total of six stations to service the area.
- **Green Line** – This line will span a total of 30km with its alignment from Pending to Damai Central. This alignment will be serviced by ten stations in total.

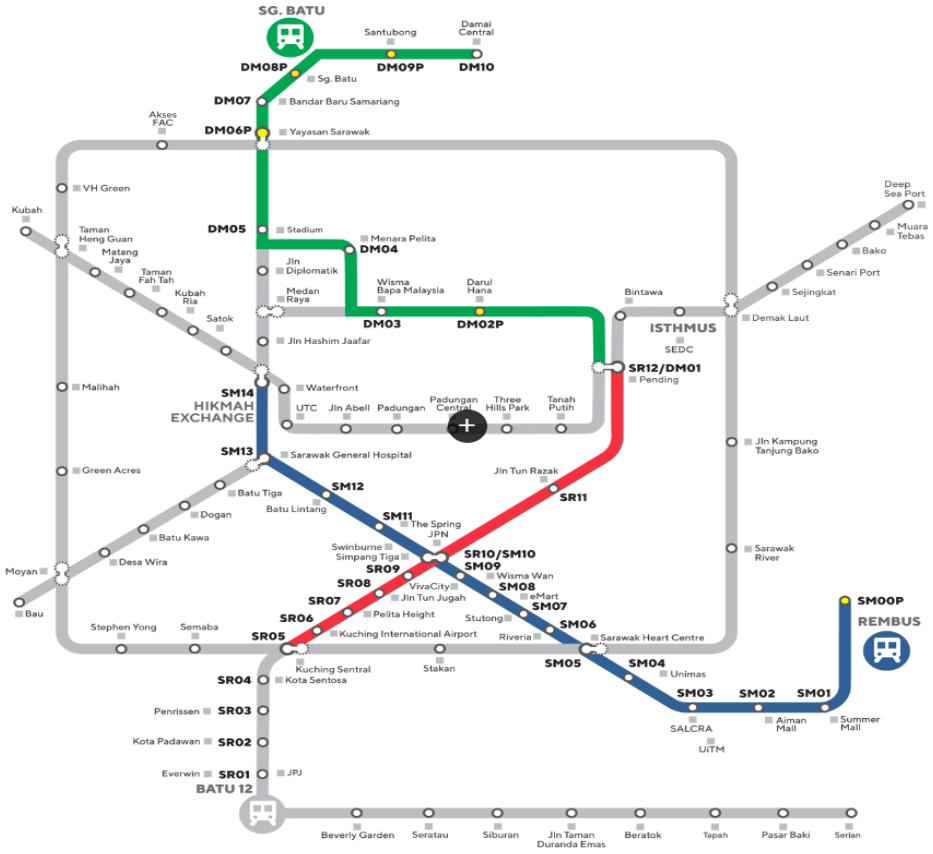
Exhibit 1: Implementation Status of KUTS (Phase 1)

Component	Length (km)	Alignment	Status
System	-	-	Awarded, pending installation
Depot	-	Located in Rembus	Awarded, under construction
Section			
- Red Line	12.3	Kuching Sentral to Pending	Awarded, under construction
- Blue Line			
~ Package 1	15.0	Rembus to Stutong	Awarded, under construction
~ Package 2	12.6	Stutong to Hikmah	Pending award
- Green Line	30.0	Pending to Damai Central	Pending award

Source: Sarawak Metro, Kenanga Research

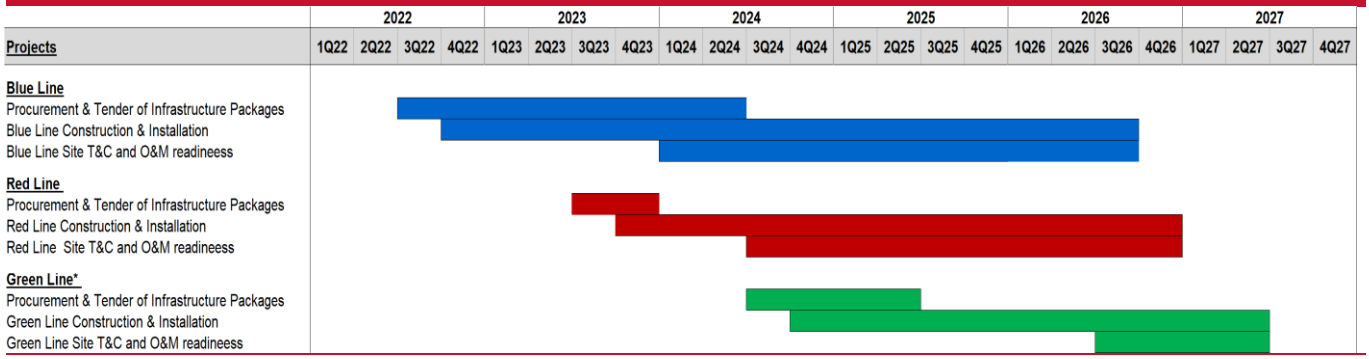
Thus far, RM4b worth of contracts have already been awarded to various contractors. Notably, construction is underway for both the red and blue line packages. Additionally, contracts for the ART system and depot have been awarded and are in the construction phase. EPR Mobilus GR JV Sdn Bhd, which is linked to CRRC, a manufacturer known for rolling stock and rail-related products and systems, is executing the ART system project, bringing a reputable track record to the ART networks. Civil work packages for the Kuching Urban Transportation System (KUTS) have also been allocated to multiple local contractors, advancing the project's development.

Exhibit 2: Alignments of KUTS (Phase 1)



Source: Company

Exhibit 3: Implementation Timelines of Three Lines under KUTS (Phase 1)



**Projections by Kenanga Research for Green LIne*
Source: Company, Kenanga Research
***Blue line is targeted for sectional completion by end 2025, and full completion by end 2025.*

Exhibit 4: KUTS Work Packages Awarded

Work Package	Scope	contactors	Value (RMm)
Consultancy	Feasibility Study on Kuching Urban Transport System	HSS Integrated Sdn. Bhd.	-
System			
Package 1	Hydrogen Vehicle (H2V), Depot Equipment &Maintenance Vehicle (DEMV), Automatic Platform Gate (APG) And Signalling & Control System	EPR Mobilus GR JV Sdn Bhd	1,425
Package 2	Telecommunication system, supervisory control, data acquisition, automatic fare collection, maintenance management system and information technology system.	DOM Industries (M) Sdn Bhd and China Railway Electric Engineering	448
Civil Works			
Depot	Depot buildings, associated structures, stabling yard, detention pond and access road	Azam Sehasrat Sdn Bhd & IJM Construction Sdn Bhd & Unique Deco Sdn Bhd Joint Venture	260
	Advanced works	Hock Seng Lee	64
Red Line	Kuching Sentral to Pending alignment (12.3km)	Sri Datai Construction (Sarawak), JV Builders, and CHEC Construction	943
Blue Line (Package 1)	Rembus to Stutong alignment (15km)	Ibraco Construction Bhd, China Railway Engineering Corp (M) Sdn Bhd, and Nanyang Tunnel Engineering	569

Source: Sarawak Metro, Kenanga Research

Exhibit 5: Rapid Transit Prototype Proof of Concept

Source: Company

Potential challenges in hydrogen supply. While CRRC Corporation possess a solid history in crafting battery-powered Autonomous Rapid Transit (ART) systems for China's public transport, the upcoming ART project in Kuching, Sarawak, is set to pioneer the world's first hydrogen-powered transit system. We anticipate that a daily hydrogen fuel requirement of 5 mt presents a formidable challenge given the nascent stage of hydrogen technology. The project's focus on green hydrogen ventures into a relatively novel territory. The consistent supply of green hydrogen to the ART project is expected to impose significant costs on the operator, especially in the initial operational phase, due to the elevated production expenses associated with water electrolysis. Moreover, scaling up green hydrogen production to meet the desired supply levels poses an additional challenge, largely due to the emerging nature of water electrolysis technology.

KUTS infrastructure a stepping stone for potential investments in Kuching. Given the higher costs associated with green hydrogen production, it's anticipated that ticketing revenue from the KUTS project in Kuching, Sarawak, may fall short of covering its daily fuel expenses. Nonetheless, the Sarawak government's commitment to green hydrogen technology is a forward-thinking move, fostering early-stage projects that may not initially appeal to private investors. Should green hydrogen production demonstrate economic feasibility, it could attract further investments into Bintulu, Sarawak, for the development of green or blue hydrogen production facilities. This, in turn, could catalyse additional investments in the gas production sector, enhancing the region's overall value chain and energy ecosystem.

Hydrogen Economy

The Plan

Japanese partners. SEDC Energy, a subsidiary of the Sarawak Economic Development Corporation (SEDC), is set to lead hydrogen production initiatives in Sarawak. The company is part of a tripartite agreement with Japan's Eneos and Sumitomo Corp for the H2ornbIll project, which aims to produce 90,000 metric tonnes (mt) of clean hydrogen annually. Of this, 2,000 mt are allocated for domestic use within Sarawak, with the remainder for export to Japan.

H2ornbill project with Japan partners. Eneos will lend its expertise in technical production and share proprietary technology for transporting hydrogen at room temperature, vital for the project's success. SEDC Energy will oversee the technicalities of hydrogen production, ensuring the integration and optimization of the energy procurement process to facilitate efficient project execution. Sumitomo's role encompasses evaluating the project's feasibility and financing aspects. Currently, in the Front-End Engineering (FEED) stage, the H2ornbIll project is ambitiously aiming to commence clean hydrogen production by 2030, marking a significant step towards sustainable energy solutions for Sarawak and potential export revenues through collaboration with Japanese partners.

H2ibiscus project with Korean partners. In addition to the H2ornbull project, SEDC Energy is collaborating with Lotte Chemical and the Korea National Oil Corporation on the H2biscus green hydrogen and ammonia project. This ambitious initiative plans to establish a green hydrogen plant in Sarawak with an annual production capacity of 150,000 metric tonnes, accompanied by a green ammonia conversion facility capable of producing 850,000 metric tonnes annually. Currently in the Front-End Engineering Design (FEED) phase, the H2biscus project is on track to be completed by the end of 2024, to commence commercial hydrogen production by early 2028.

For both the H2ornbull and H2biscus projects, the final investment decision (FID) is pending. The outcomes are anticipated to be announced towards the end of 2024 or early 2025. Following these decisions, EPCC (Engineering, Procurement, Construction, and Commissioning) contractors will be able to start bidding for the plant construction works. This pivotal step will mark the transition from planning to the actualization phase, setting the stage for Sarawak's advancement in green hydrogen and ammonia production.

Sarawak possesses an advantage in green power generation such as hydropower. Scaling up green energy sources for green hydrogen production presents challenges, particularly with solar power's limitations in rapid scalability and maintaining consistent uptime. However, Sarawak's unique geographic advantages position it favourably for leveraging hydropower, a sustainable and scalable energy source. This inherent advantage suggests hydropower as a viable and strategic solution to meet the state's burgeoning demand for green hydrogen. Currently, with an installed capacity of 3,452MW, Sarawak Energy is poised to enhance its hydropower output by an additional 1,285MW upon the full commissioning of the Baleh hydroelectric project by 2027, reinforcing Sarawak's potential as a leader in green hydrogen production.

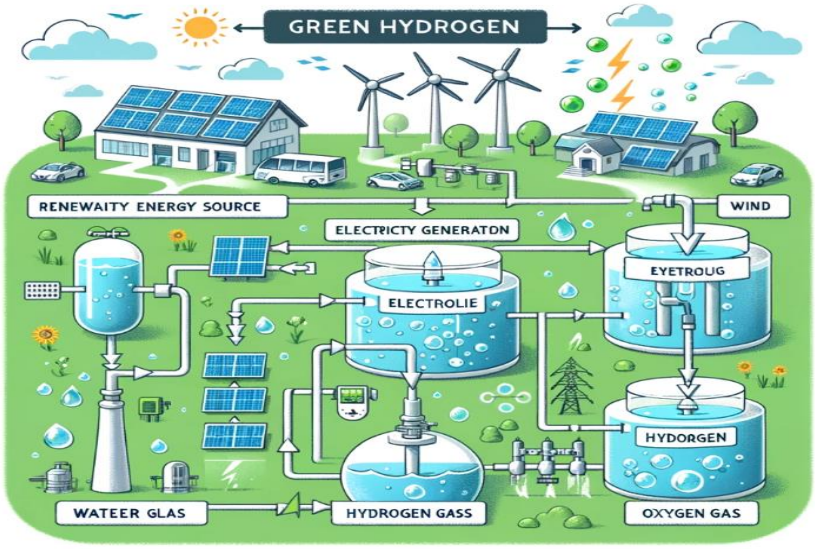
PCHEM-Sarawak PetChem MOU. PCHEM has entered into an MOU with Sarawak Petchem Sdn Bhd to explore the feasibility of establishing a low-carbon ammonia and urea production facility in Bintulu, Sarawak. Though in the preliminary stages, reports from The Edge suggest that the joint venture is considering the development of a large-scale blue ammonia plant, with an estimated investment of USD1b. Low-carbon ammonia is primarily used in hydrogen production and the power sector, notably for co-firing in power plants (substituting coal with ammonia) and ship bunkering applications.

Moreover, the proposed plant has the potential to leverage Sarawak's green hydroelectric power, contributing to its low-carbon objectives. Additionally, it could utilise carbon-captured natural gas (methane) from the existing Kasawari gas field carbon capture facility. This approach could provide a source of methane for the ammonia plant, enabling the production of blue ammonia, and aligning with global shifts towards more sustainable energy solutions.

The Technology

How is green hydrogen produced? Green hydrogen production involves a process known as electrolysis, where electrical energy sourced from renewable energy technologies (such as solar, wind, or hydroelectric power) is used to split water (H2O) into its basic components: hydrogen (H2) and oxygen (O2). This method is termed "green" because the electricity used in the process is generated from renewable sources, leading to a low-carbon footprint for the hydrogen produced. The efficiency of the electrolysis process, the cost of electricity from renewable sources, and the capacity and lifespan of electrolysers are critical factors in the economic viability and environmental impact of green hydrogen production.

Exhibit 6: Green Hydrogen Production Flow Chart (Illustrative)



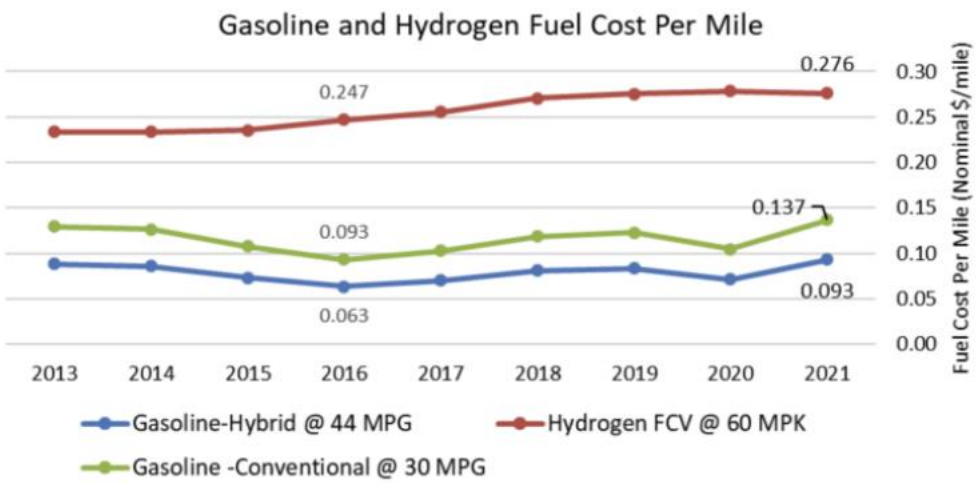
Source: Company, Kenanga Research

A look into hydrogen costing. Based on Global Energy Perspectives (GEP), the cost to produce blue hydrogen, made from natural gas with carbon emissions reduced by carbon capture and storage, is currently USD2.8 to USD3.5 per kg, depending on natural gas prices being between USD6 and USD11 per mmbtu. On the other hand, green hydrogen, which is made by splitting water using renewable energy, costs more, between USD3 and USD6 per kg. This shows that producing green hydrogen is more expensive than blue hydrogen. According to Exhibit 6, running vehicles on hydrogen costs (non-green) about twice as much per mile compared to those running on gasoline. It's not clear when hydrogen will become as affordable as gasoline, making it challenging to predict when hydrogen can compete with gasoline in price.

Exhibit 7: Production Cost Breakdown of Green Hydrogen

Source: GEP

Exhibit 8: Gasoline and Hydrogen Fuel Cost Per Mile



Source: Stillwater Associates

Blue hydrogen could be the potential backup choice. Aside from hydropower, Sarawak state also possesses large swaths of natural gas resources. Therefore, the production of hydrogen can also stem from blue hydrogen sources whereby natural gas produced in offshore Sarawak can be used as feedstock. This will drive higher demand for carbon capture and storage (CCS) facilities in offshore gas fields by gas producers as demand for blue hydrogen could potentially offer more premiums to the price of the natural gas the field produces, thereby providing a return on investment on CCS facilities. The RM4.5b Kasawari mega CCS project is a great example of future blue hydrogen feedstock sources, and it is already under the execution stage at this juncture.

By referring to several online publications and industry reports, we have identified several potential use cases for hydrogen:-

Energy Storage: Hydrogen can serve as a medium for storing energy from renewable sources (like wind or solar power), enabling the grid to balance supply and demand over time.

Transportation: Hydrogen fuel cells are used in vehicles (cars, buses, trucks, trains, and even planes and ships) as a clean alternative to fossil fuels, offering zero emissions at the point of use.

Industrial Processes: Hydrogen is crucial in various industrial applications, including refining petroleum, treating metals, producing fertilizers (ammonia synthesis), and as a feedstock for chemical production (e.g., methanol).

Power Generation: Hydrogen can be used in turbines or fuel cells to generate electricity, either as a primary fuel source or as a supplement to balance the grid, especially in systems with high levels of renewable energy penetration.

Heating: Hydrogen has potential use in residential and commercial heating systems, either through blending with natural gas in existing infrastructure or dedicated hydrogen boilers and fuel cells.

Decarbonization of Sectors: Hydrogen plays a critical role in decarbonizing sectors hard to electrify directly, such as heavy industry (steel and cement manufacturing) and long-haul transport (aviation and shipping).

Our Views

At present, hydrogen technology remains costly without government intervention. Hence, the Sarawak government's financial commitment appears crucial for initiating the growth of hydrogen technology and supporting its early development phase. We anticipate that with consistent governmental investment, Sarawak could leverage the potential exponential growth cycle within the hydrogen ecosystem, should the technology prove commercially feasible in the future. From a manufacturing and operational standpoint, state funding emerges as the most effective strategy at this juncture. Local entities are likely to gain indirectly through construction activities and the fabrication of steel structures, benefiting from the state's investment in hydrogen infrastructure.

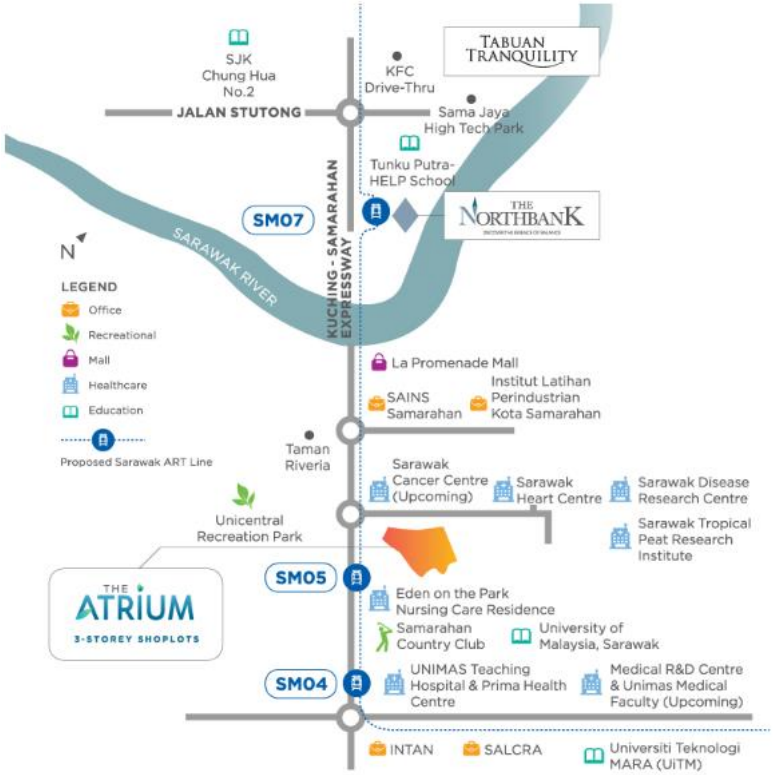
That aside, we believe if green hydrogen can be scaled up, the export market could be substantial for Sarawak with key potential clients being Korea and Japan as they may pay a premium for green hydrogen to power their economy. This might boost the Sarawak state's income in the longer run which eventually will lead to more reinvestments into the state.

Potential Beneficiaries of These Initiatives

The state's investment in the ART project and hydrogen technologies will generate tremendous spillover effects throughout the state's economy. Already, civil contractors, engineering consultants and suppliers of building materials have benefitted such as **HSSEB (Not Rated), IBRACO (Not Rated)** and **IJM (OP; TP: RM2.54).** We believe construction companies with a strong foothold in Sarawak could potentially also garner a slice of action such as **BPURI, KIMLUN (MP; TP: RM0.89), KKB** and **PRTASCO (Not Rated).**

The ART project could significantly enhance the development potential of land along its alignment as it offers accessibility to public transport connectivity. Thus far, **IBRACO** has emerged as the biggest real estate winner of the ART project via its own property project called Atrium (see Exhibit 8) along the Blue Line and near the Sarawak Heart Centre and a JV with Sarawak Metro to develop an integrated riverside development offering both commercial and residential spaces in Samarahan, Sarawak, called The Northbank in close proximity to Tunku Putra-HELP School, Kuching. Other potential real estate beneficiaries include **NAIM (Not Rated)** and **BPURI**.

Exhibit 8: Overview of The Northbank and The Atrium Projects



Source: Company

Stock Ratings are defined as follows:

Stock Recommendations

OUTPERFORM	: A particular stock's Expected Total Return is MORE than 10%
MARKET PERFORM	: A particular stock's Expected Total Return is WITHIN the range of -5% to 10%
UNDERPERFORM	: A particular stock's Expected Total Return is LESS than -5%

Sector Recommendations***

OVERWEIGHT	: A particular sector's Expected Total Return is MORE than 10%
NEUTRAL	: A particular sector's Expected Total Return is WITHIN the range of -5% to 10%
UNDERWEIGHT	: A particular sector's Expected Total Return is LESS than -5%

******Sector recommendations are defined based on market capitalisation weighted average expected total return for stocks under our coverage.***

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