



INTRODUCTION

THE RISE OF ELECTRIC VEHICLES

The world is shifting towards sustainable transportation, particularly with the rise of electric vehicles (EVs) such as cars, buses, and motorcycles. The average driver currently spends approximately 61 hours per year refuelling their petrol car. In comparison, EVs demand much more time, ranging from 20-60 minutes (for public DC fast chargers) up to 4-10 hours (for Level 2 home or workplace sessions). Scaled to roughly 40 million EVs globally, this translates into an estimated 13.5 billion hours per year collectively spent charging.

With this in mind, a unique opportunity arises to reimagine “dwell time” and the traditional petrol refuelling station experience. In Bangkok and across Thailand, public electric vehicle chargers are currently concentrated in office towers, shopping mall parking lots, or spaces where drivers naturally spend longer periods. However, a solution as simple as this will not be enough. As petrol stations become obsolete, we are left with roadside plots which lack the size and amenities that large commercial properties can offer. Thus, in collaboration with the **Petroleum Authority of Thailand (PTT)**, I want to turn my focus to the human experience: to create a comprehensive solution utilising human-centred design to make use of the space and location, making the waiting time during vehicle charging more meaningful.

OPPORTUNITY FOR ELECTRIC BUSES

In addition to private cars, the rapid growth of electric buses and trucks is creating a new demand for charging infrastructure. These larger vehicles require high-capacity chargers and dedicated spaces that can accommodate their size and operating schedules, which current stations often lack. This opens an untapped market for PTT to develop specialized charging hubs for them.

MY CLIENT

I am working with **Mr. Lapas Hasdin Na Ayudhaya**, Business Development Manager, seconded to Arun Plus (a subsidiary of PTT), which focuses on expanding Thailand’s EV ecosystem through strategic partnerships, new technologies, and solutions tailored to Thai people. An example of a project Mr. Lapas has worked on is the deployment of 23 fully electric CRRC (China Railway Rolling Stock Corporation) buses on Bangkok’s BRT line. From being a project manager to creating solutions to serve consumer needs, Mr. Lapas continues to **“find new opportunities within the EV industry, such as to study and explore new partnerships with both domestic and overseas companies for joint ventures on various areas such as EV Charger production in Thailand.”** He hopes to introduce new technology to the Thai market, with various projects connected to both private and public sectors for the EV ecosystem.

This is supported by Southeast Asia's annual EV charger installation rate, which is projected to increase 30% by 2030. Mr. Lapas further emphasises the need for greater consumer awareness of electric vehicles, coupled with increased government support, because **“with favourable conditions from both the public and private sectors, we will likely see the EV adoption rate continuing to grow.”** Right now, Thailand has the largest network of chargers in the region, with more than one-third of the chargers installed in 2024. Therefore, we should expect to see more electric vehicles on the road, and infrastructure must be developed to accommodate this growing demand.



ABOUT PTT

PTT is one of the largest energy companies in Thailand. It has a long history spanning more than a century of innovation and adaptation, **especially in response to changing global energy needs. They were established in December 1978 during the global petroleum crisis to strengthen Thailand’s energy security and reduce dependence on imported fuels. Over the decades, it has grown from a traditional petroleum-focused company into a diversified energy leader.** Today, PTT operates over 2,650km of transmission and distribution pipelines, manages national LPG terminals, and owns the popular Café Amazon chain, often found at its petrol stations. The Thai government remains its largest shareholder, with approximately 51% ownership, while the rest is publicly traded.

In recent years, PTT’s main strategy has been to build on its extensive petrol station network of over 2,500 stations and install hundreds of EV chargers this year. Under its “EV Station PluZ” initiative, the company has expanded its charging network from 400 outlets in July 2023 to 600 by the end of 2024, with an ambitious target of 7,000 outlets by 2030. Through its subsidiary Arun Plus, PTT also supports the EV ecosystem via its On-ion brand, which offers both public and residential charging. So far, they have begun to implement around 40 stations in the Sathorn area and are expanding into mixed-use spaces.



PROBLEM IDENTIFICATION

PTT has provided Thai drivers with trusted roadside assistance that serves as both refuelling points and rest stops on long journeys. Stations like PTT Mahachai have become natural stopovers for families, commuters, and tourists leaving Bangkok towards the southwest. However, as EV adoption grows, especially among intercity buses and trucks, an opportunity presents itself.

Mr. Lapas observes that “customers now face longer charging times in spaces that no longer match their needs of just a quick stop.”

Currently, there are no convenient stations in Bangkok that successfully cater to both private EV drivers and buses. Existing setups either offer basic chargers with no amenities or comfortable rest areas without the required infrastructure for larger vehicles. Commercial drivers face downtime due to the absence of dedicated bays, while private drivers endure long, unproductive waits. The current reservation system further adds to user frustration, with its poor design and restrictive 55-minute limit.

As PTT’s biggest competitors, such as Shell plc, begin to introduce EV chargers, PTT’s need for differentiation increases. Mr. Lapas believes that there is an opportunity to reposition Arun Plus as an integrated, human-first network that supports both users of cars and buses. By providing fast, comfortable, reliable intercity solutions alongside amenities that reflect Thai cultural habits, PTT can strengthen its competitive position while aligning with its sustainability and customer-focused goals.

USER GROUP

The target user group for my reimagined EV charging station encompasses a rapidly growing and diverse range of individuals, with the majority of customers valuing location, fast, reliable, and predictable costs.

For PTT, its customer segment can be divided into 2 main sectors:

- 1) Commuters:** Customers who prioritize quick charging and aim to be in and out within 30–40 minutes.
- 2) Destination parkers:** Customers who value convenient parking at prime locations, such as shopping malls, and are willing to pay for charging as a way to secure a good parking spot without spending over 30 minutes searching for space.

However, there is an emerging gap for upcoming intercity trucks and buses that require high-capacity, reliable charging infrastructure. This represents a critical new user group for future station designs and could be an area I choose to explore.

PRELIMINARY DESIGN BRIEF

Design and create a branded station concept for PTT/ArunPlus that transforms dwell time into a valuable experience for both private EV car and bus drivers and passengers. The station will integrate comfort and productivity, while still accommodating those who want speed and efficiency, all within roadside constraints and supporting PTT’s environmental goals. With Mr. Lapas’s expertise and insights, this project aims to deliver an innovative, user-centred, and commercially viable solution.

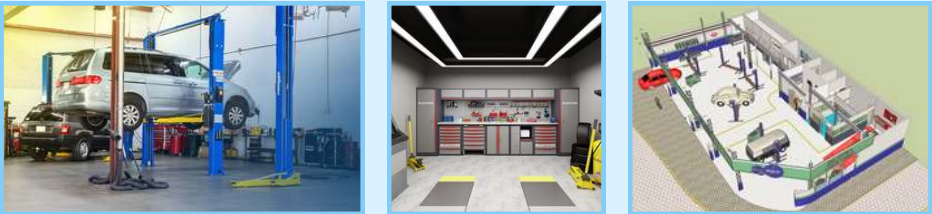
INITIAL PRODUCT POSSIBILITIES

1) VEHICLE QUICK-CHECK STATIONS (STATION AMENITY)

Dedicated quick-check stations at PTT hubs where EVs and buses can receive fast, basic maintenance such as tire pressure, fluid levels, brake checks, and software diagnostics during charging time. This turns otherwise idle dwell periods into opportunities to ensure safety and efficiency, especially for long-distance drivers. I would design a modular unit as the “repair and maintenance” zone. **Value for PTT:** Converts downtime into added value, reinforces PTT’s role as a trusted roadside partner, and differentiates the stations as multi-service hubs rather than just charging points.

CLIENT COMMENT: “This plays to our heritage as roadside support. If paired with charging, it could become a signature PTT feature. The key will be keeping it truly quick so it feels like an add-on, not a delay.”

MY COMMENT: Strong idea because it builds on PTT’s business and infrastructure. If kept under 15 minutes and aligned with charging cycles, it could create real loyalty and safety value.



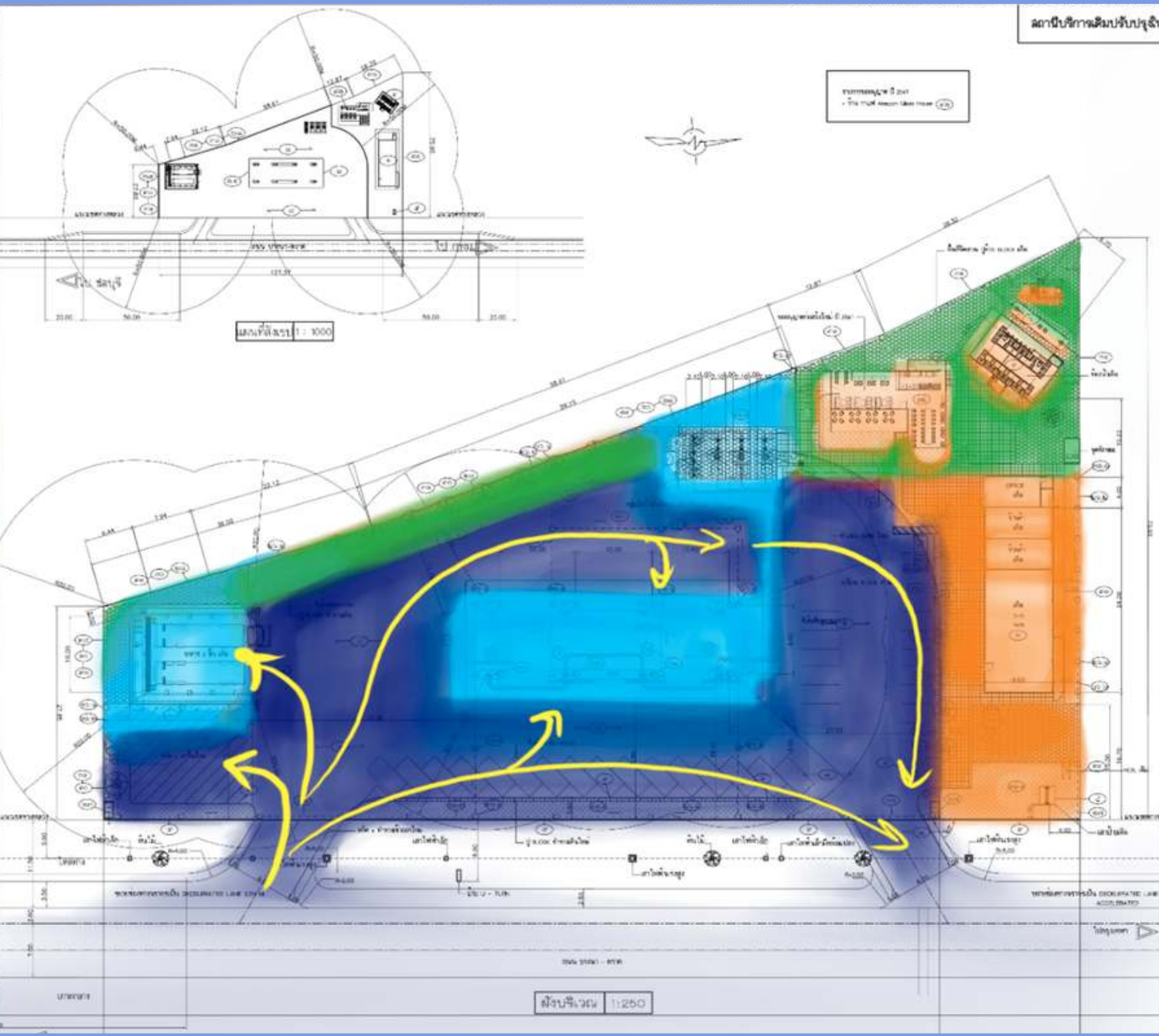
SPATIAL ANALYSIS: FUNCTIONAL ZONES

PRIMARY RESEARCH

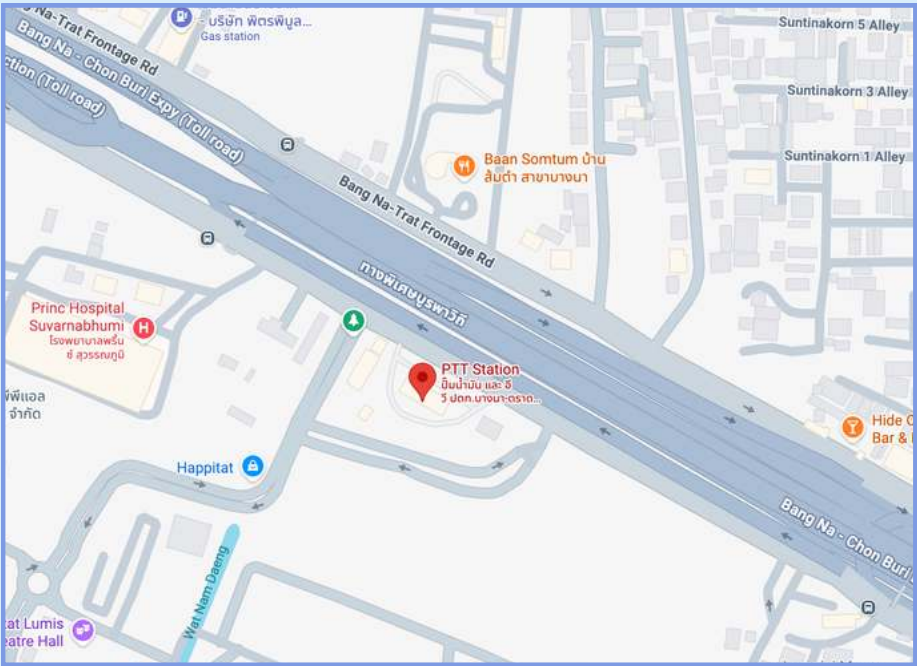
After visiting the site, I broke the station into four functional areas (driveways & pedestrian paths, EV charging zone, green space, and retail/amenities) so that I could identify what each area must include: clear sightlines and vehicle access, safe pedestrian circulation, EV power and technical requirements, and comfortable places for people to wait or linger. This analysis enabled me to test various circulation options in the flow diagrams and identify the trade-offs of each layout.

CLIENT COMMENT: I want you to keep the four functional zones as the foundation for our EV station design since they've proven successful in our traditional PTT stations. However, I'd like you to have creative control over the proportions and ratios. Feel free to test different spatial relationships between the different areas to adapt to EV-specific customer behaviours and longer dwell times.

My response: Okay, I'll experiment with the size and positioning of the charging, retail, green, and amenity zones to enhance both operational efficiency and the customer experience during longer dwell times. My goal will be to create a balance between convenience, safety, and engagement.

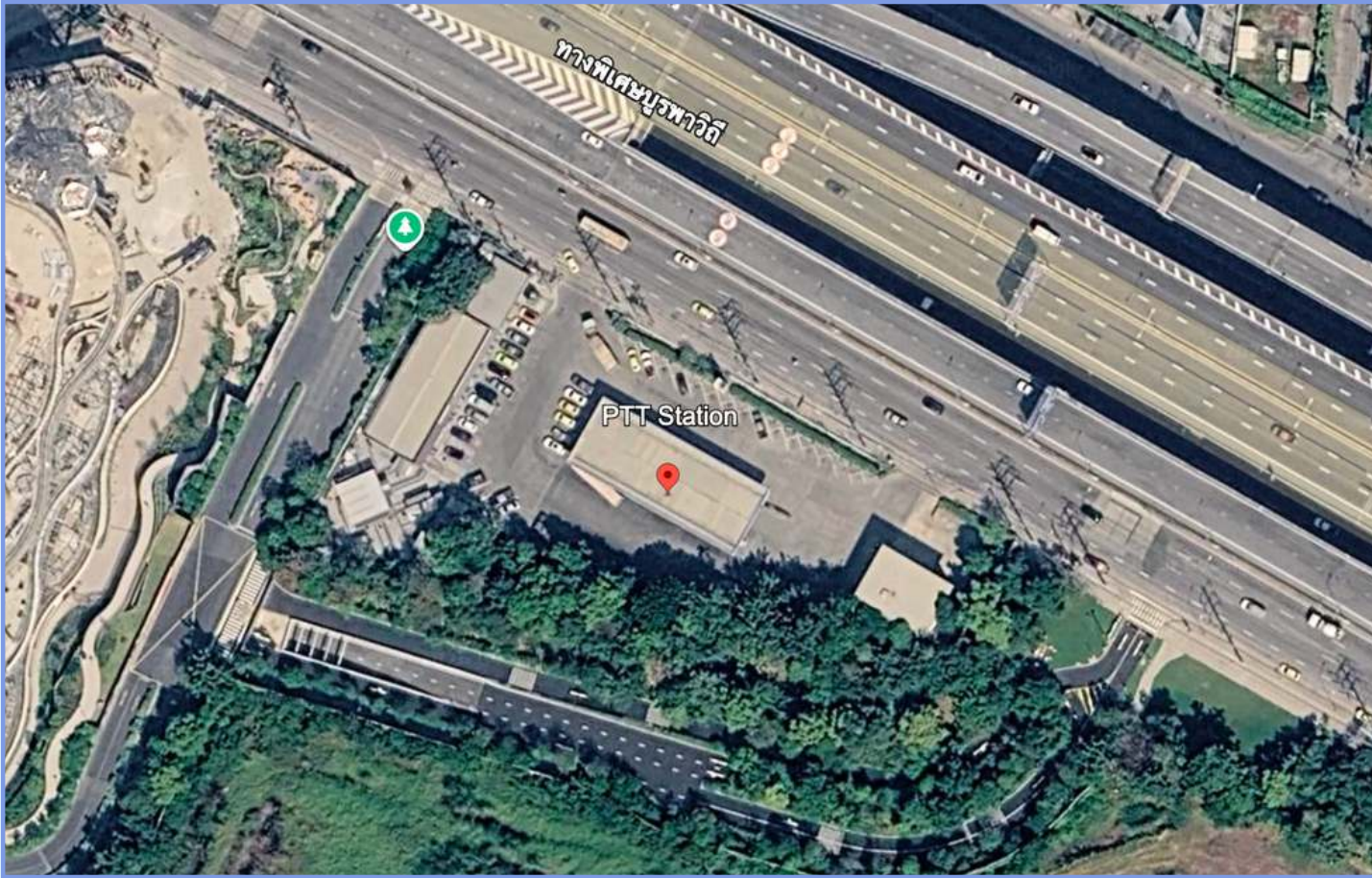
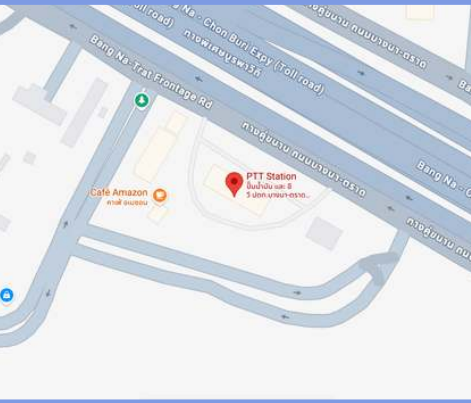


SITE ANALYSIS



My chosen site: ปิ่นนํ้ามัน และ 55
ปตท.บางนา-ตราด กม.7 ขาเข้า.

Address: 41/5 ม.13 ถ.บางนา-ตราด อำเภอ
บางพลี, Bang Kaeo, Bang Phli District,
Samut Prakan 10540



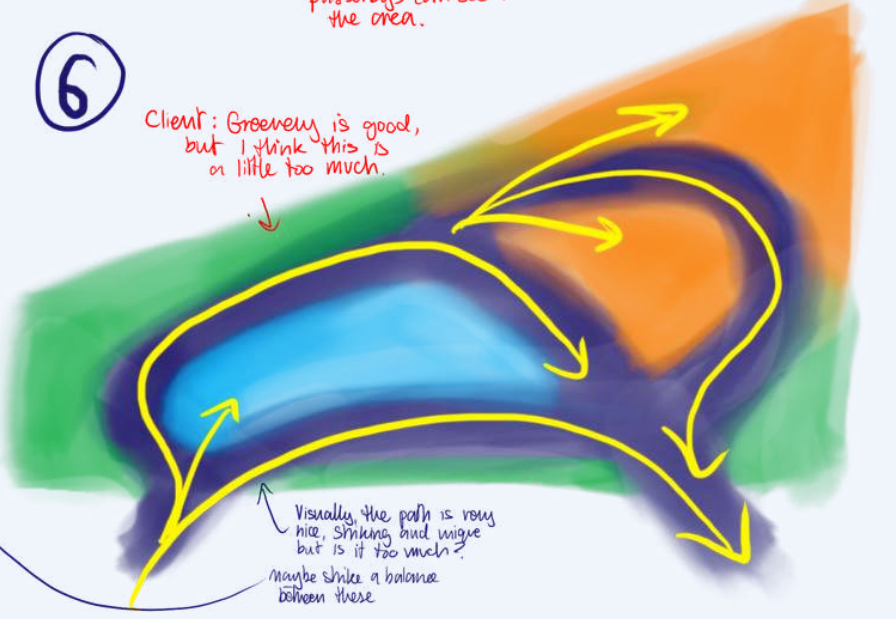
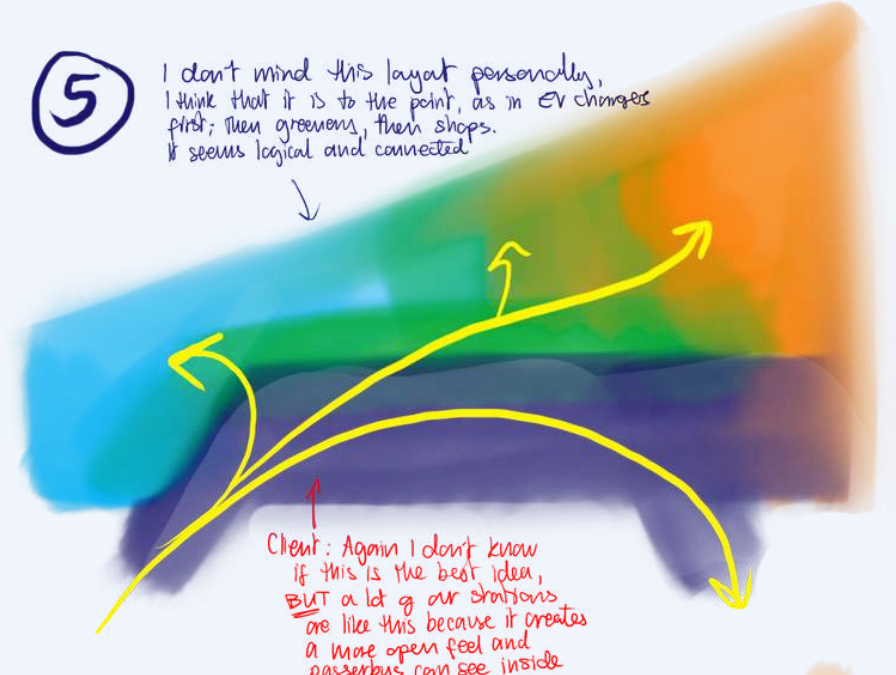
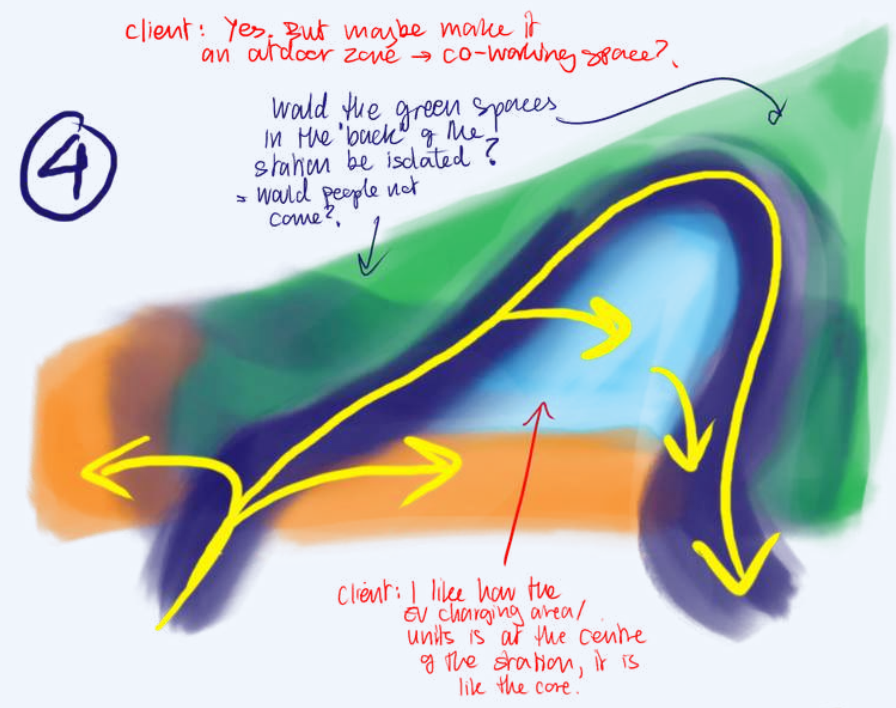
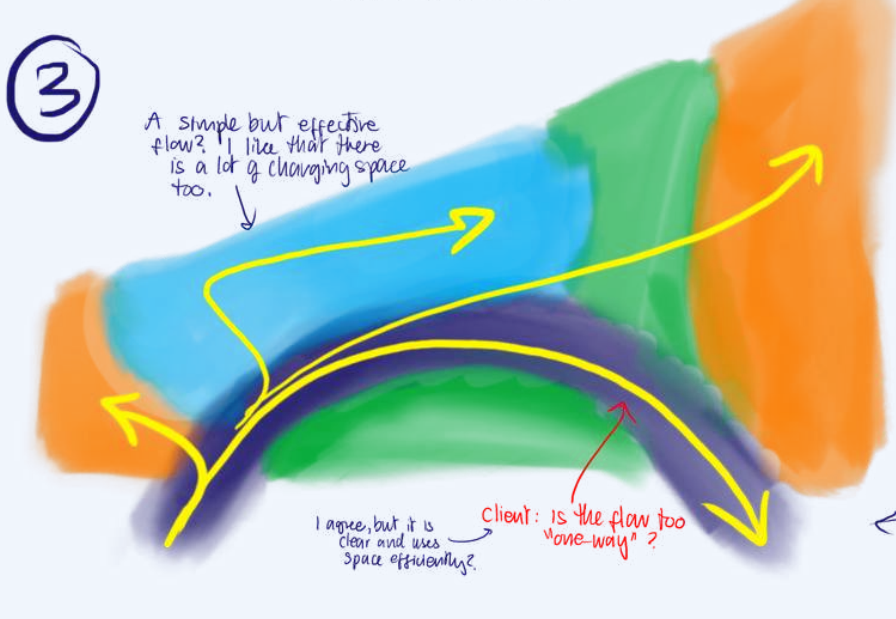
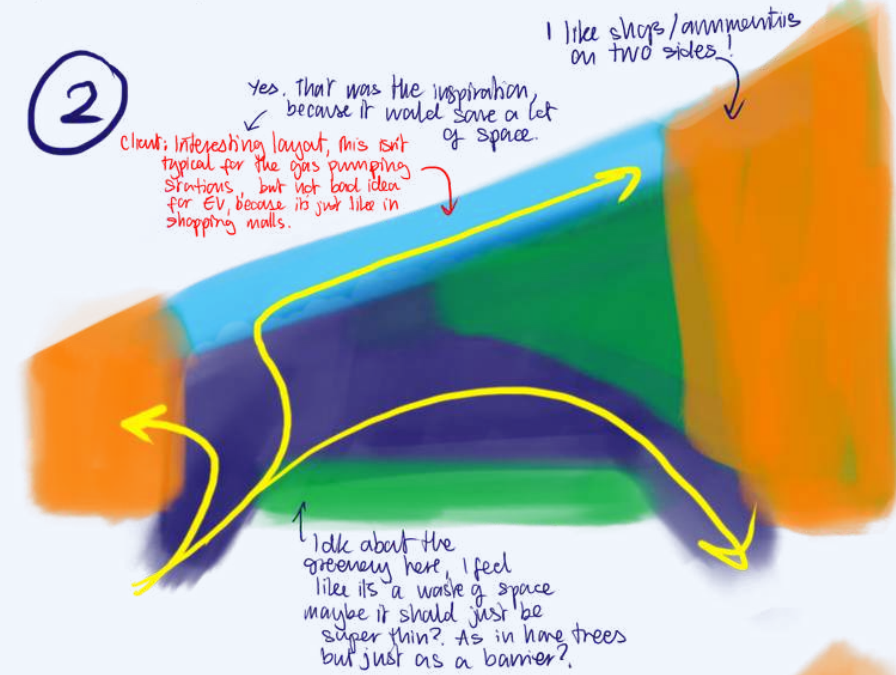
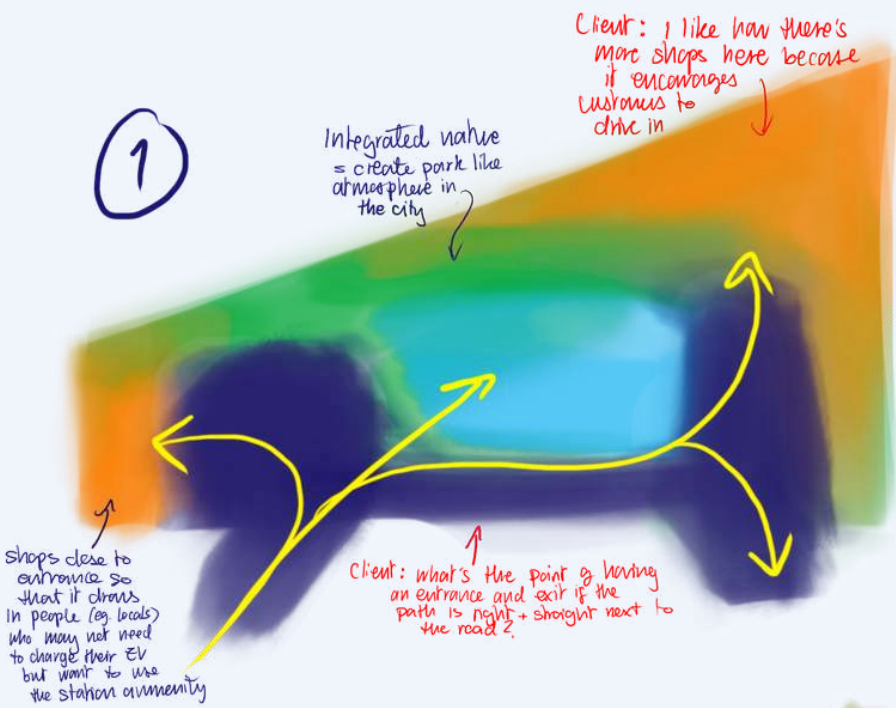
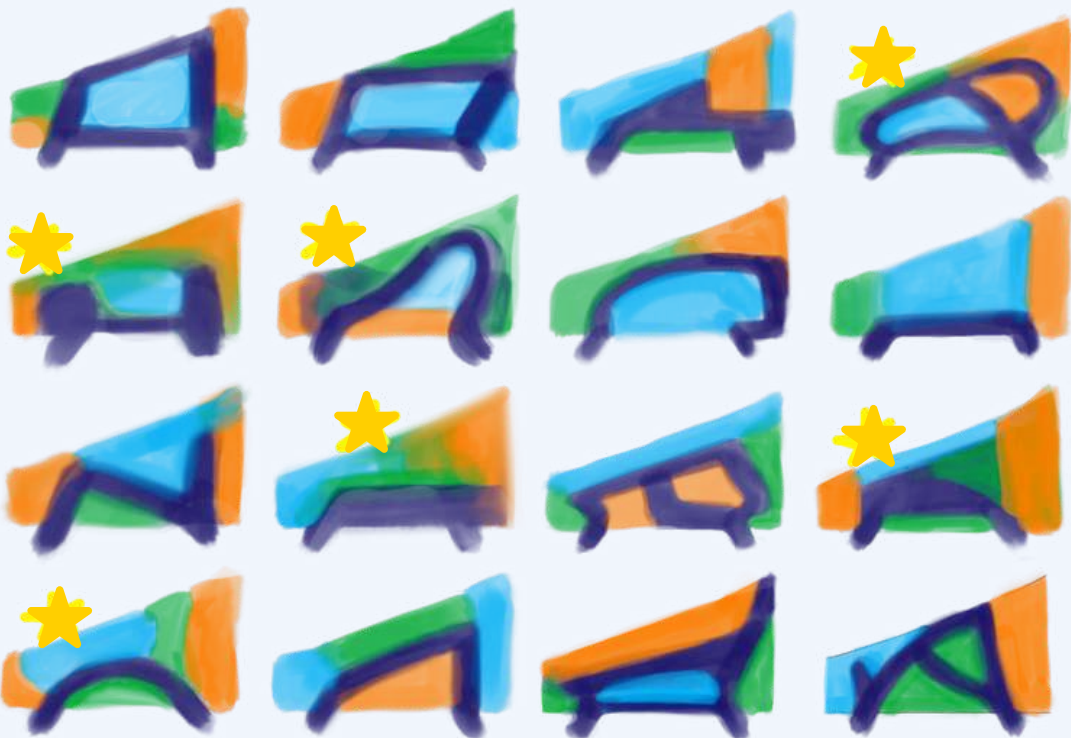
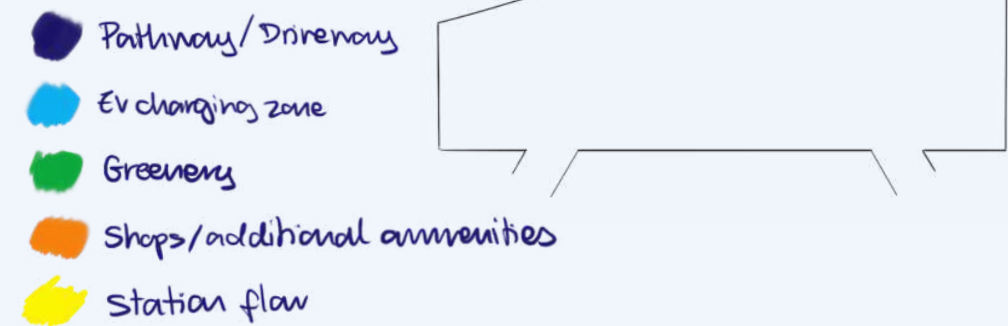
Based on Google Earth analysis, the site is notably large and well-structured, with a clear central gas pump zone and supporting peripheral programs already in place. Rather than redeveloping the entire site, the design strategy focuses on rebuilding only the middle, main gas pump area into a fully electric vehicle charging zone, while keeping the remaining parts of the station largely intact or refreshed through surface-level upgrades. This approach allows the existing circulation, retail, and service functions to continue operating efficiently, while introducing a future-facing mobility system at the core of the site.

The site's strategic location, adjacent to a highway exit and surrounded by a hospital, cafés, offices, and residential areas, supports this selective intervention, as it attracts both short-stay and longer-dwell users. By concentrating the EV infrastructure in the central zone, the design minimizes disruption, reduces construction impact, and leverages the site's generous scale to accommodate longer charging times without compromising traffic flow. Overall, the site offers strong potential for a phased transition from a traditional fuel station to a hybrid EV-focused destination, balancing innovation with practicality.

MY EV STATION: FLOW DIAGRAMS

These six traffic flow configurations explore diverse circulation strategies to address the fundamental challenge of EV charging stations: managing extended vehicle occupancy while maintaining smooth operations. The thumbnail grid reveals progressive iterations, with Configuration 1 prioritising direct pathways between charging and retail zones, while Configuration 4 introduces curved flows that naturally separate incoming and departing vehicles. Each yellow arrows emphasise efficiency through streamlined routes, while others maximise accessibility to all functional zones through interconnected pathways.

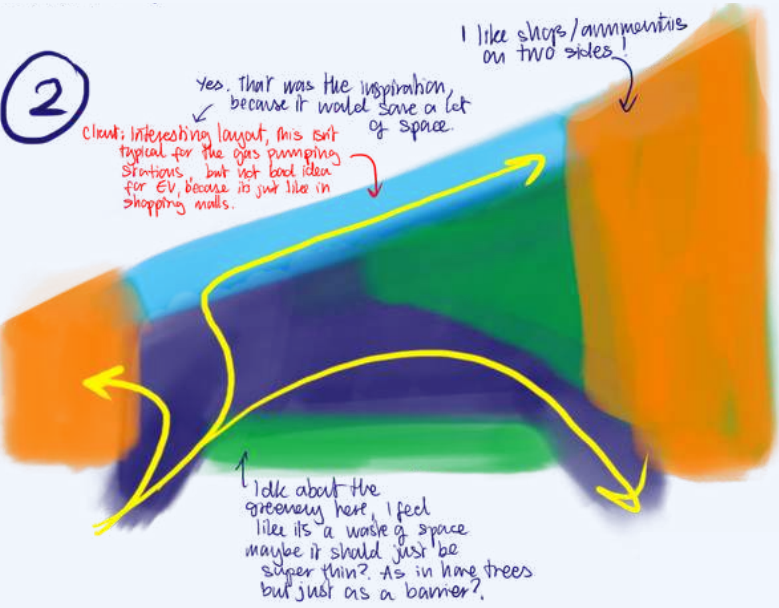
The client annotations highlight design considerations that emerge from this analysis: balancing green space integration with practical circulation needs, and determining optimal positioning for retail amenities relative to charging points. Configuration 5's "logical and connected" approach contrasts sharply with Configuration 2's more segregated zones, demonstrating how circulation patterns directly influence user behaviour and station revenue potential.



DEVELOPED IDEA: BUBBLE DIAGRAM

This bubble diagram translates the selected flow configuration into spatial relationships, showing how each functional zone connects to the EV charging area and to one another. It helps visualise proximity, adjacency, and user movement, allowing me to test how amenity placement can support longer dwell times, convenience, and overall user comfort.

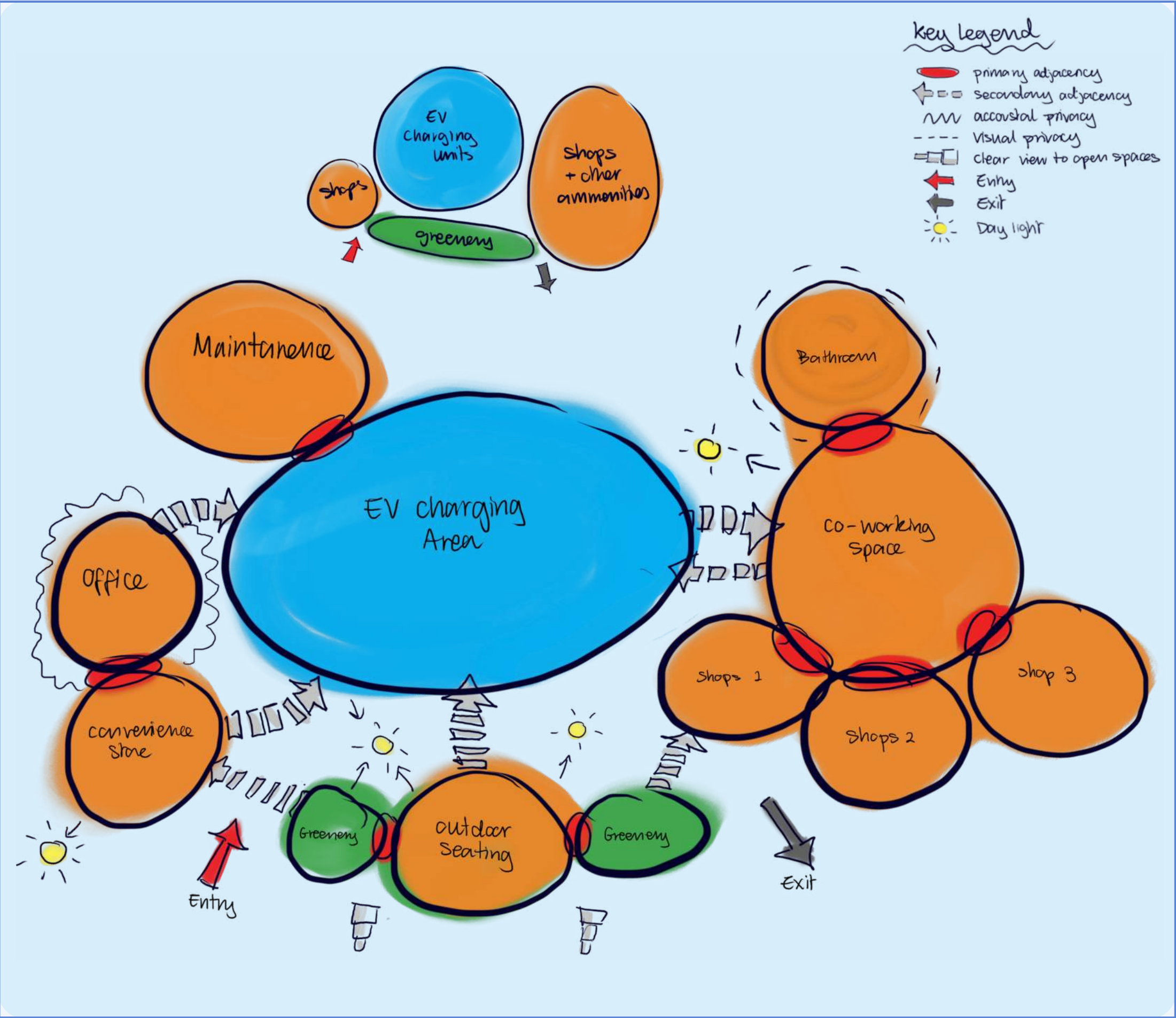
EXPLAINING CHOSEN FLOW DIAGRAM #2



I decided to go with the second Flow Diagram because it provides a clear and intuitive circulation route that naturally guides vehicles from entry to charging areas, and then onward to retail and amenity zones without unnecessary backtracking. The charging zone remains visually central, supporting the idea of longer dwell times while making nearby convenience spaces easily accessible. This layout encourages users to move toward the co-working and retail cluster while waiting, thereby increasing foot traffic and potential revenue. Additionally, the greenway buffer softens the boundaries between areas, improving comfort and walkability while maintaining a smooth operational flow.

Limitations for Consideration
However, this configuration requires careful control of sightlines and signage to prevent confusion between pedestrian and vehicle paths. I also need to ensure that the clustering of shops around the coworking space does not create congestion during peak charging periods.

CLIENT COMMENT
Mr Lapas noted that they appreciate how this layout supports natural customer movement and encourages use of amenities during charging time. They emphasised the importance of maximizing shade and outdoor comfort in the greenway to reinforce dwell time and maintain the station's welcoming atmosphere.



EXPLORATION OF FORM



CARD MODELLING & DRAWN ON PROCREATE

This page documents my early exploration of architectural forms. Inspired by natural structures like shells and spirals, these studies helped me investigate movement, flow, and balance as foundations for my later design development.

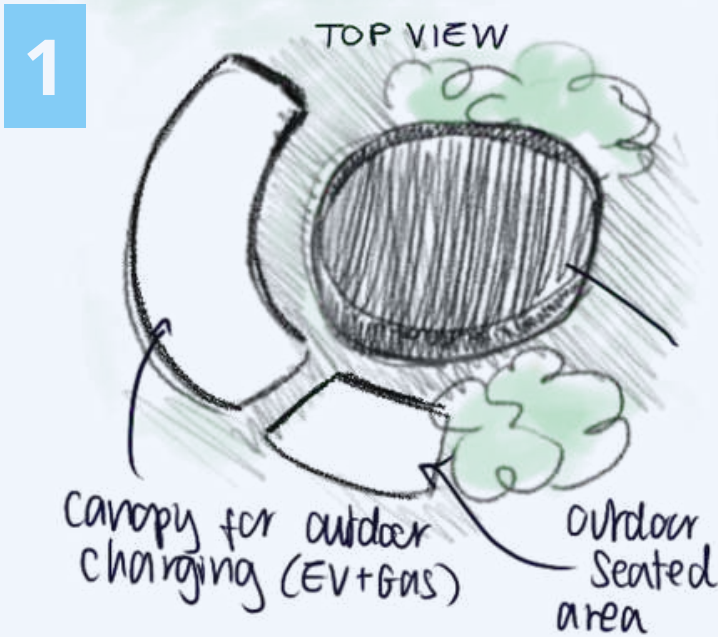
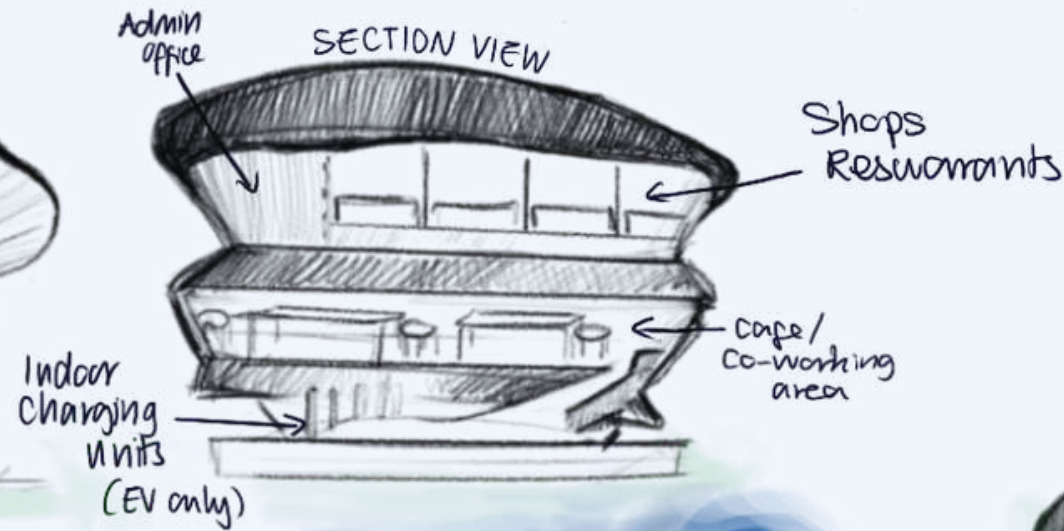
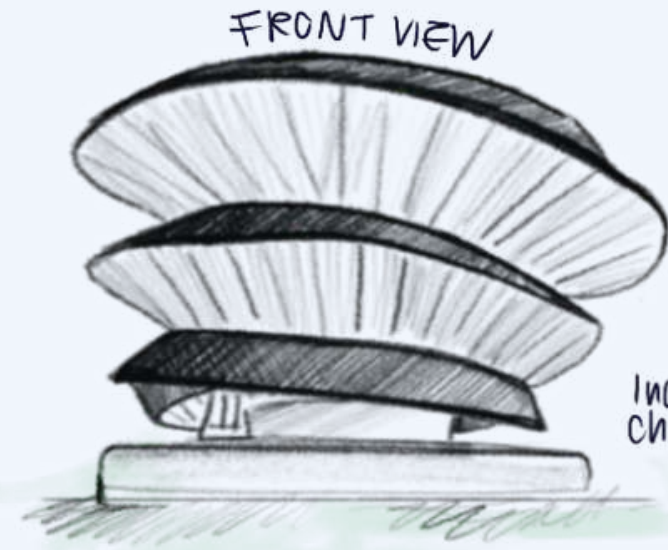


INITIAL IDEAS



DRAWN ON PROCREATE

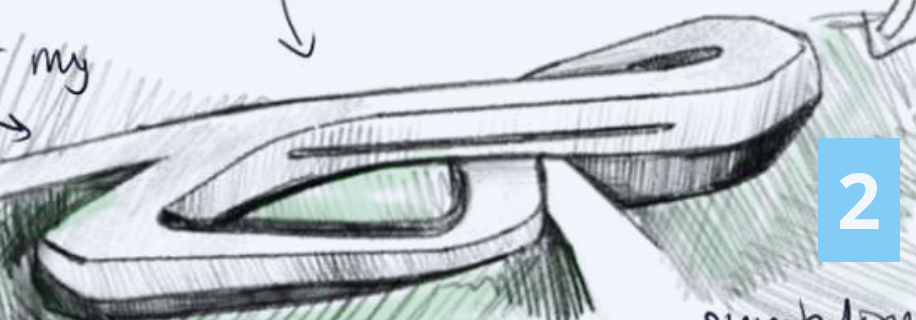
This page includes 6 initial ideas developed from the previous page.



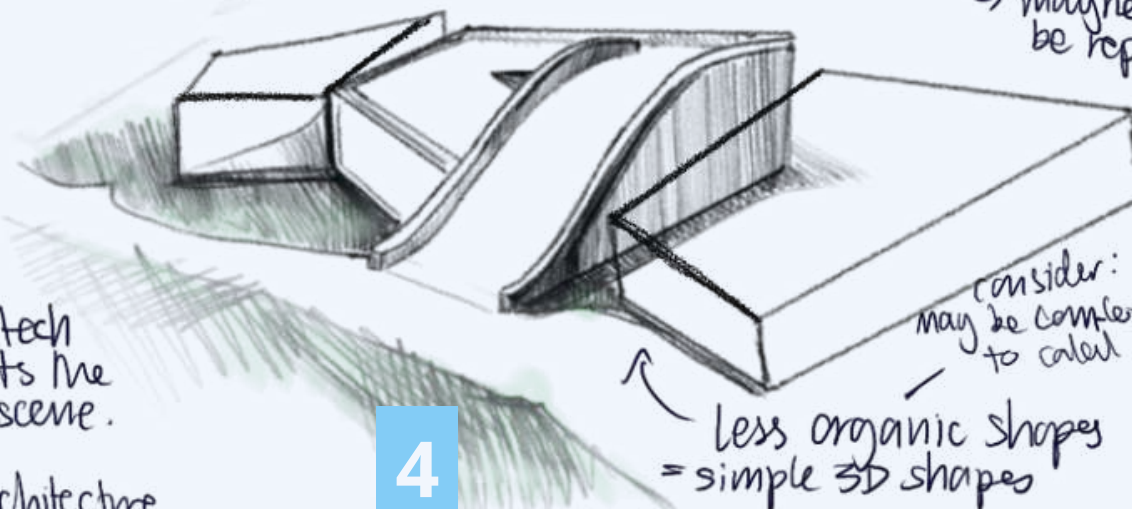
Combining these 2 ideas to make something more functional

Doesn't support my traffic flow diagram

A more futuristic "vibe" → vernacular (but in a way where it blends in with the highway) // not traditional Thai architecture



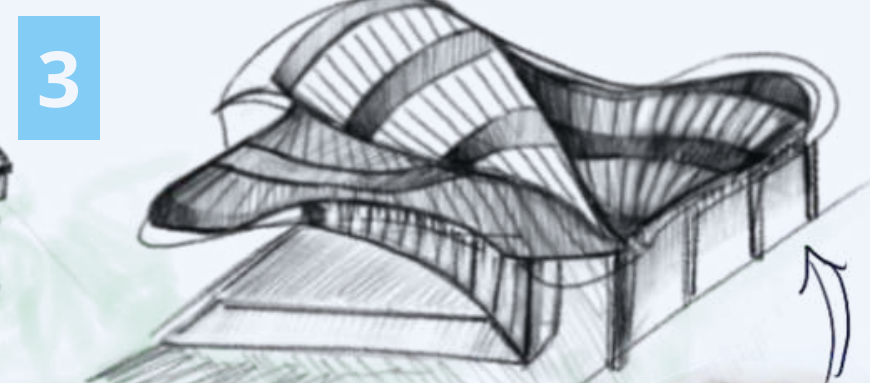
symbolism of tech evolution + fits the growing EV scene.



Seashells: Natural geometry + efficiency
⇒ strong, lightweight, shaped for protection and flow



★ cultural link → Thailand's coastlines + marine ecology/national symbols of identity + resource balance



interesting texture to capture for the canopy
↳ maybe could be replicated by manufacturing techniques like kerf cutting/living hinges on ply?

↳ Bamboo ships?
↳ Synthetic fabrics?

★ Do material research!

consider: may be complex to build

less organic shapes = simple 3D shapes

1

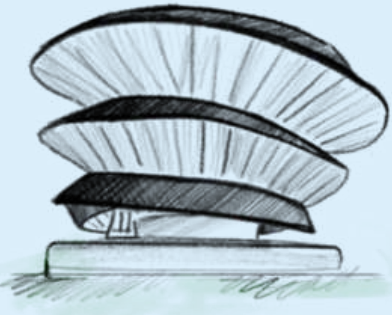
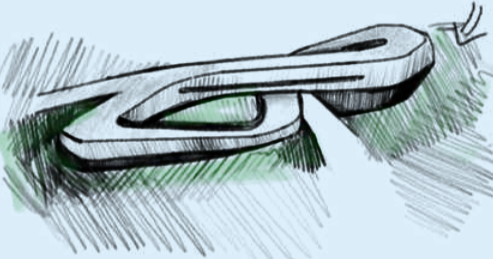
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3

6

4

EVALUATION OF INITIAL IDEAS (CONSIDERING THE USER AND SPECIFICATION)

DESIGN	FUNCTION & DESIGN	MATERIALS & CONSTRUCTION	FEASIBILITY	SAFETY	CULTURE & SUSTAINABILITY	CLIENT COMMENTS	DEVELOP?
1) CIRCULAR CANOPY 	The stacked circular roof creates a striking landmark, but the slanted outer shells conflict visually with the flat internal floor plates, which may create uncomfortable or “disorienting” interior spaces. The compact footprint limits the number of charging bays inside, meaning the hub may not meet projected capacity/demand without adding external quick-in-and-out charging zones.	Full-scale station: The slanted circular canopy would require radial steel ribs and curved beams, increasing complexity without offering additional functional benefit. The mismatch between sloped roof and flat interior structure also creates waterproofing and drainage challenges. Model: Thin curved discs are difficult to produce cleanly at 1:100, and the stacked layers may warp or appear uneven, reducing model accuracy.	Full-scale station: The structure is buildable, but spatially inefficient, offering limited usable internal volume for shops, seating, and EV bays. The unusual geometry also complicates MEP routing and rainwater management. Model: Achievable but fragile, with high risk of misalignment between layers, making it poorly suited for precise representation.	Shade coverage is inconsistent because the slanted discs leave gaps between levels, exposing pedestrians to heat and rain. Movement routes are not naturally guided by the geometry, increasing risk of congestion at peak times.	The stacked form does not clearly relate to Thai cultural motifs, coastlines, or traditional materials, making it visually strong but contextually weak. Limited continuous shading reduces passive cooling. The varied roof angles restrict PV installation and complicate rainwater capture. Enclosed layouts also limit natural ventilation.	“I’m also unsure whether the circular form scales well if we need to expand later. The stacked discs feel quite fixed, and I can’t see an easy way to add more bays or extend the structure. I’m worried this might limit long-term flexibility.” My response: That’s a good point, the geometry doesn’t lend itself to modular expansion. Perhaps I could explore more modular ideas.”	Yes The spiral shape is very interesting, but I would have to explore the surrounding and outdoor areas more.
2) FUTURISTIC LOOP 	The looped form creates a bold, futuristic identity that fits an EV-technology theme, but its sweeping geometry does not naturally support zoning for charging bays, walkways, and interior amenities. The continuous loop also flattens spatial hierarchy, making it difficult to separate quick-stop charging, long-stay areas, and service facilities. While visually eye-catching, its functionality is not clear.	Full-scale station: Would require double-curved concrete or steel shell construction, increasing cost and complexity. Large unsupported spans risk becoming structurally inefficient. Model: The loops can be shaped from foam or laminated balsa, but require heavy sanding and shaping; maintaining symmetry is difficult.	Full-scale station: Feasible but expensive; the design gives limited shading relative to material investment. The shape also creates awkward interior spaces that are difficult to furnish or use effectively. Model: Possible but time-intensive, and the result may not reflect realistic construction logic.	The flowing geometry may confuse traffic direction, as the loop does not create clear entry/exit lines or intuitive sightlines. Shading is limited, reducing comfort in Thailand’s climate.	The form reads as futuristic and global rather than rooted in Thai identity, craft traditions, or landscape references. Curved surfaces create inconsistent solar exposure, reducing PV efficiency. The low sweeping geometry traps heat and limits airflow. Material use is high due to the continuous shell.	“I have the same thoughts about the overall shape, it reminds me of a path or highway rather than a charging station. But I’m also thinking about maintenance, those sweeping surfaces might be difficult to clean or repair, especially in outdoor conditions. If the structure needs specialised materials, that could increase long-term costs.”	No The general form doesn’t allow for functional zones and spaces.
3) WATER DROPLETS & RIPPLES 	The ripple-inspired geometry references flowing water and natural rhythms, offering a poetic narrative link to Thai rivers and coastlines. However, the form does not efficiently organise functional elements, and the sweeping curves reduce the available rectangular zones needed for EV parking, canopy bays, and clear circulation. Without major modifications, it may feel more like a sculptural plaza than a functional charging hub.	Full-scale station: Would require custom-curved steel and complex composite cladding, raising cost and limiting buildability. The layered form risks creating narrow pinch points that restrict movement. Model: Layered contours can be built using stacked card or thin plywood, but capturing the smooth curvature and maintaining alignment across all layers is difficult at 1:100.	Full-scale station: Buildable at a high budget, but not practical for a public EV station aiming for efficiency, expansion, and maintenance simplicity. Model: Possible, but time-consuming, and the model may not communicate structural realism.	The curves do not provide consistent shading or covered walkways, leaving pedestrians exposed. Circulation paths may be ambiguous, reducing safety for drivers entering and exiting quickly.	Strong metaphorical link to water, one of the most iconic elements in Thai landscape and culture, and also reminds the viewer of PTT’s logo. However, the symbolism does not translate naturally into a functional infrastructure layout. Curved layers give weak shading and increase ground heat gain. Irregular roof forms hinder PV placement and water harvesting. Airflow paths are unclear, reducing passive ventilation.	“This is relevant for the other designs too but I am concerned about wayfinding. The fluid shapes might look elegant, but I can imagine users having trouble understanding where to go, especially if they’re just stopping briefly. With so much curvature, the signage might not stand out clearly.” I will research into existing architecture that has organic forms and curves like this.	No This has a strong conceptual link, but it is not practical.

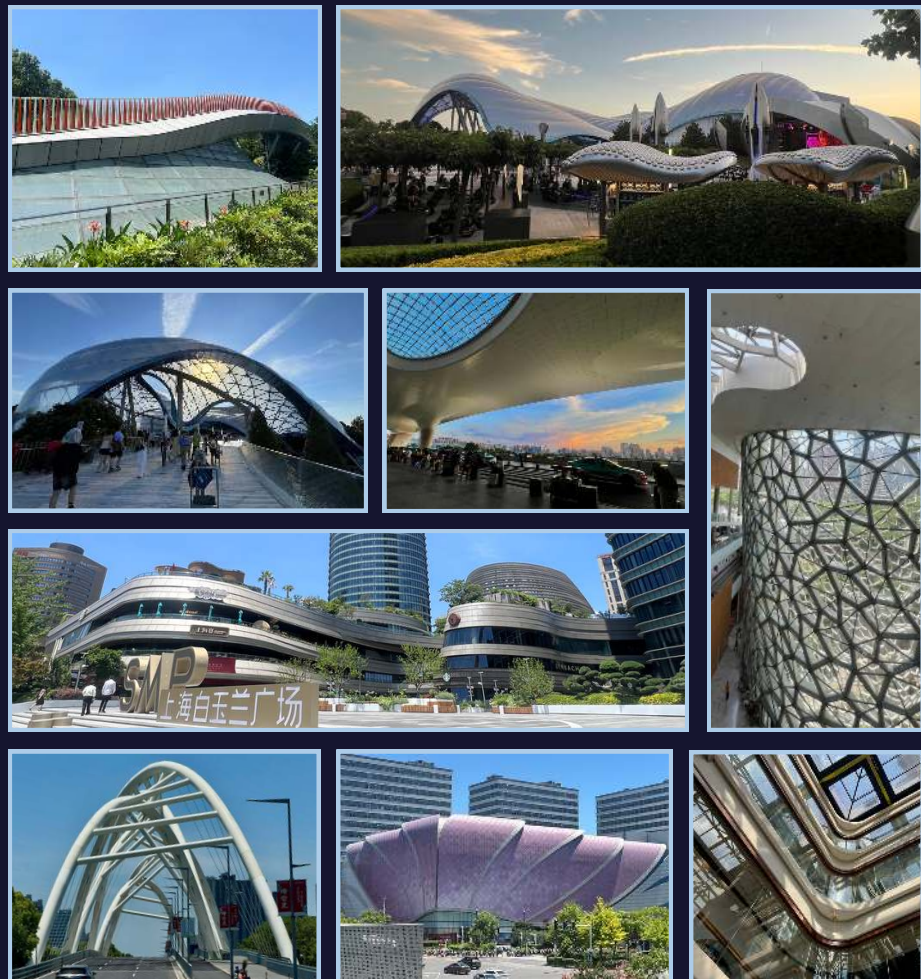
FURTHER RESEARCH: ARCHITECTURAL CASE STUDIES

CASE STUDIES

SHANGHAI ARCHITECTURE (VISIT IN JUNE 2025)

I had the opportunity to visit Shanghai over the summer, which allowed me to explore and gain valuable insights into China's leading EV charging infrastructure. As a global force in this field, Shanghai has developed one of the most comprehensive urban charging networks, integrating technology seamlessly into everyday spaces. Their EV ecosystem consists of over 63,000 public charging points distributed across the metropolitan area. But when I explored for myself, most of the stations from major Chinese EV companies remained surprisingly conventional: most were positioned roadside or inside shopping malls or office complexes, identical to Thailand's current stations. **Except they just have higher efficiency and faster charging technology, with a range of 120-180kW compared to our 50-120kW range.**

However, the real architectural value came from observing my surroundings. Shanghai has numerous striking contemporary buildings and urban design, which were innovative, almost futuristic-looking. They consisted of dramatic curved facades that created dynamic shapes, sophisticated geometric patterns and bold structural elements. The buildings I took photos of and documented demonstrate what I believe is an advanced form and function, creating memorable architectural experiences. These Shanghai precedents showcase the limits that can be pushed to; the city's architecture highlights significant opportunities for PTT to differentiate through innovative architectural design that elevates the charging experience beyond just functionality. **These were some of the images I took.**



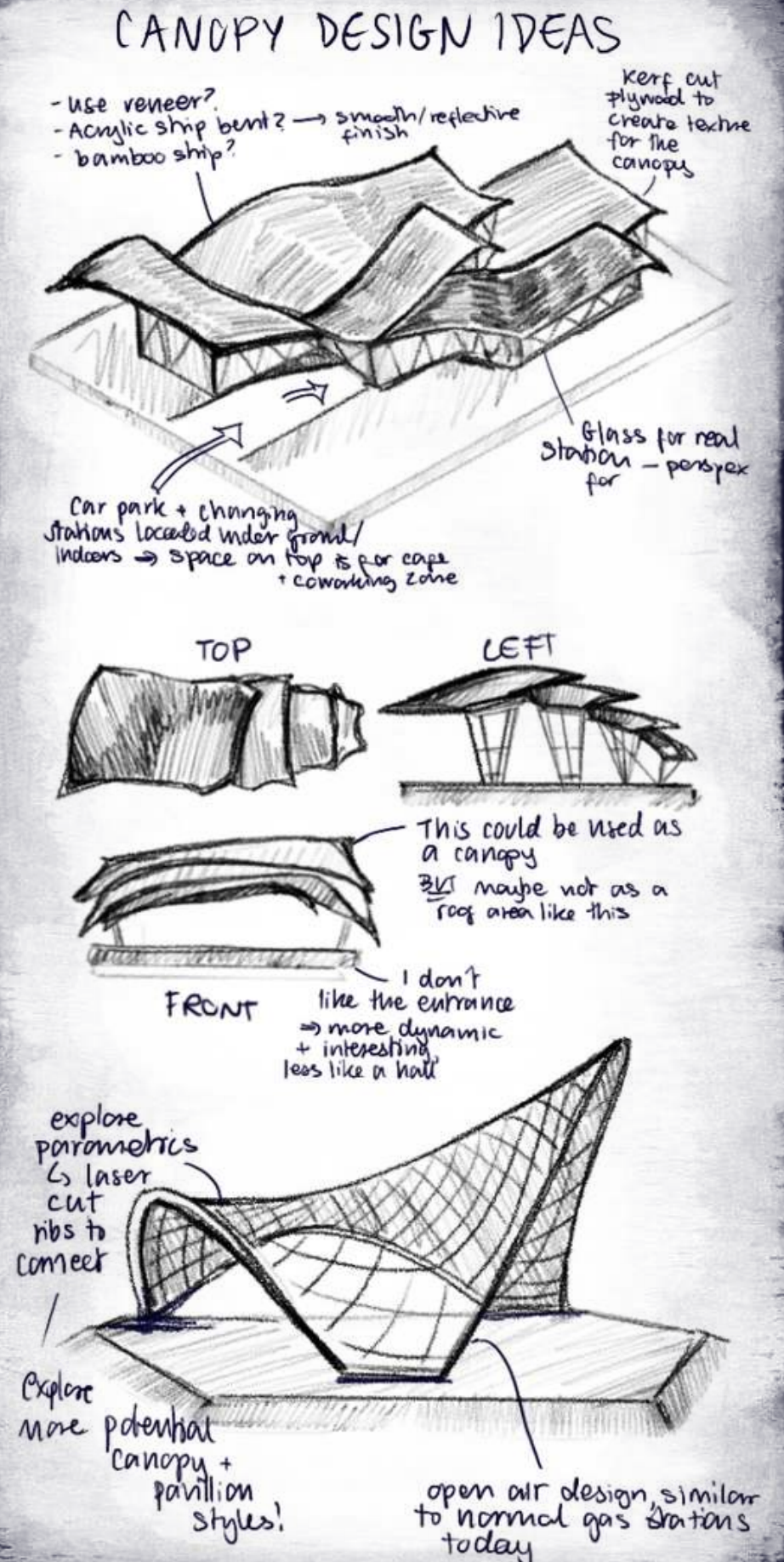
DONGDAEMUN DESIGN PLAZA - ZAHA HADID (VISIT IN DECEMBER 2025)

Visiting Dongdaemun Design Plaza allowed me to see the building's continuous, flowing surfaces that blur the distinction between roof, wall, and ground, creating an intuitive circulation system without relying on clear thresholds or signage in real life. This directly relates to my aim of designing an EV charging station canopy that feels seamless and easy to navigate for both vehicles and pedestrians. At a human scale, the large sculptural form remains calm and legible, which challenged my assumption that expressive architecture risks overwhelming users. This informed my design approach, encouraging me to explore continuous canopy forms where structure and enclosure merge, using curvature to provide shelter, shade, and a clear sense of direction while maintaining openness and visual flow.



SYDNEY OPERA HOUSE - JORN UTZON (SECONDARY RESEARCH)

The Sydney Opera House exemplifies how natural geometry can convey identity through its structure. Its interlocking shell forms, derived from spherical segments, show how complex, organic shapes can still be modular and buildable. This is very similar to my initial ideas for the EV-charging canopy design, but its flowing curves guide vehicles and people intuitively without visual barriers. The Opera House's textured ceramic tiles reflect sunlight differently throughout the day. I think if there were solar panels implemented to generate renewable energy, it may be a good direction to go towards.



INTEGRATED SOLUTION FOR RAIN & VENTILATION

Referring back to my key considerations around weather protection and ventilation, I told Mr. Lapas that the challenge now is finding one solution that handles both at the same time. I explained that my starting point was the traditional **Kalae (Lanna) house**, because its high, open roof volume allows hot air to rise and escape naturally, which supports comfort beneath the roof without sealing everything off.

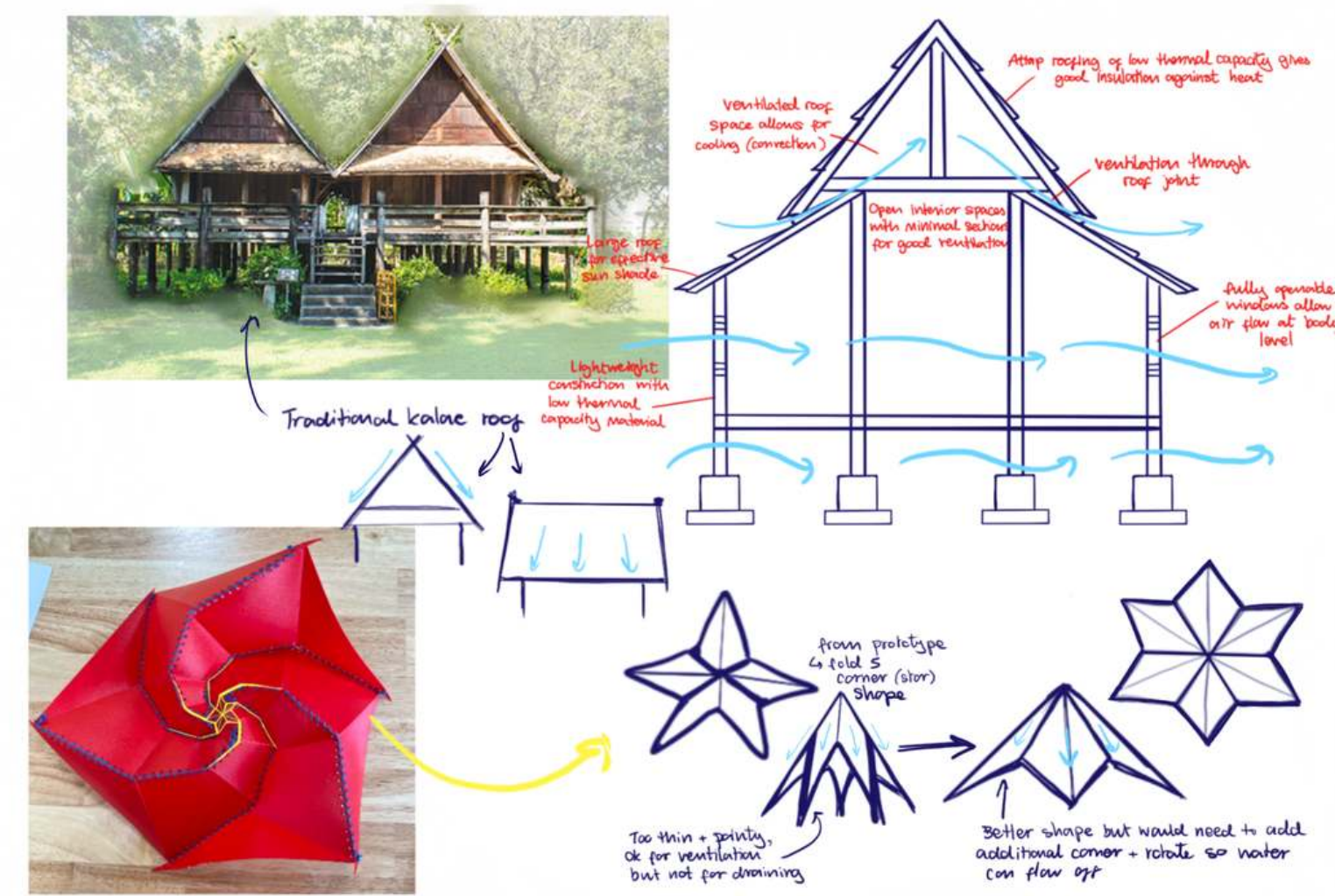
CLIENT COMMENT: Mr. Lapas agreed that this was a strong direction, especially because it connects the design to climate-responsive local architecture. He also added that I could also reference **Malay house** roof strategies, which often use layered roofing to create an air gap that improves ventilation while still protecting from heavy rainfall.

I realised that this was incredibly useful as the upper roof blocks direct rain and sun while a second layer creates an air gap that improves airflow and reduces heat build-up.

CLIENT COMMENT: After further discussions, Mr. Lapas raised some practical design questions: where would water go at the junction between layers, how could I prevent runoff from being trapped between skins, and how might I guide discharge so it doesn't fall onto circulation zones below. He suggested exploring overlapping edges and drip lines to control release points, and considering baffle-like details that allow air through but stop wind-driven rain from entering openings. He also mentioned that if I keep using stitching, the seam strategy could be more intentional, using controlled patterns for airflow, but reinforcing or tightening seams in areas most exposed to rain.

KALAE HOUSE

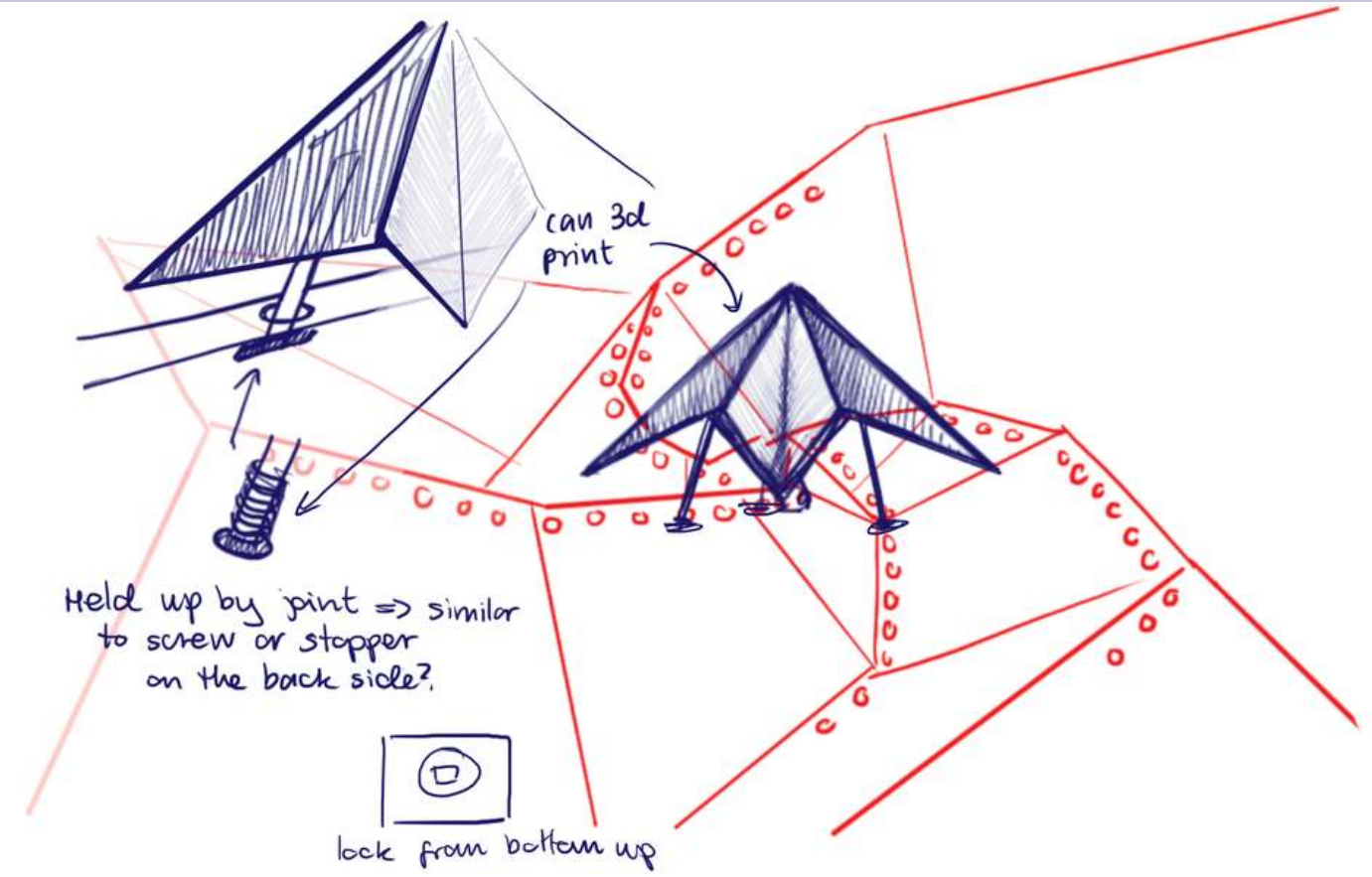
MALAY HOUSE



After consulting Mr. Lapas, I sketched a possible integrated solution inspired by Malay house roof layering: a six-sided folded “umbrella” cap placed atop each spidron to deflect rain while still allowing ventilation through the central geometry. The concept should address my rain and airflow issues, but my next challenge is figuring out a stable, realistic way to attach the cap to the spidron structure.

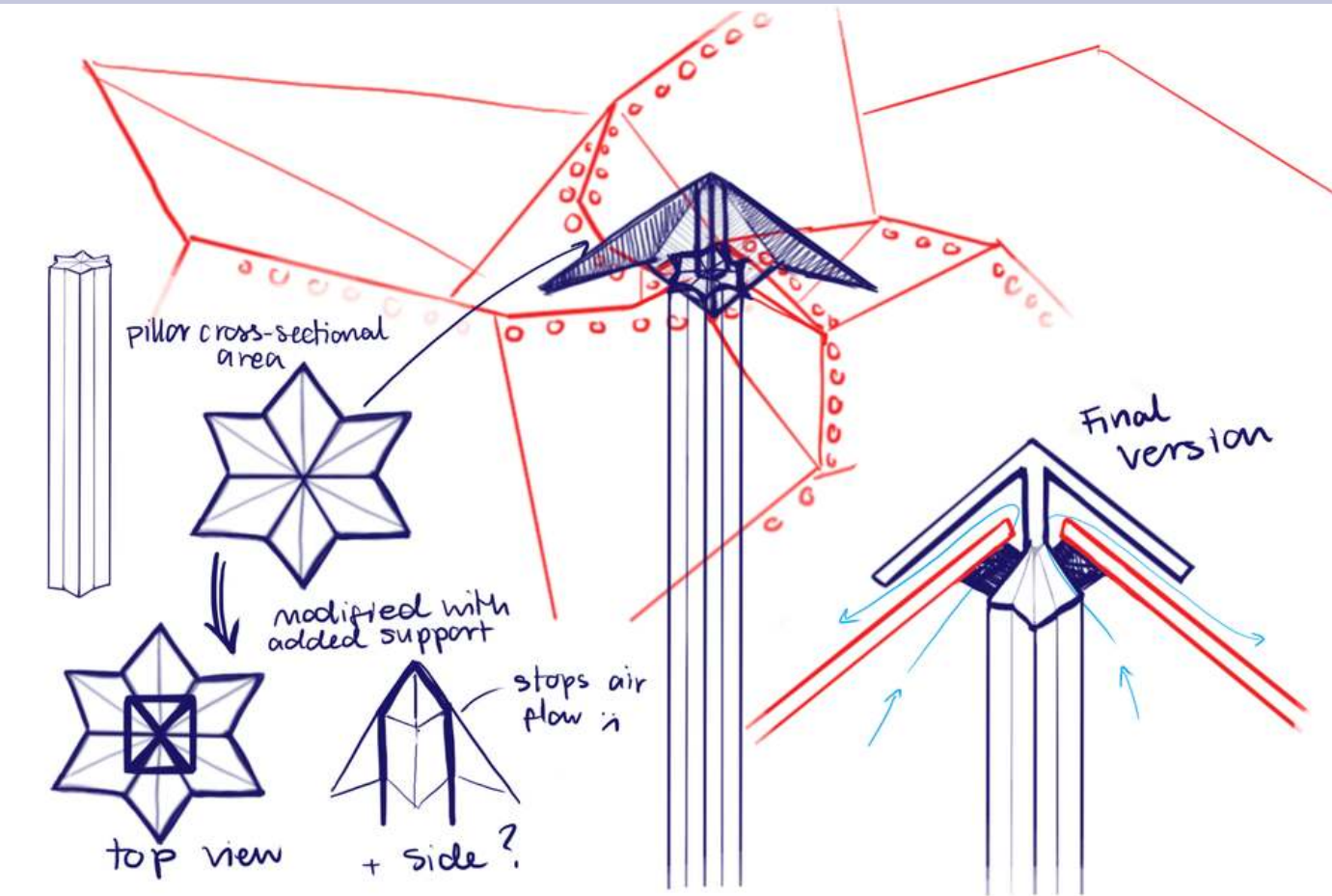
IDEA 1

I first explored a simple 3D-printed locking joint to secure the roof cap modularly, but I realised it could introduce wobble and stress at the stitched edges under wind load. Due to PP being very lightweight, it may be difficult to do.



IDEA 2: FINAL CANOPY DESIGN

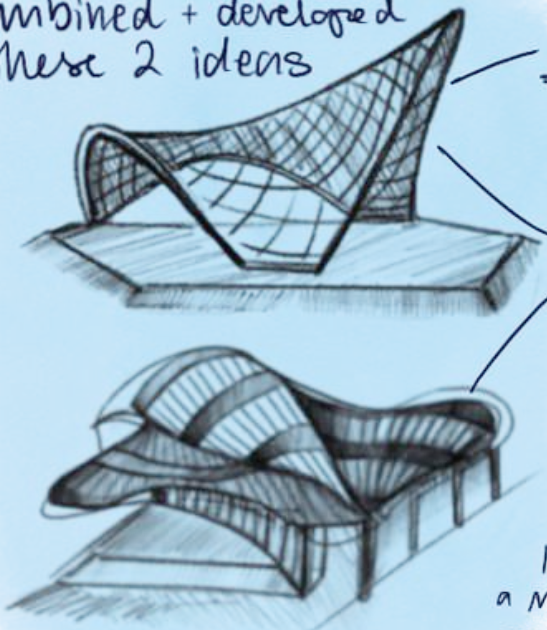
Much stronger than Idea 1, as it not only stabilises the canopy connection but also supports the overall structure, while still preserving ventilation through the central opening.



FINAL DESIGN SOLUTION



combined + developed these 2 ideas



parametric design
→ weaving effect,
cultural link to
Thailand + craft

Have a main canopy
+ open area, both
indoor + outdoor space

laminated, make
a mould, then steam bend wood
or laser cut + laminate

Weather protection
(Rain + direct sunlight)

⇒ Actual station = curved polycarbonate
roofing sheets

⇒ Model = Transparent
PVC sheet?

research into
what is commonly
used in architecture
to get this effect.



Resin pour
on top?
w/ PTT colors

too heavy +
shape/mould would
be very complex

some sort
of fabric? → research
stretch - shear

could use a
bit more "planned"
green space → integrated
into the station
itself
★ consideration

neodymium magnet
connection to toggle
sensor for LEDs

could have visual indicators
to show if the chargers are
free/occupied - Alongside App?

bamboo might
work too.
use veneer + weave
it together

steam bend wood?
→ into strips and join



laser cut ply +
assembling
through
ridges?

Main canopy → parametric structure

3D printed
organic shape use as a mould
+ heat shrink

Heat bend acrylic?
→ glossy, smooth
finish



(plexi glass, easy to
deform BUT hard to
create compound curves + very
organic shapes.

could be
3D printed + painted w/
acrylic.
PLA filament

could use literal wires
(black) for small circuitry
to be the EV pump wire.

carve shape
out of block of
Bals wood? - CNC?

could 3D
print main
structure as
octagon

then laser cut
clear/frosted acrylic
sheets as rectangles
to assemble

BUT would have
to consider
compound
angles

CLIENT COMMENT: The design is highly compelling; its overall form feels contemporary and forward-looking, while the supporting structure introduces an organic, almost tree-like quality that creates a strong connection to nature. I particularly appreciate the contrast between the woven canopy and the clean, symmetrical glass volumes, as it successfully blends traditional craft with modern architectural language. Incorporating a PTT forecourt pylon sign would further strengthen the project's visibility and contextual identity, making it immediately recognisable from the road while complementing the overall design. I think it is an important part you cannot miss out.

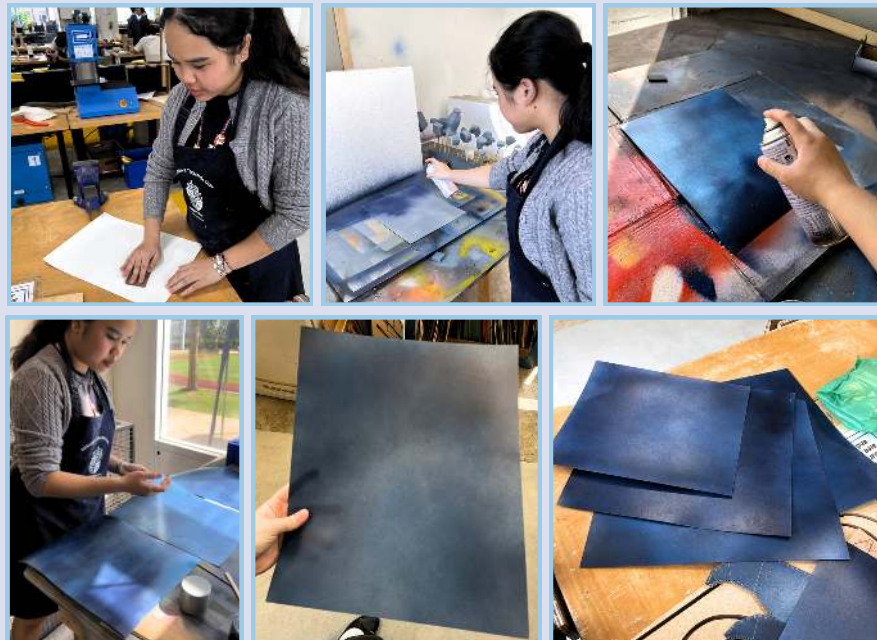
PART 4: THE CANOPY

Processes covered

- Laser cutting 0.5mm polypropylene sheet
- Spray painting
- Sewing

THE POLYPROPYLENE SHEET

I lightly sanded the 0.5 mm matte white and matte clear polypropylene sheet to improve surface adhesion, ensuring the spray paint would bond properly and produce a more even finish. I then applied two coats of primer before spray painting the surface with a mixture of dark blue and Ford Tractor Blue. By lightly blending the two colours during application, I created a subtle textured gradient effect that added depth and visual interest to the canopy panels.



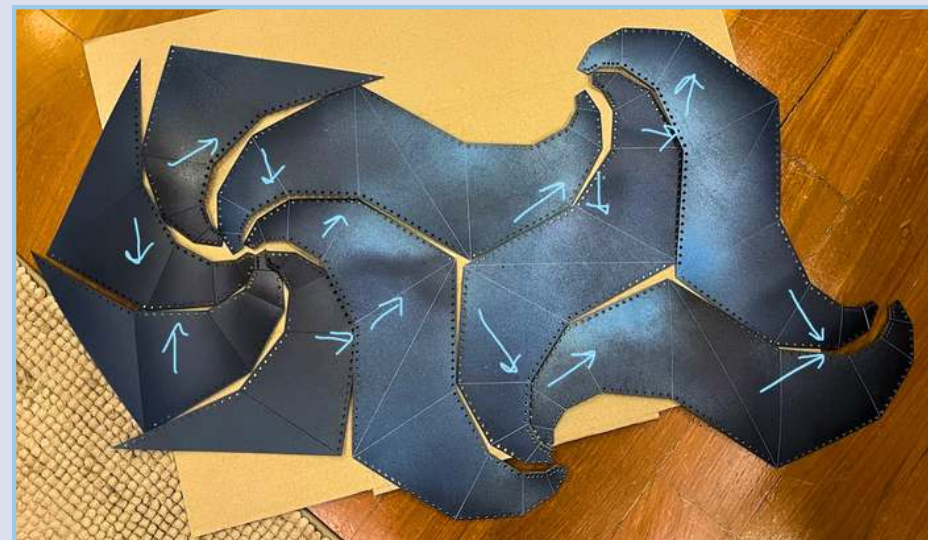
LASER CUTTING THE PP SHEET

To manufacture the canopy panels, I experimented with laser cutting the polypropylene sheet using several different settings. Some settings did not have enough power to cut through the material, while others used too much power and caused the plastic to melt or deform, especially around the small holes.

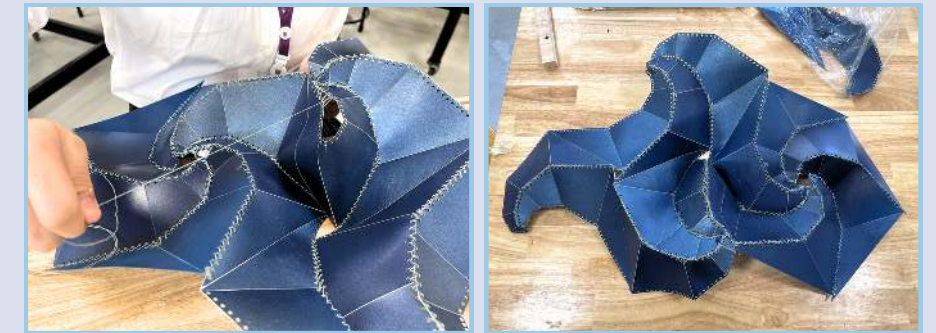
After testing multiple combinations, I found that a cutting speed of 5 and power of 25 worked best for the main cuts. For the smaller holes, I reduced the power slightly to prevent melting. This required separating the holes and outer shapes into different layers in the file so they could be cut with different settings. Overall, the final settings produced clean results that I was happy with, although the small polypropylene pieces inside the holes did not always fall out easily, so some manual picking out and removal was required.



FINAL TOUCHES BEFORE STITCHING



ASSEMBLING THE CANOPY

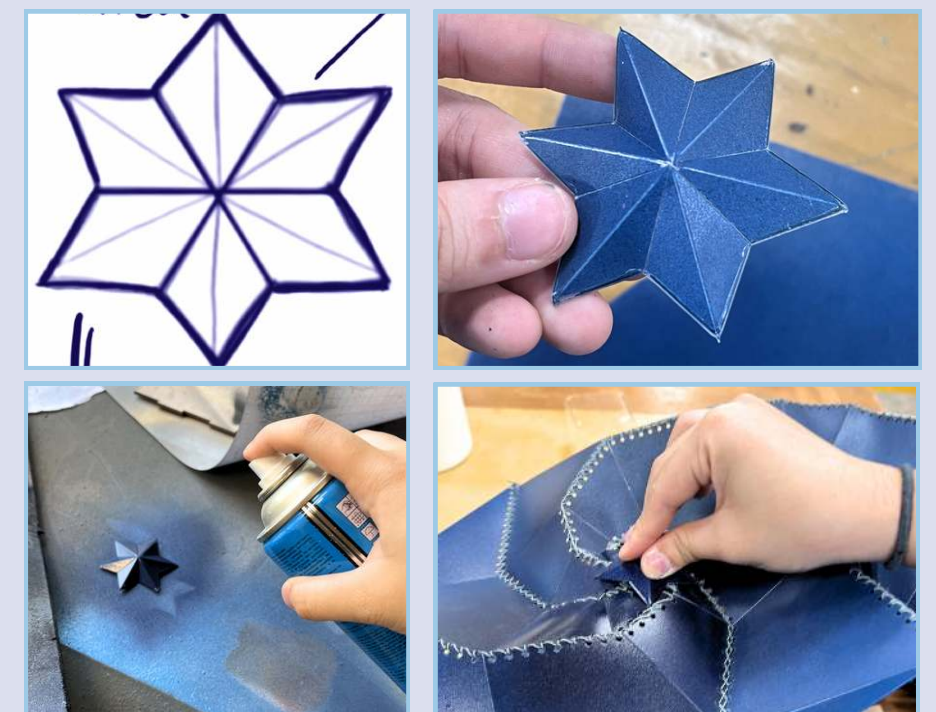


Before I stitched each PP panel together, I used a metal rule to guide the creases in the polypropylene sheet, ensuring that each fold was straight and positioned where it should be. This helped maintain consistent angles across all panels and kept the geometry of the canopy aligned with the CAD design engraving.

Once the creases were formed, I used light blue yarn to stitch the panels together, starting from the lower edge of each piece and working upward to the points where multiple panels meet. This method allowed the individual sections to connect flexibly while still holding the intended form.

The final assembled canopy worked extremely well and the overall shape turned out even better than I had expected. It became a strong structural form while still maintaining the lightweight, flowing appearance that I had envisioned in the design.

WATER DRAINING SYSTEM



JOINING THE CANOPY WITH THE BUILDING

After assembling the main structure, the final stage was constructing and attaching the canopy, which required careful consideration to ensure it sat at the correct angle, height, and alignment with the building. I needed a connection method that would appear seamless while still supporting the lightweight roof structure.

To achieve this, I designed and 3D printed a roof support element that sits on top of the building. I measured the total height from the base to the highest point of the canopy to determine the size of the main supporting beam. After 3D printing it, I sanded it and used wall putty to smoothen the texture,

I then measured the vertical distance between the second floor and the canopy level to create accurately sized pillars. These were cut using a fret saw, measured with a steel rule, and then sanded down to ensure precision. Additional supports were also designed and 3D printed based on the height from the base to the second floor.

Once all components were prepared, I carried out surface finishing, sanding all parts to achieve a smooth surface before applying primer and spray paint.

I needed the polypropylene canopy panels to extend slightly further so they could meet the support structure more cleanly. To achieve this, I added small PP extension tabs to the edges of the roof panels. These were attached using a combination of double-sided tape and spray adhesive, which provided enough hold while keeping the connection thin and unobtrusive.



BRINGING EVERYTHING TOGETHER

To complete the EV charging forecourt, I 3D printed the EV charging units, then lightly sanded and spray-painted them for a clean finish.

I then used contact adhesive to stick the concrete-textured base layer down first, followed by the parking zone sections. After this dried, I applied PVA glue to the underside of the hexagon base and pressed it firmly into place.

Next, I glued the pillars in place using epoxy resin for extra strength. Finally, I attached the roof/canopy using super glue, completing the full model assembly.



PART 7: FINISHING TOUCHES

Processes covered

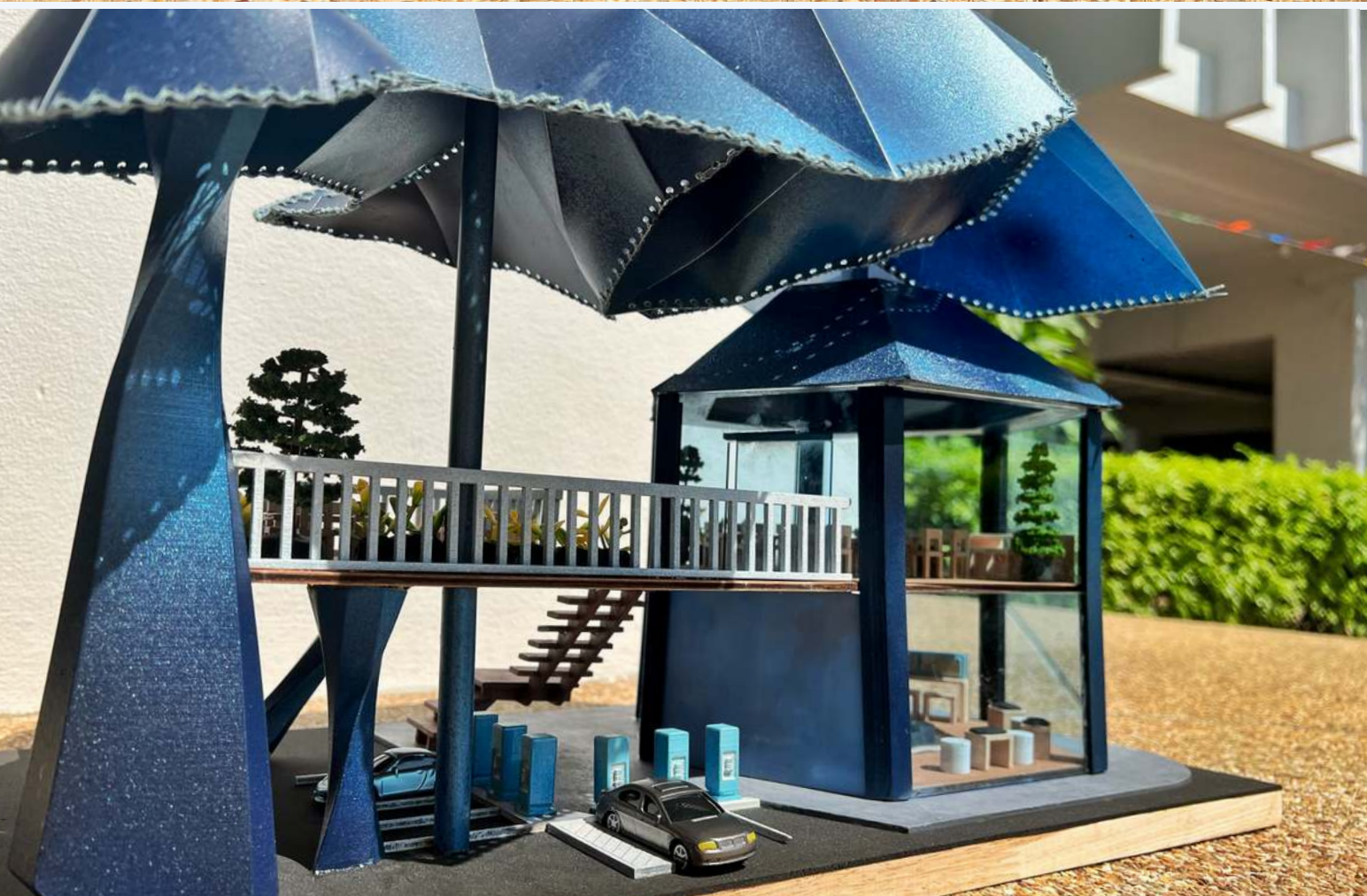
- Assembling components with Super Glue

For the final details, I laser-cut thin plywood tabs and spray-painted them before attaching them above the door openings to represent the sliding door tracks/details. This helped strengthen the realism of the café facade and made the transparent acrylic walls feel more architecturally complete. I also created the PTT pylon sign by first 3D printing the structural form, then designing the graphic signage digitally and printing it onto sticker paper. After cutting the sticker accurately, I applied it to the pylon and fixed the completed sign onto the base.

With these final branding and details completed, the model was fully finished!



A-Level Design Technology Final Model



FEEDBACK FROM STAKEHOLDERS & ANALYSIS

COMMENTS FROM MY CLIENT: MR LAPAS



“I would like to formally commend Medbua for her exceptional research and strategic vision regarding the development of our next-generation EV charging ecosystem. Her work represents a comprehensive and data-driven approach to infrastructure planning that addresses both current market gaps and future consumer requirements.

Key Strategic Achievements

- **Evidence-Based Site Strategy:** Through extensive field research at key traffic arteries acting as gateways out of the capital, Medbua has identified an optimal location that balances accessibility with high-volume transit needs.
- **Validated Product Development:** Her design and service offerings are not speculative; they are anchored in quantitative data derived from over 100 consumer questionnaires. This ensures that the station footprint is perfectly aligned with the actual preferences and pain points of today’s EV drivers.
- **Market Differentiation:** The proposed design transcends traditional refuelling station architecture. It offers a unique, modernised, and lifestyle-oriented experience that is currently unparalleled by competitors in the sector.

Operational Recommendations

To further optimise this project for full-scale implementation, I recommend a minor refinement to the site layout:

- **Spatial Optimisation:** Increasing the dimensions of the charging bays to accommodate two vehicles per charger.
- **Technical Accessibility:** Implementing dual-charging gun configurations per unit. This modification will significantly enhance manoeuvrability and improve the user experience, effectively addressing the variability in charging port positioning across different EV models.

Conclusion

Medbua’s concept is entirely viable for real-world implementation and represents a sophisticated evolution in our infrastructure strategy. Her work does not merely propose a facility for energy replenishment; it defines a blueprint for the future of mobility and lifestyle integration. I am confident that adopting these designs will position us as a leader in the modern EV era. Lastly, this design does not just facilitate energy delivery; it defines the future intersection of technology, convenience, and modern living.”



FEEDBACK FORM

Section 1 of 5

Questions Responses Settings

PTT EV Station Redesign (Stakeholder Feedback)

This form is part of my A-Level Design Technology project, an 8-month design journey that explores a conceptual redesign of a traditional PTT petrol forecourt into a future EV charging hub for Bangkok. Your thoughts and feedback will be incredibly valuable in helping me evaluate the concept and guide future refinements.

Thank you so much for taking 5 minutes to complete this form.

This form is automatically collecting emails from all respondents. [Change settings](#)

Full Name *

Short answer text

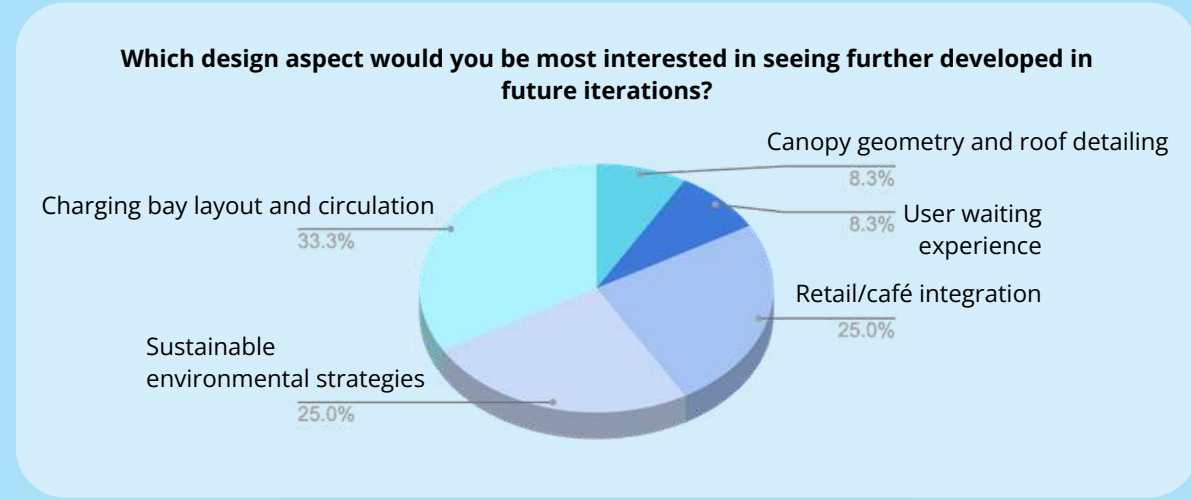
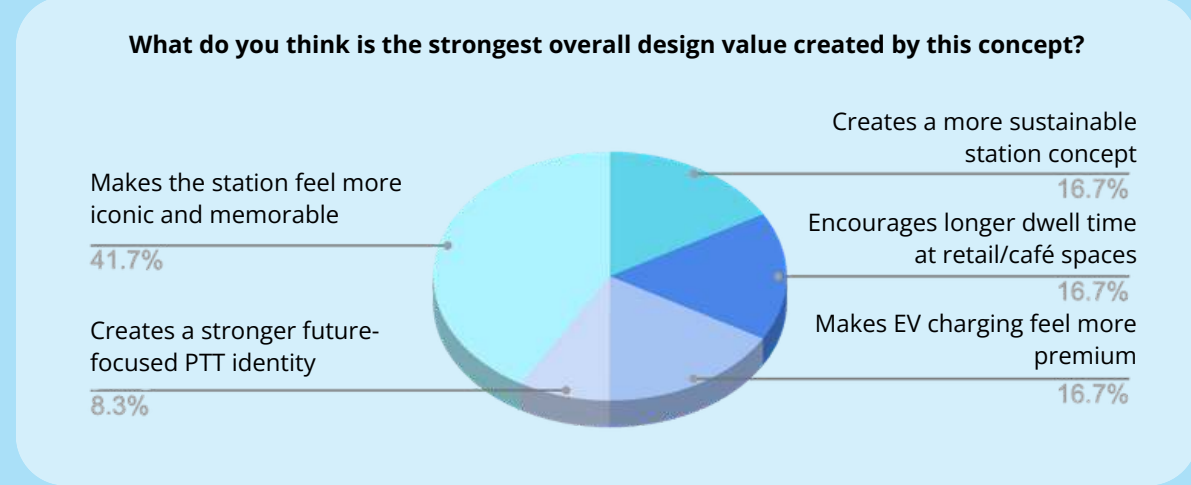
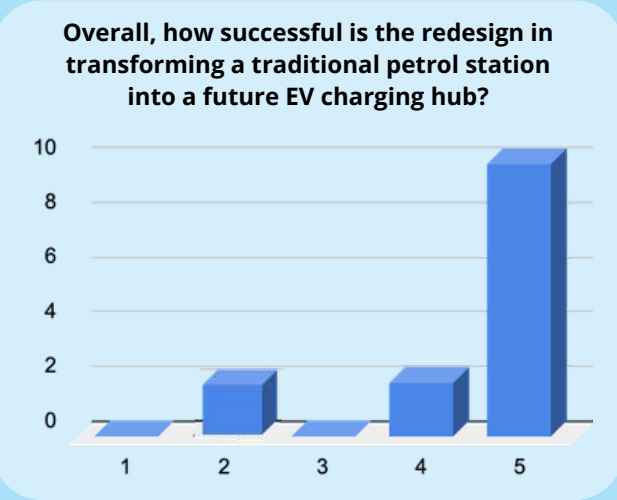
Below are some photos of the final model.

For more detail on the research, design development, and iterative making process behind the project, please feel free to request access to the link below:

<https://drive.google.com/file/d/1HUXJgJX7KZAc1fwhj41KDfH6CTKAZ/view?usp=sharing>

FINAL MODEL

To further understand stakeholder needs and validate the suitability of the final concept, I distributed a feedback questionnaire. The 19 responders showed strong support for transforming the station into a more destination-led environment. This feedback validated the decision to combine charging with social and lifestyle functions, and has given me valuable insight, qualitatively and quantitatively, about how to improve this in the future.



FINAL THOUGHTS

FUTURE IMPROVEMENTS

STATION TRAFFIC CIRCULATION

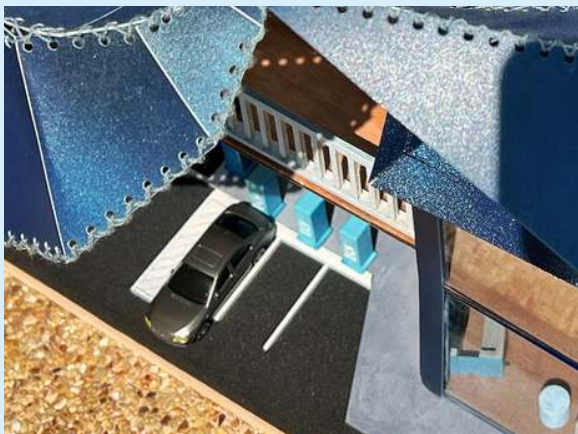
Although I had already planned the traffic circulation earlier in the design process, this was done before the final site plan was fully resolved. As I had developed the exterior form/architecture, café pavilion, charging stations and car parking area further, I did not re-evaluate the original flow diagram against the final layout as it could have been. In hindsight, this is an area I would revisit more critically, as vehicle turning radii, drop-off points, and pedestrian crossings may have been refined further to improve flow and reduce potential congestion. If I were to do this again, I would have chosen a larger base. This would allow me to experiment with a wider range of entry and exit arrangements, trial alternative charger bay positions, and test how traffic interacts more realistically with the hospitality spaces. This would allow the final design to feel even more resolved as a real service station environment.

GREATER EMPHASIS ON EV CHARGING & THAT EXPERIENCE

Something I would also develop further are the EV charging units themselves. In the current design, the chargers are positioned in a relatively standard way beside the parking bays, which allows the station to function clearly but does not fully celebrate charging as the core purpose of the space. As the café and folded canopy became the dominant design features, the chargers became more secondary than originally intended. If I were to refine the concept further, I would explore ways to make the EV charging process a more central design feature, potentially through more sculptural charging pods, integrated lighting, dedicated charger canopies, or a layout where the vehicle charging moment becomes the focal point of arrival. This would strengthen the identity of the station as an EV-first destination and ensure that the core function is expressed as strongly as the surrounding hospitality experience.

CONSTRUCTION MATERIAL CHOICES

I would reconsider the use of fully transparent acrylic-style glazing if the design were translated into a real station. Especially in Bangkok's very hot climate. For the model, I thought the clear acrylic walls worked extremely well because it allowed the interior design and decoration to remain highly visible, in reality a fully glazed facade may create excessive heat gain and make it uncomfortable during the day. Bangkok's high temperatures and strong sunlight would require a more climate-responsive material. If developed further, I would explore alternatives such as low-E glass, perforated metal screens, shaded louvers, fritted glazing, or semi-open facades that still preserve visual connection while reducing heat buildup. This would allow the design to maintain the openness and transparency that made the model so visually successful, while making the architecture more realistic, comfortable, and energy-efficient for real-world use.



PERSONAL REFLECTIONS

WHAT I AM MOST PROUD OF / SUCCESS

One of the strongest successes of this project was how the final model came together and how clearly it communicates my original idea. I think the destination-led EV charging concept translated well into the final pavilion, especially through the folded canopy and café space, which I'm particularly happy with. In terms of making, the overall finish feels clean and quite controlled. I think that the joints and neat, glue marks are minimal, and edges are well finished. A lot of this came down to careful sanding, accurate measuring, and thinking through the order of assembly. This helped the model stay visually clean while still expressing the architectural form clearly. Overall, I feel that the craftsmanship supports the design well, and I'm very pleased with how it turned out.



Completing this Design Technology project has pushed me to develop skills far beyond what I could have learned in theory alone. As my first architectural model, it was definitely one of the most challenging things I've done. I had to learn how to take an idea from research and site analysis and turn it into a resolved design, while also building practical skills in CAD, laser cutting, 3D printing, and iteration. I also realised how important it is to constantly test and adjust rather than expecting things to work first time.

More importantly, this project changed how I think about sustainability and design. Redesigning a familiar PTT station into an EV charging destination made me consider how architecture can actually influence behaviour, making greener choices feel more comfortable and natural. I found it especially meaningful to explore how Thai identity and the existing PTT brand could be kept, while still pushing the design forward.

This project also made me more interested in the balance between tradition and innovation, especially when introducing new technologies like EV infrastructure into familiar environments. Moving forward, I want to continue designing spaces where sustainability feels intuitive, accessible, and culturally grounded, so that it becomes something people naturally engage with rather than something forced or separate from daily life.



Signing off,
Medbua Gomutputra
(Shrewsbury International School Class of 2026)

Medbua