ACKNOWLEDGEMENT OF COUNTRY

We would like to acknowledge the Gadigal People of the Eora Nation upon whose lands the Ultimo campus of which we work from stands. We would also like to acknowledge the Koeybuway and Moegibuway peoples of Saibai Island on whose lands and waterways our design solution is based. We would also like to pay respect to the Elders past, present, and emerging, acknowledging them as the traditional custodians of knowledge for these lands.

Design Area: 4.1 Clean, affordable energy for small coastal urban environments

Hybrid Solar System

Figure 1

Syed Ali Haider, Azlan Shah, Yusuf Kilic, Chaitanya Kothawade, Daniel Mutero & Adit Lohani

Background

Remote island located in the Torres Strait, 140km from Cape York
(Indigenous, n.d.)

340 people
(ABS, 2021)

Low-lying & swampy terrain, highest point 1.7M above sea level (QLD Gov, 2018)

Residential: 28.35 kWH/day per customer
(Solar Quotes, 2024)

Businesses: 123.75 kWH/day
(Solar Quotes, 2024)

Key energy consumers: hospitals, schools, water treatment facilities
(EWB, 2025)

Figure 2

Syed Ali Haider

The Problem

Energy Challenges

Heavy reliance on imported diesel: $3.70/L (TSIRC, n.d.)

High cost, environmental risks, and logistical difficulties (TSIRC, 2018)

Limited local technical capacity for maintenance and infrastructure (Houst, 2011)

Wider Impacts

Economic hardship: median weekly household income is $911

(ABS, 2021)

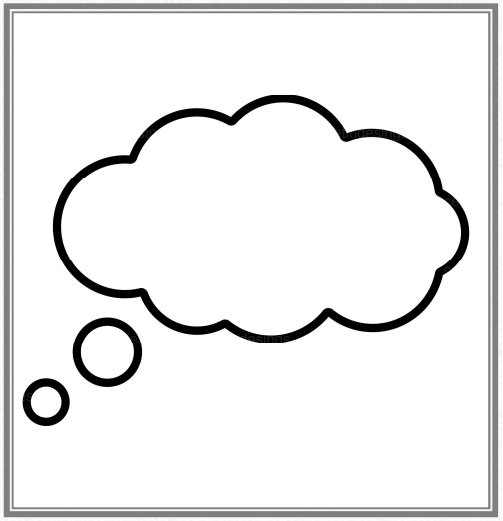
Limited land and unsuitable terrain for large-scale infrastructure (Chessel, 2012)

Urgent need for resilient, sustainable, clean, and energy systems (EWB, 2024)

Syed Ali Haider

How Might We Statement?

How might we utilise the combination of solar panels and piezoelectric energy to provide Sabai residents with a clean, affordable, and sustainable source of electricity; while also considering key stakeholders consisting of the Indigenous peoples of Saibai, the Queensland Government and the Torres Strait Regional Council, in addition to the island's geographical, sociocultural and economic characteristics?



Azlan Shah

Design Solutions

Centralised hybrid energy system (solar farm, piezoelectric, diesel, tidal, wind turbine and a centralised data centre)

Decentralised hybrid energy System (solar, piezoelectric and diesel inspired by the Lord Howe Model)

Power Cable from PNG

Design Solutions

Automatic Mode / Control Hierarchy		PV Plant	BESS	Diesel Generators
Sufficient Solar Radiation Present	Status	On	On/Grid Forming	Off
	Function	Servicing Island Load Charging BESS	Charging Ancillary Services	Stand-by
Sufficient Solar Radiation Present BESS Charged (95%)	Status	On/Curtailed	On/Grid Forming	Off
	Function	Servicing Island Load (Load following)	Ancillary Services	Stand-by
Insufficient Solar Radiation BESS SOE (95%-5%)	Status	Off	On/Grid Forming	Off
	Function	Stand-by	Servicing Island Load Ancillary Services	Stand-by
Insufficient Solar Radiation BESS SOE (5%)	Status	Off	On/Grid Forming	On
	Function	Stand-by	Ancillary Services	Servicing Island Load

Figure 4.1

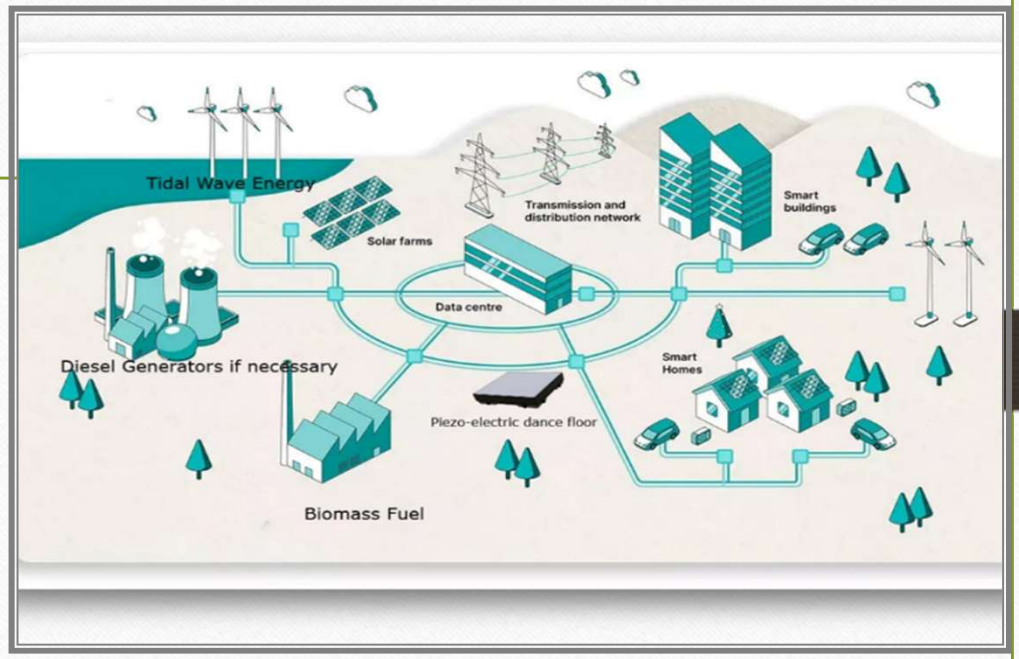
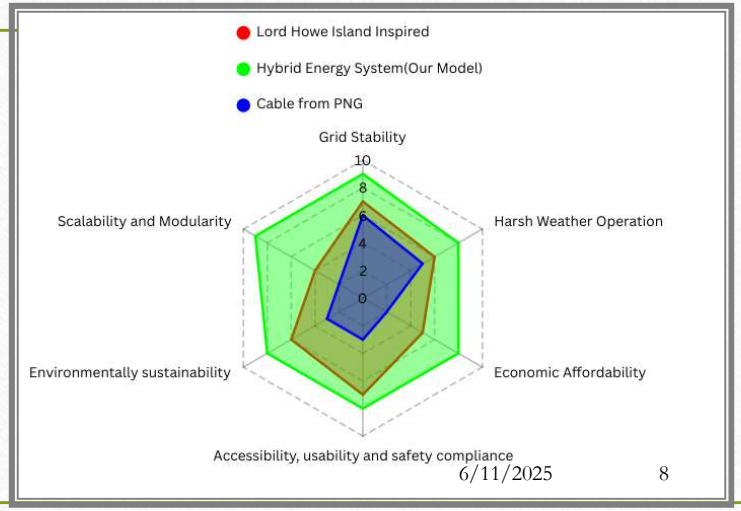


Figure 4.2

Design Selection

DECISION MATRIX

DESIGN REQUIREMENTS	DESIGN OPTION 1	DESIGN OPTION 2	DESIGN OPTION 3
GRID STABILITY AND RELIABILITY	GOOD	VERY GOOD	ACCEPTABLE
HARSH WEATHER OPERATION	ACCEPTABLE	ACCEPTABLE	POOR
ECONOMIC AFFORDABILITY	POOR	GOOD	EXTREMELY POOR
ACCESSIBILITY, USABILITY AND SAFETY COMPLIANCE	GOOD	GOOD	POOR
ENVIRONMENTALLY SUSTAINABILITY	GOOD	GOOD	POOR
SCALABILITY AND MODULARITY	GOOD	GOOD	POOR



Azlan Shah

How does our solution work?

Solar panels and battery installed on all buildings (19) and houses (85)

Batteries store excess solar energy for later use.

Piezoelectric tiles in the community hall

A hybrid inverter manages energy use.

Backup diesel generators

BESS units in each home

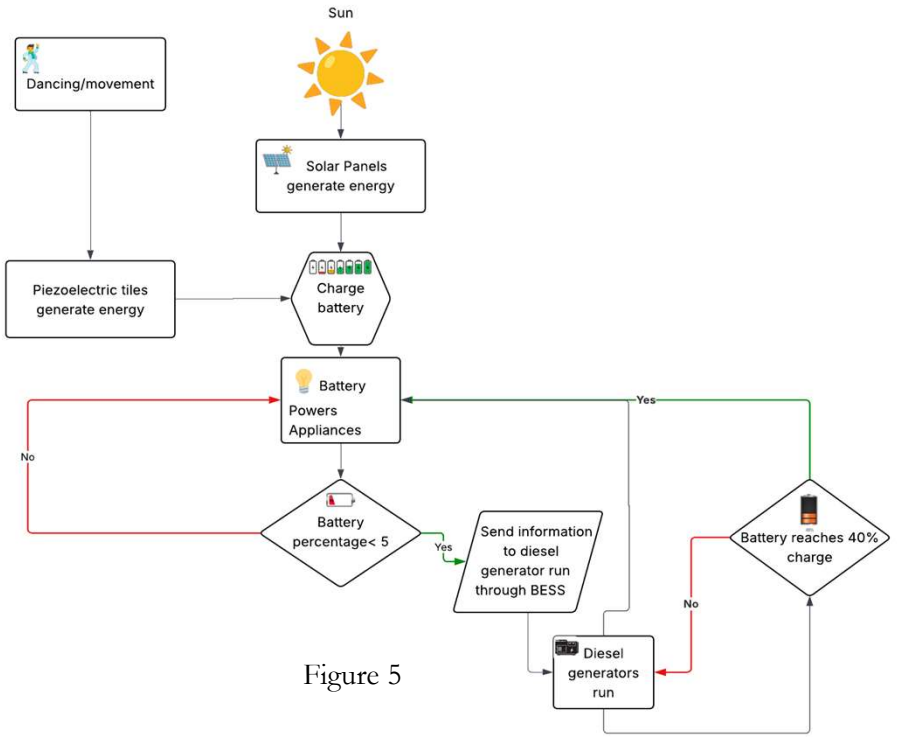


Figure 5

How does our design meet the needs of the project partners and communities?

Preservation of cultural practices of Saibai people(*EWB Challenge | Introduction to Local Government in the Torres Strait*, n.d.)

Reduces reliance on diesel power(*EWB Challenge | Introduction to Local Government in the Torres Strait*, n.d.)

Equitable and provides opportunities for all(*EWB Challenge | Introduction to Local Government in the Torres Strait*, n.d.)

Yusuf Kilic

Our Prototype

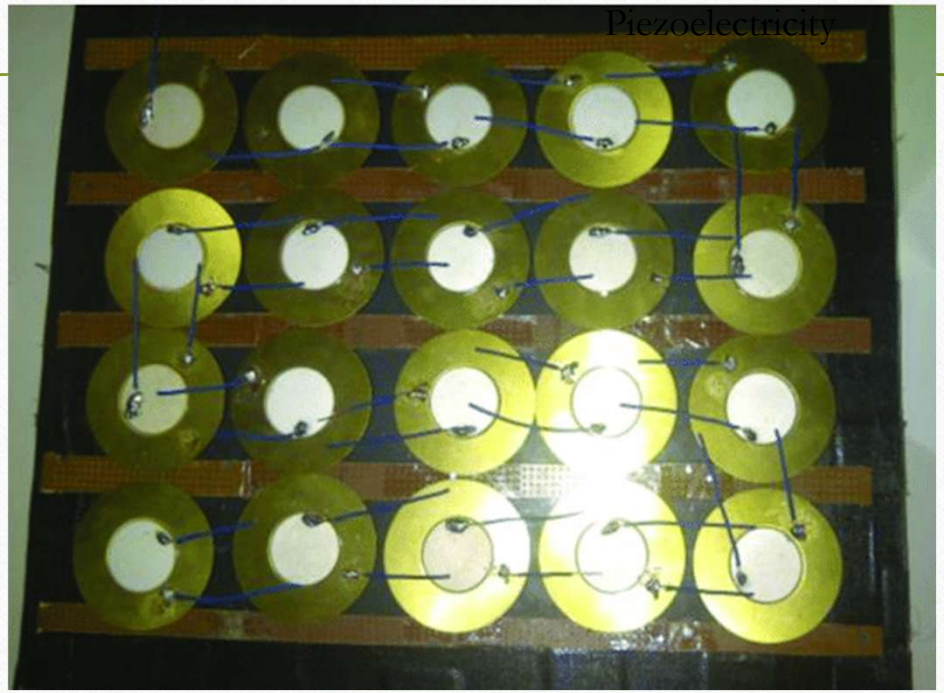


Figure 6

Outcome

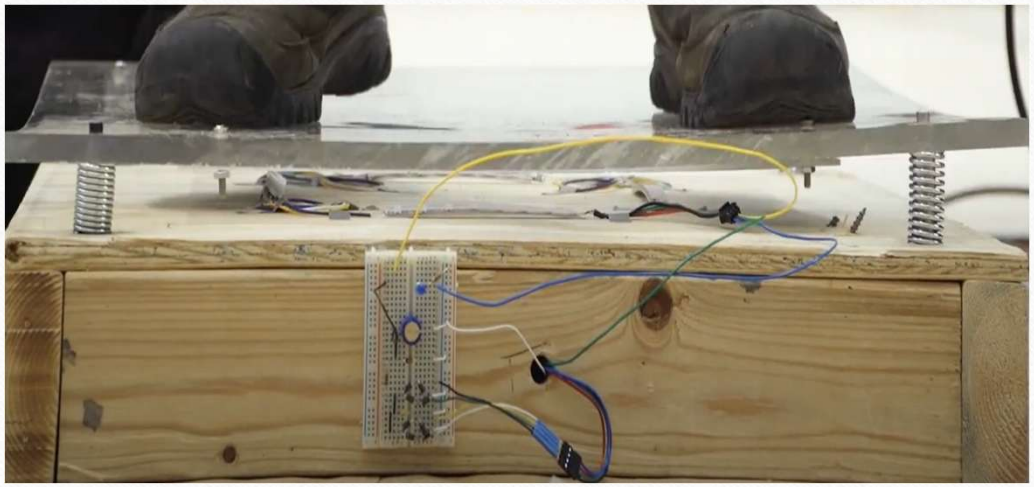


Figure 7

30 V (open-circuit)

2 W per step

PZT

- 50 x 50 cm
- 1W per 2 step
- Flex of 0.1 inch

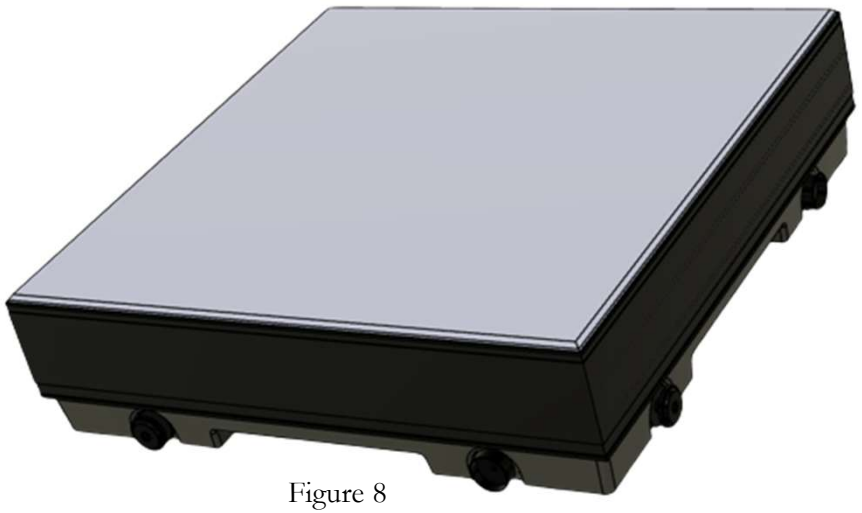


Figure 8

Solar Prototype

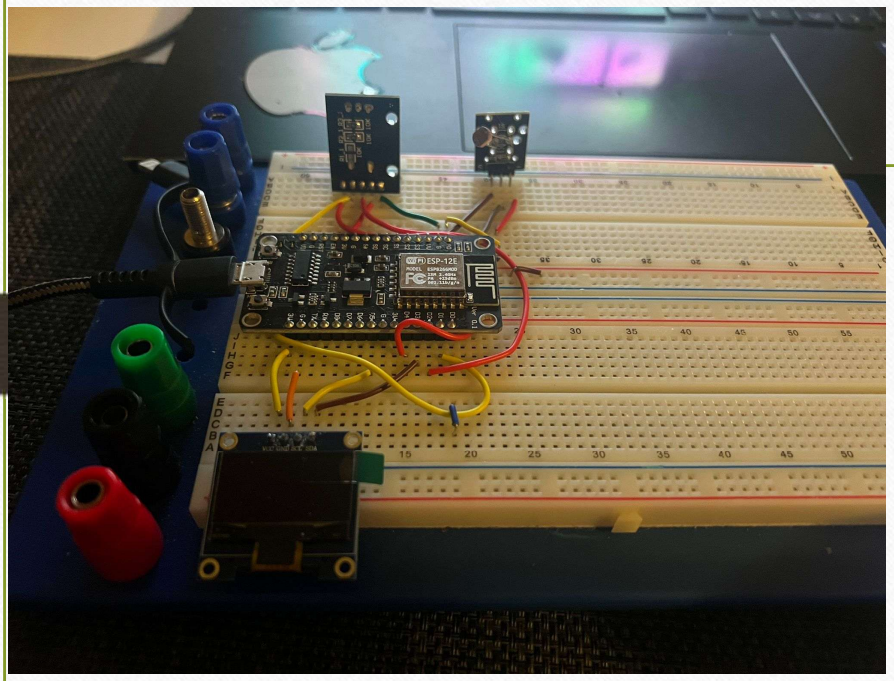


Figure 9.1

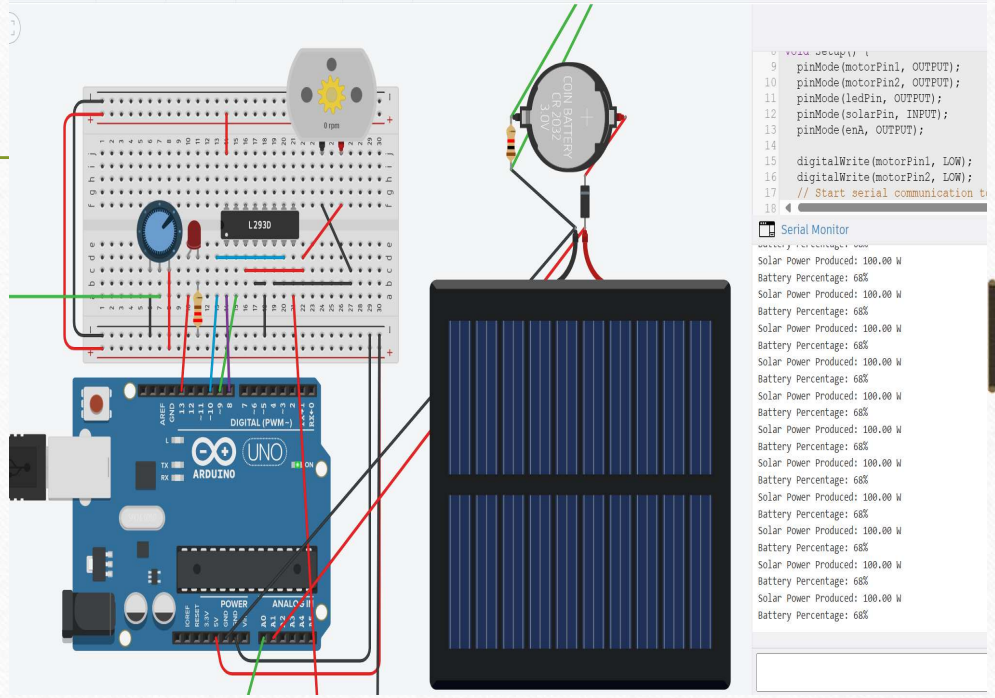


Figure 9.2

Outcome

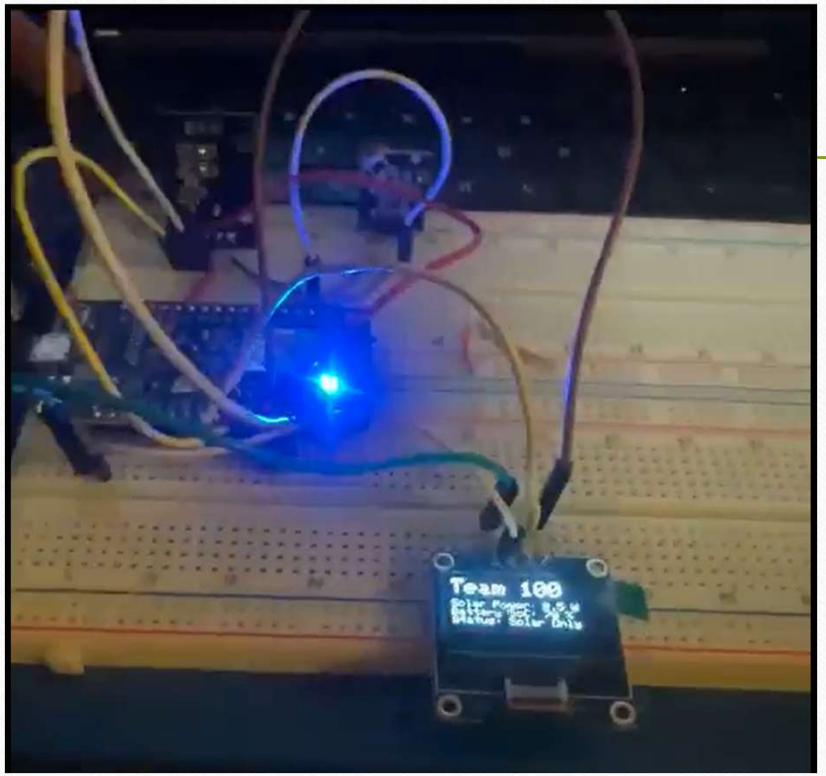


Figure 10.1

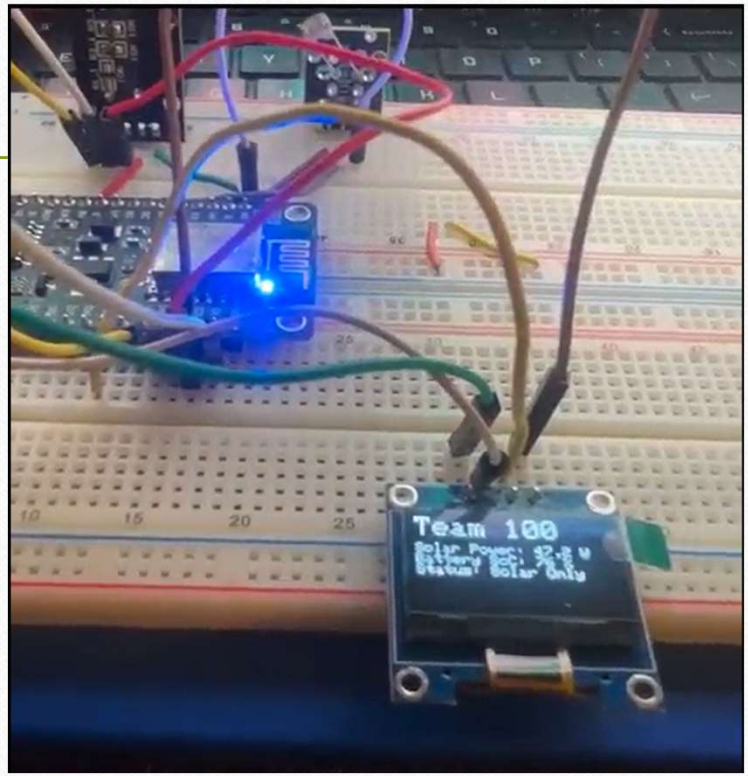


Figure 10.2

Implementation Plan

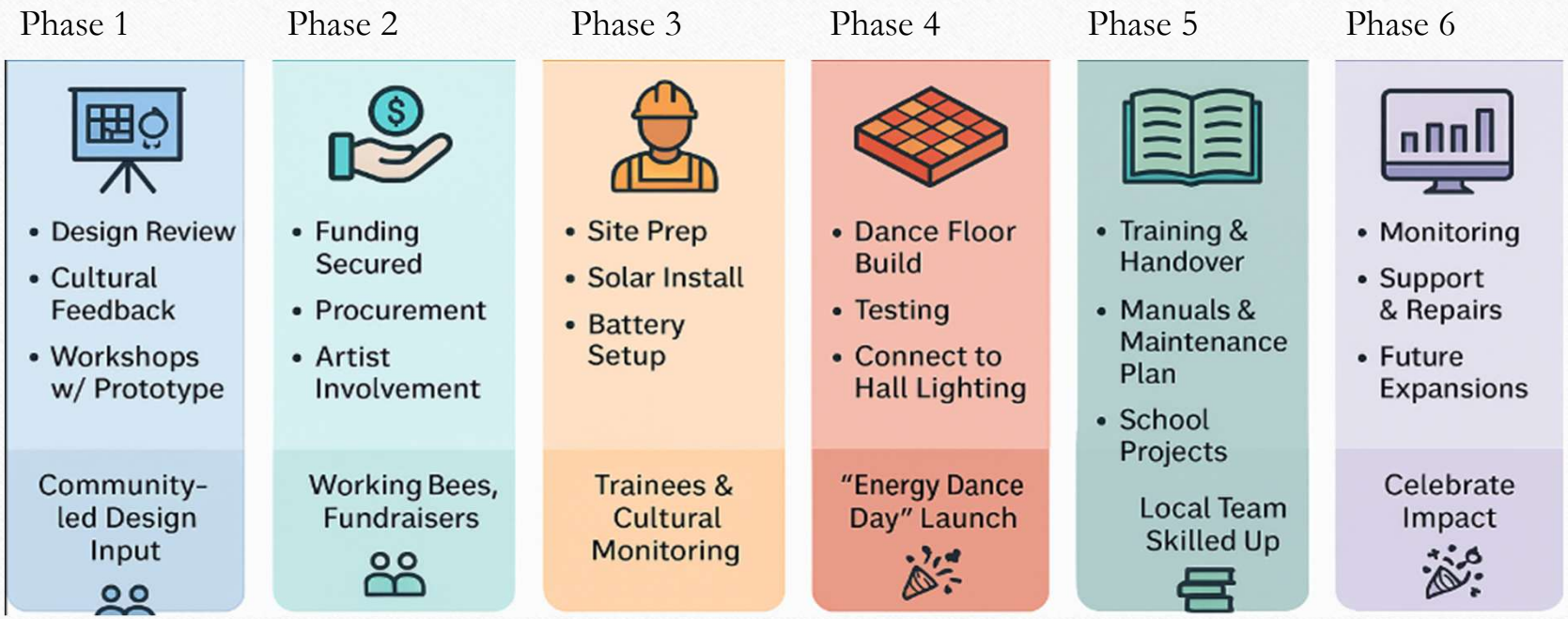


Figure 11

Cost Analysis

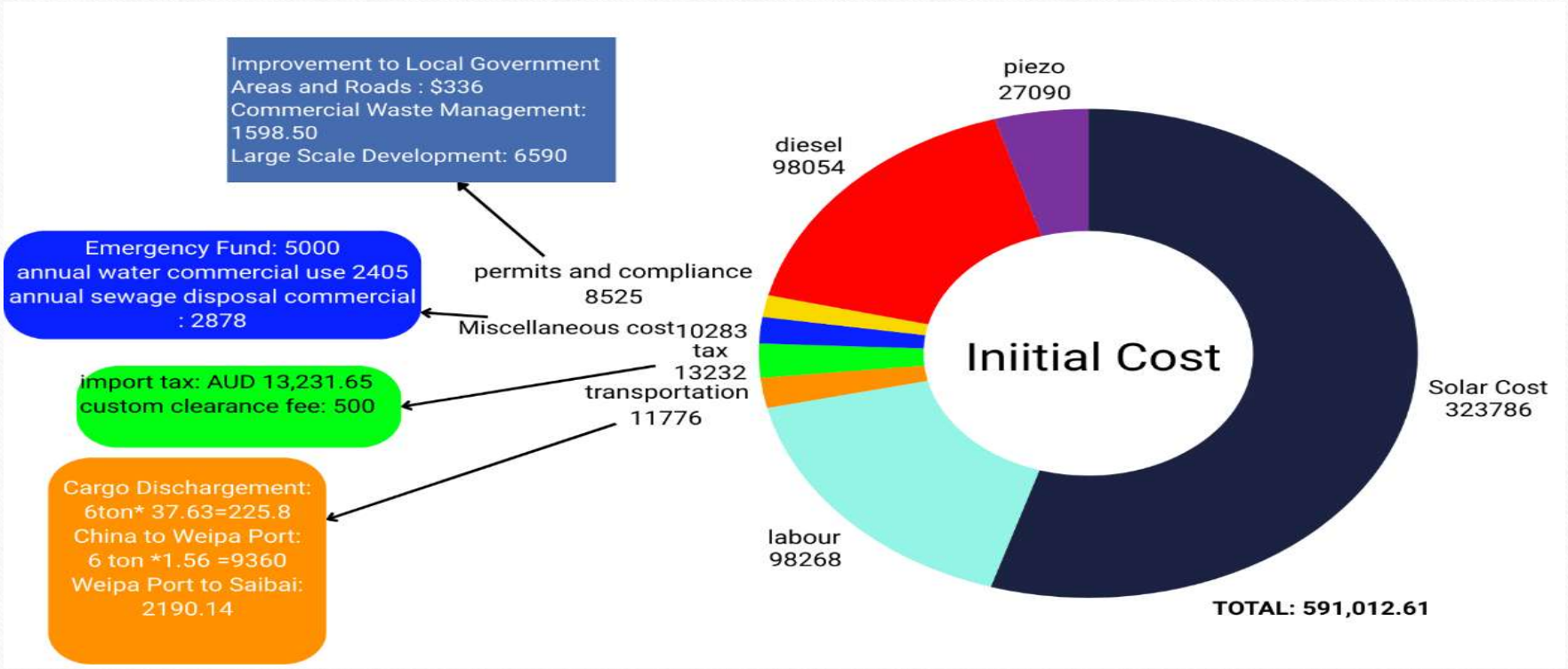


Figure 12

Materials Cost

- Total cost of raw materials = **$464,100.42**
- 104 solar sets of 22 (85 houses, 19 for businesses, school and hospital)
- Solar sets include solar panels, hybrid inverter, roof and ground mounting, 10kWh batteries, waterproof connectors and 100 metres DC wires.
- 100 50x50cm piezoelectric tiles
- 26501L diesel

Daniel Mutero

Raw Materials Bill

BALANCE DUE $464,100.42

Team 100
niversity of Technology Sydney (UTS)
Ultimo Campus

To:
EWB Australia,
552 Victoria St, North Melbourne VIC 3051
&
Residents of Saibai Island

Date: 10/05/2025

#	Item name	Description	Quantity	Price	Amount
1	Residential Solar Set	Complete Solar Set for residential homes	85	3113.33	$264,633.05
2	Saibai Water Treatment Plant Solar Set	Solar Waste Water treatment (+1 for security and backup)	5	3113.33	$15,566.65
3	Small Business and Service Providers Solar Set	Saibai takeaway and catering services , Services Australia agent, Saibai ibis store	5	3113.33	$15,566.65
4	Solar Set for Saibai Island Primary health Care	Solar Solution for the only hospital in Saibai (+1 for security and backup)	5	3113.33	$15,566.65
5	Solar Set for Tagai State College (TSC)	Solar Set for Tagai State Collec	4	3113.33	$12,453.32
6	Piezoelectric dance floors	PZT ceramic (50cm × 50 cm)	100	422.60	$42,260.40
7	Diesel cost	Diesel for backup	26501	3.70	$98,053.70
				Total	$464,100.42

Note
All prices are in Australian Dollar,
with the forex of **1USD =1.56 Australian Dollar**
Business consumption takes ~4 times more power than residential consumption (Calculated using Ergon Energy's (data to share) (121.3666/29.5117 =~4)
The 'Solar Set' consists of :
22 pcs of 460W MONO Solar Panels (Total 10 kW)
1 set of Growatt Hybrid Inverter 10kW
1 set of Roof Mounting/ Ground Mounting
3 pcs of ELEBOX-HV 10kWh Batteries (Total 30kWh)
14 pairs of MC4 Waterproof Connectors
100 meters of DC Wires

Figure 13

Solar Panel

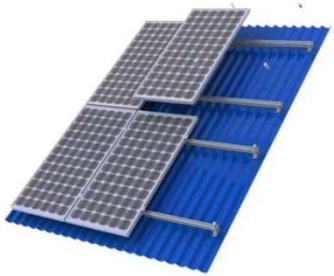
> Brand: EITAI
> Optional Mono/Poly Blue/Black Panels
> 25 years Warranty
> Excellent mechanical load resistance
> PID Resistant,High salt and ammonia

Figure 13.1

Growatt Hybrid Inverter

> Brand:Growatt
> Power: 10KW
> Type: Three Phase Hybrid
> Max.Efficiency： 93%
> Panel Input Max Volatage:1000V

Figure 13.2



Roof Bracket

> Flexible rooftop mount system
> Significant savings
> Compatible with most modules
> Static reliability
> Maximum service life

Figure 13.3

High Voltage Battery

> Capacity(kWh): 10
> Nominal Voltage(Vdc): 153.6
> Depth of Discharge: 90%

Figure 13.4

Ground Bracket

> Easy and Quick Installation
> Flexibility and Stability
> High Precision Construction
> Excellent Environmental Protection
> Superb Quality

Figure 13.5

PV Cables& Connector

> PV Cable 4mm2/ 6mm2
> MC 4 compatible Connector

Figure 13.6

Daniel Mutero

Labor Costs

- Total workers = 19
- Total wages = $98,268
- Skilled (ie. Solar technician), semi-skilled and unskilled workers (ie. trainees) → wages based on skill levels
- Rented accommodation for workers (single and double rooms at the council houses and Indigenous homestays)

LABOUR COST CALCULATOR

Project Name	Number of Hours	Workers Count	TOTAL
Hybrid Energy Project	49	19	
Hourly Wage (Skilled)/hr	Hourly Wage (Semi-Skilled)/hr	Hourly Wage (Unskilled)/hr	**$98,268**
$40	$30	$25	

COST BREAKDOWN

Phase	No.	Designation	No. of Staff Required	Hourly Wage	Hours Worked	Days Worked	Total Wage
1	1	Community Coordinator	1	30	4	7	840
	2	Local Representatives	3	25	4	7	2100
2	1	Financial Officer	1	40	4	20	3200
3	1	Solar Technician	1	40	4	35	5600
	2	Local Trainees	2	30	5	35	10500
	3	Local Labourer	4	25	6	35	21000
4	1	Flooring Specialist	1	40	4	20	3200
	2	Local Labourer	2	25	7	20	7000
5	1	Trainer (Skilled)	1	40	4	20	3200
	2	Local Workers	3	25	7	20	10500

RENT BREAKDOWN

Phase	No. of Workers	No. of Single Rooms	No. of Double Rooms	Cost Of Single Room per Week	Cost Of Double Room per Week	Duration (Weeks)	Total Cost
1	4	0	2	504	984	1	1968
2	1	1	0	504	984	3	1512
3	7	1	3	504	984	5	17280
4	3	1	1	504	984	3	4464
5	4	0	2	504	984	3	5904

Figure 14

Funding

- Total cost of our design is $591,000 as previously calculated
- Total external funding accessible is $3.42 million, combination of private and public sources
- $22,080 generated per year by selling excess energy to the grid in total.

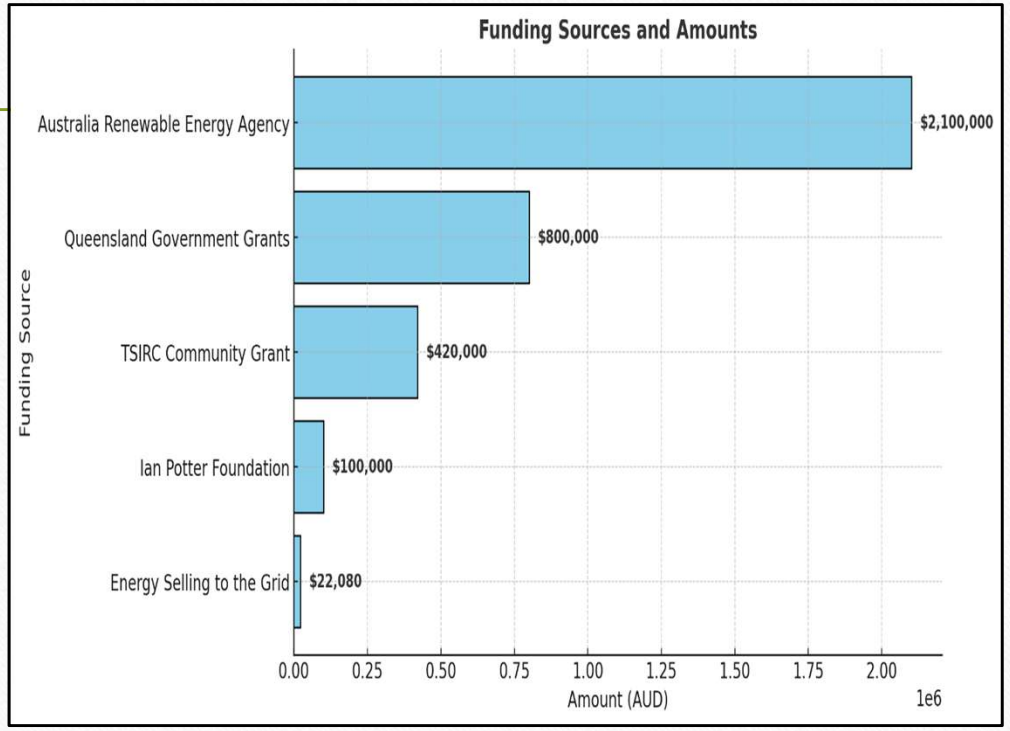
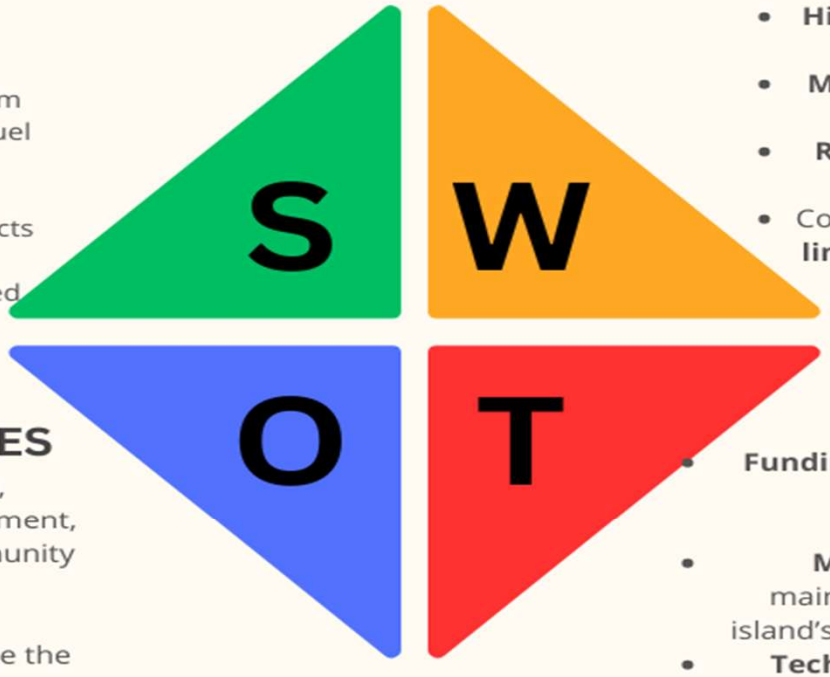


Figure 15

SWOT Analysis Diagram



STRENGTHS

- **Significant fuel savings** estimated at approximately **$140k+ per year.**
- **Reduction in diesel dependency** (from 100% to 20%), cutting emissions and fuel costs. Saves **~259,403.2 L** of diesel.
- **Community engagement** potential through cultural and educational aspects (e.g., piezo dance floor).
- **Long-term sustainability** with reduced operational costs and lower carbon emissions. saves

WEAKNESSES

- **High upfront costs** (**~$600k**), requiring external funding.
- **Maintenance and replacement costs** for batteries and other equipment.
- **Remote location challenges** increase freight and labor costs.
- Community contribution mainly in-kind, **limiting financial support** from locals.

OPPORTUNITIES

- **Access to various funding sources**, including TSRA, Queensland Government, ARENA, private sponsors, and community partnerships.
- **Potential for tourism and media attraction** if innovative elements like the piezo dance floor are implemented.
- **Long-term cost savings** and environmental benefits could lead to further grants or community reinvestment.
- **Increasing diesel prices** and its scarcity will make the project more cost-effective in

THREATS

- **Funding Uncertainty**: Reliance on external funding, which may be delayed or withdrawn.
- **Maintenance Challenges**: Difficulty in maintaining advanced systems due to the island's remote location and harsh weather..
- **Technological Risks:** Potential failures or reduced efficiency of solar panels and batteries due to harsh environmental conditions.
- **Community Resistance:** Local skepticism or cultural mismatch regarding innovative elements like the piezo dance floor.

Figure 26

CONCLUSION

RECOMMENDATION

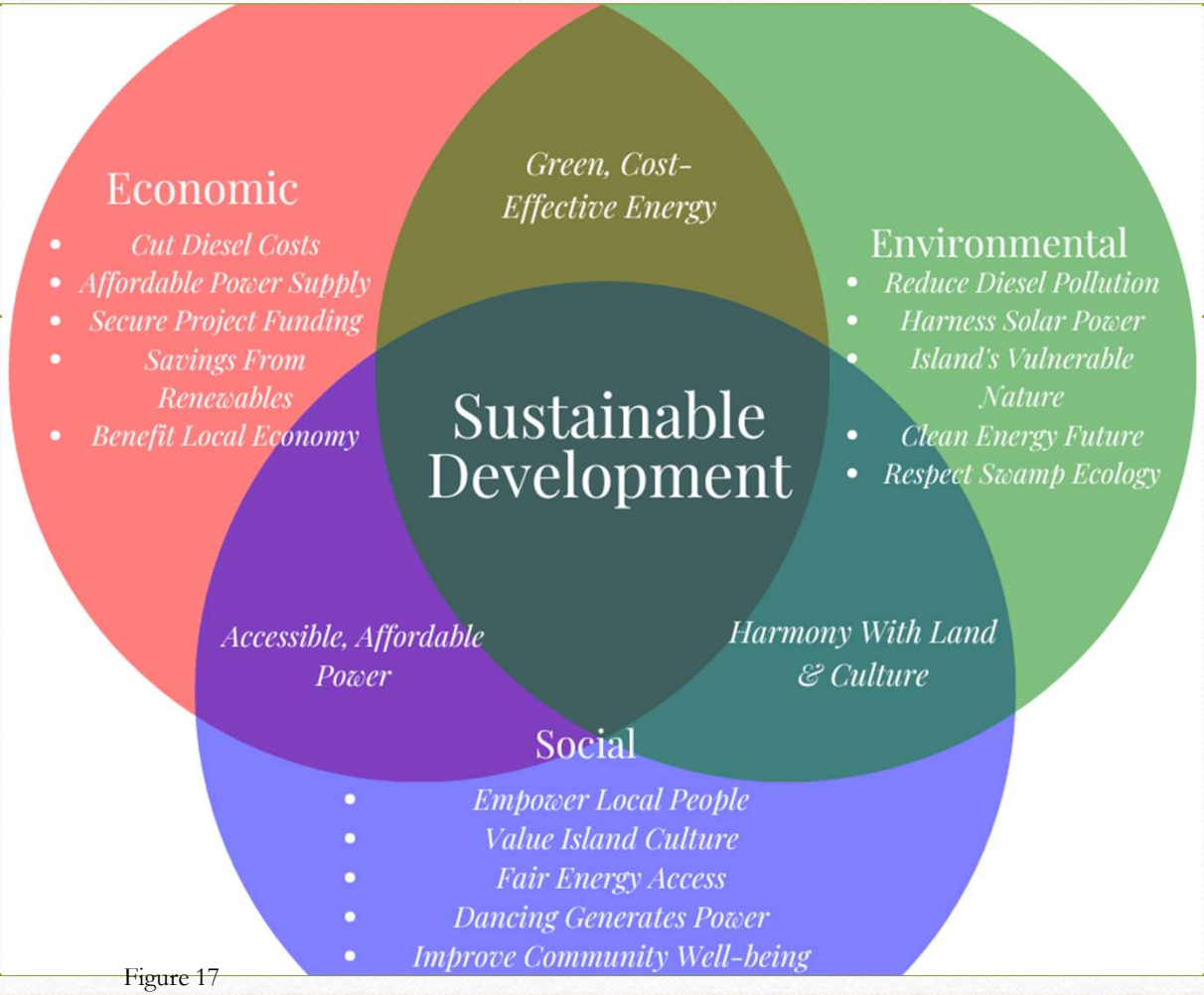

Economic
Cut Diesel Costs
Affordable Power Supply
Secure Project Funding
Savings From Renewables
Benefit Local Economy
Green, Cost-Effective Energy
Environmental
Reduce Diesel Pollution
Harness Solar Power
Island's Vulnerable Nature
Clean Energy Future
Respect Swamp Ecology
Sustainable Development
Accessible, Affordable Power
Harmony With Land & Culture
Social
Empower Local People
Value Island Culture
Fair Energy Access
Dancing Generates Power
Improve Community Well-being

Figure 17


11 SUSTAINABLE CITIES AND COMMUNITIES
Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 7:
Ensure access to affordable, reliable, sustainable and modern energy for all.
10 REDUCED INEQUALITIES
17 PARTNERSHIPS FOR THE GOALS
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
Ensure sustainable consumption and production patterns
SAIBAI
13 CLIMATE ACTION
3 GOOD HEALTH AND WELL-BEING
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
8 DECENT WORK AND ECONOMIC GROWTH
Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
SUSTAINABLE DEVELOPMENT GOALS

Figure 18

Future Improvements

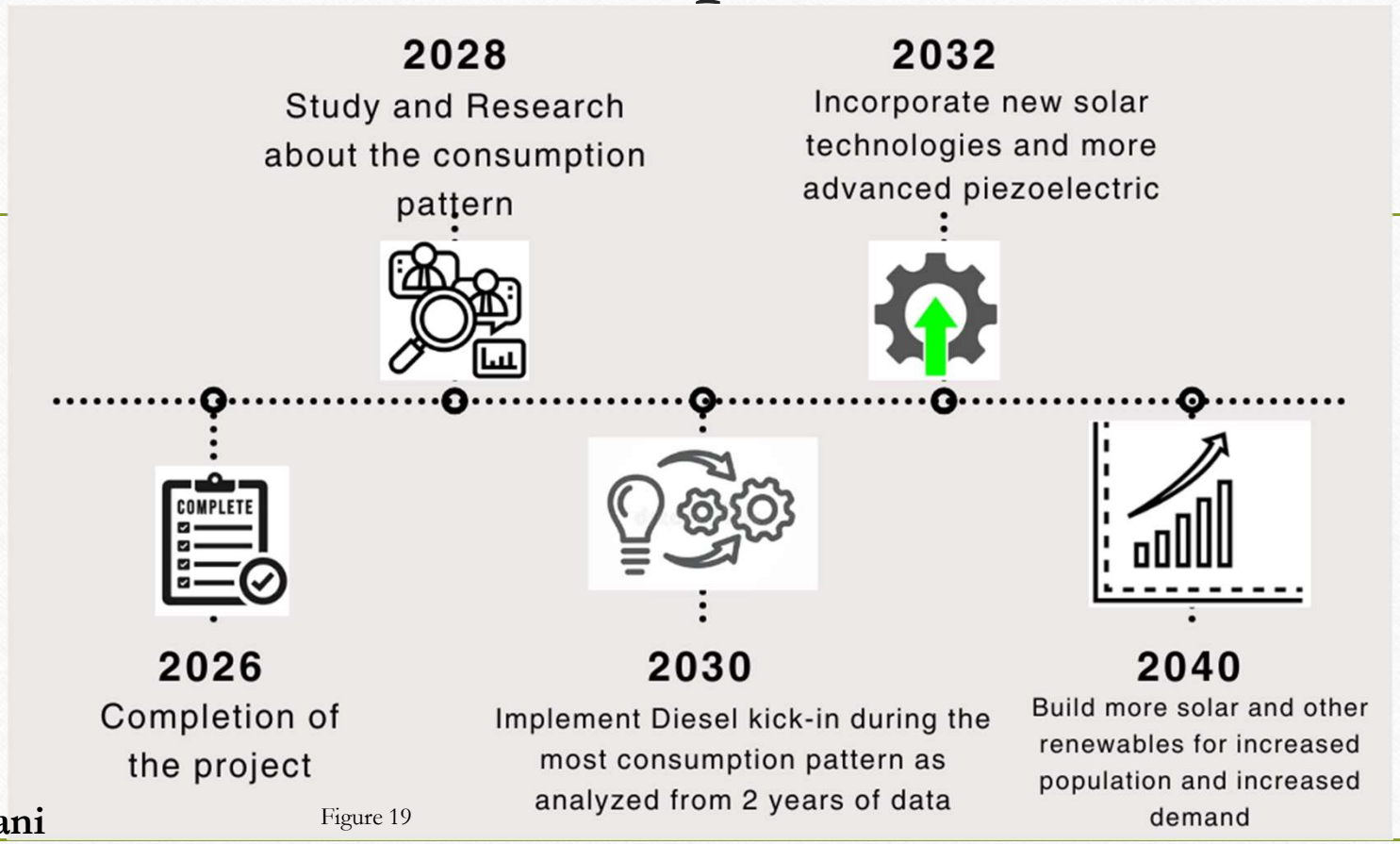


Figure 19

Thank you

Team100

Figure 20

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Figures List

Figures List

Figures List

Appendix

- [NOTE: THE SLIDES AFTER THIS WONT BE PRESENTED BUT WILL BE USED AS REFERENCE TO ANSWER THE QUESTIONS OF THE AUDIENCE]
  [THESE SLIDES INCLUDE MOSTLY IMAGES, RAW DATA & FIGURES]

SOLAR SITE FOR THE SOLAR FARM

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Eitai 5kw 10kw 20kw 30kw Photovoltaic Kit Energia Complete Set 3phase Three Phase Hybrid Solar Panel Home Power Energy Storage System 10000W for Home

Top8 in Hot Selling Solar Energy System

US$3,999.00 1-9 Sets

US$1,999.00 10+ Sets

Product Details

Customization:	Available
After-sales Service:	Yes
Warranty:	10years

Start Order Request | Contact Supplier | Chat

Still deciding? Get samples of **US$ 9999/Set** ! Order Sample

Shipping & Policy

Shipping Cost:	Contact the supplier about freight and estimated delivery time.
Payment Methods:	

EiTai **Eitai (Xiamen) New Energy Technology Co., Ltd.**

TradeMessenger

Solar Panel

> Brand: EITAI
> Optional Mono/Poly Blue/Black Panels
> 25 years Warranty
> Excellent mechanical load resistance
> PID Resistant,High salt and ammonia

Growatt Hybrid Inverter

> Brand:Growatt
> Power: 10KW
> Type: Three Phase Hybrid
> Max.Efficiency： 93%
> Panel Input Max Volatage:1000V

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PV Cables& Connector

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> MC 4 compatible Connector

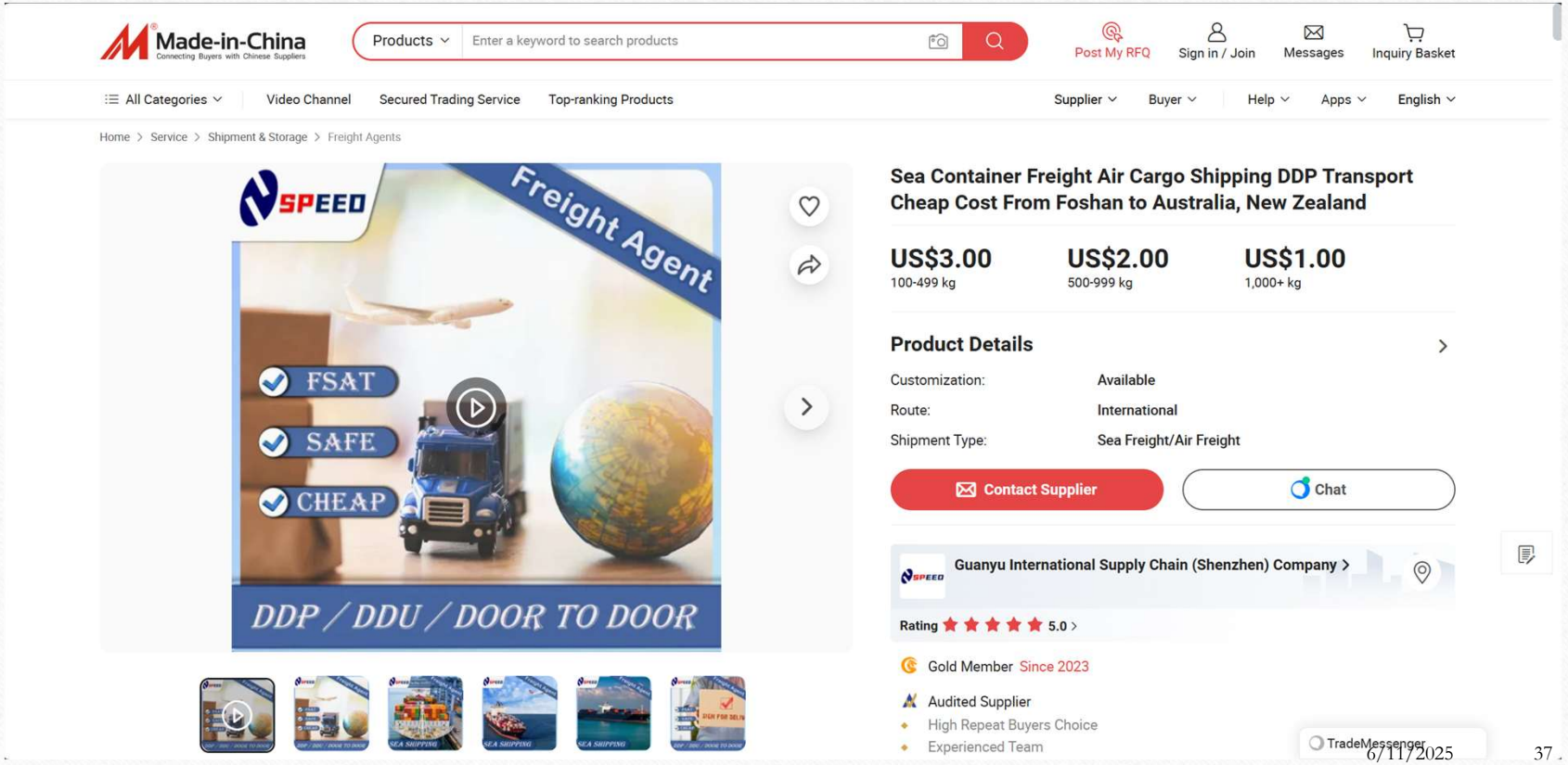
Ground Bracket

> Easy and Quick Installation
> Flexibility and Stability
> High Precision Construction
> Excellent Environmental Protection
> Superb Quality

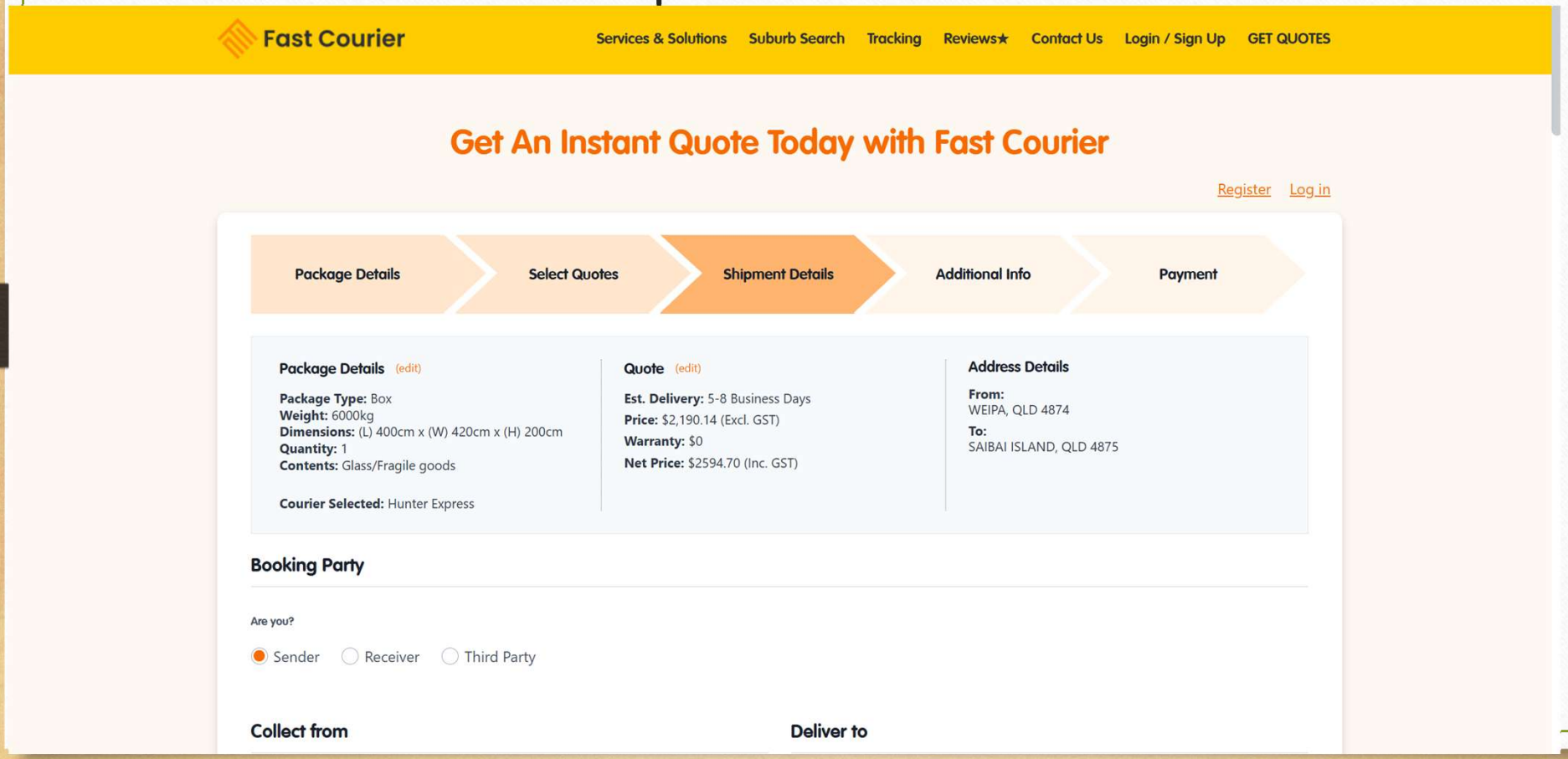
Roof Bracket

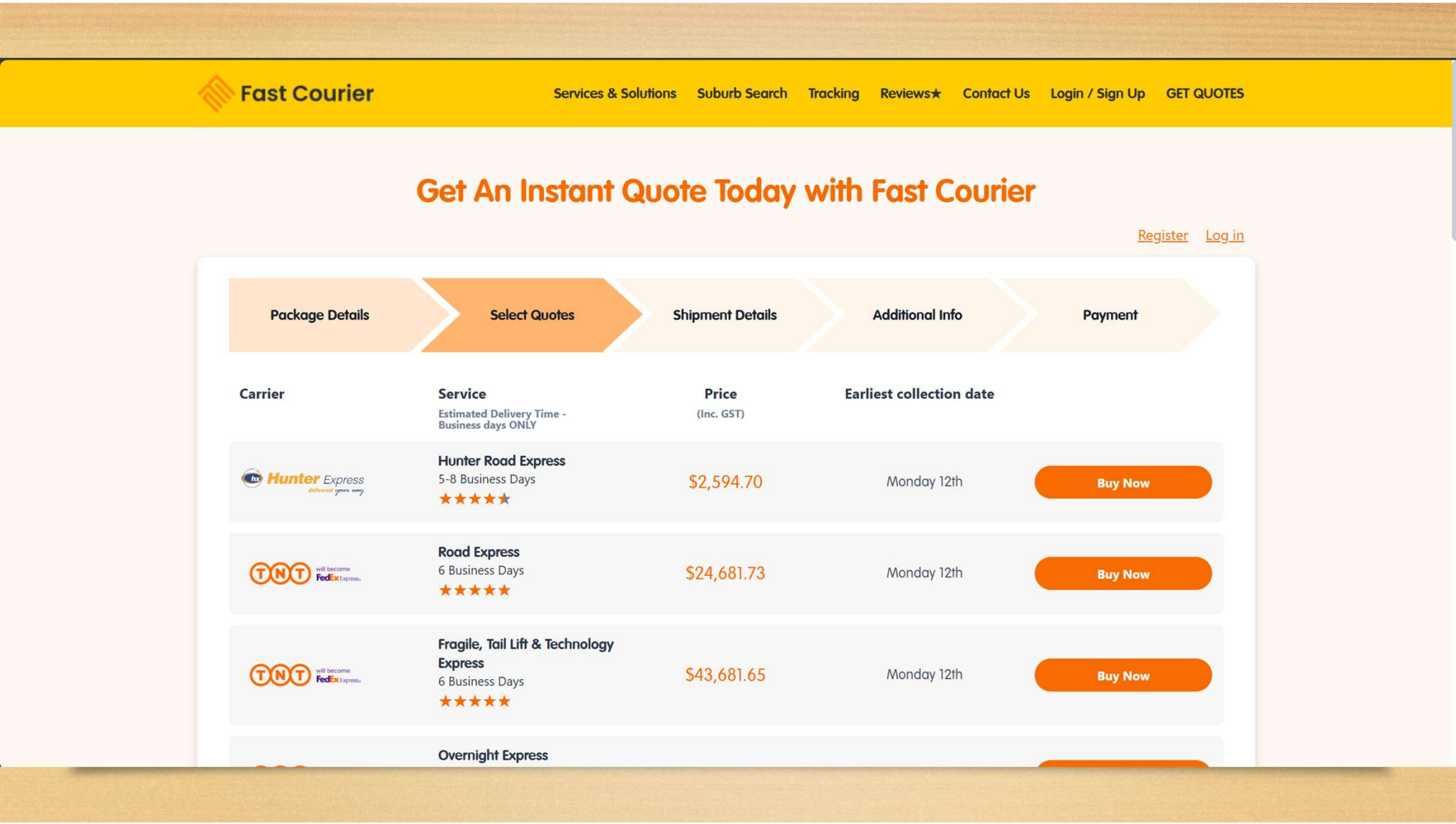
> Flexible rooftop mount system
> Significant savings
> Compatible with most modules
> Static reliability
> Maximum service life

China to weipa



Weipa to SAIBAI

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Services & Solutions
Suburb Search
Tracking
Reviews★
Contact Us
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Get An Instant Quote Today with Fast Courier
Register
Log in
Package Details
Select Quotes
Shipment Details
Additional Info
Payment
Carrier
Service
Estimated Delivery Time - Business days ONLY
Price
(Inc. GST)
Earliest collection date
Hunter Express
Hunter Road Express
5-8 Business Days
$2,594.70
Monday 12th
Buy Now
TNT will become FedEx Express
Road Express
6 Business Days
$24,681.73
Monday 12th
Buy Now
TNT will become FedEx Express
Fragile, Tail Lift & Technology Express
6 Business Days
$43,681.65
Monday 12th
Buy Now
Overnight Express

What Are the Key Price Trends in China's Battery Recycling Market?

End-of-Life Battery Pricing

NCM EOL battery prices currently stand at 23,000-25,000 yuan per tonne, reflecting their higher content of valuable metals. In contrast, LFP EOL battery prices have declined to 7,000-8,300 yuan per tonne from previous levels of 7,500-8,600 yuan per tonne.

This significant price differential of approximately 200% between NCM and LFP scrap highlights the economic challenges in LFP recycling, where material recovery values are substantially lower. The price gap underscores why many recyclers prioritize securing NCM feedstock despite the growing prevalence of LFP batteries.

RECYCLING COST

7000 to 8300 Yuan per tonne

1517.49 AUD to 1,799.30 AUD

BATTERY RECYCLING STATE IN AUSTRALIA

NEWS

'Urgent' need to establish lithium-ion recycling facilities as toxic waste soars

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Australia's love affair with lithium-ion batteries continues to grow exponentially through e-bicycles, e-scooters and handheld electronics, but is it an environmental disaster in the making?

Just 10 per cent of lithium-ion batteries (LIBs) in Australia are collected and sent offshore for processing, with the rest either stockpiled or put in landfill where they can cause "significant environmental harm".

Edith Cowan University senior research engineer Dr Yasir Arafat and Professor Daryoush Habibi have been working to raise awareness about Australia's "alarmingly low" recycling rate for LIBs which, in landfill, can lead to the leakage of hazardous metals like cobalt, nickel and manganese.

"The release of [these] toxic substances ... and lithium hexafluorophosphate (an electrolyte) into irrigation systems can harm aquatic life and pose serious health risks, including asthma, cancer, eye damage, reproductive toxicity, skin sensitisation, damage to bones and kidneys for nearby residents," Dr Arafat said.

He said stockpiles at waste management facilities also increased the much-reported risk of battery-related fires, with "approximately 10,000

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Aspect	LiFePO4	Lithium-Ion
Composition	Lithium, Iron, Phosphate	Lithium compounds (Cobalt, Nickel, Manganese)
Safety	Very safe, less prone to overheating or fire	Can overheat and catch fire if damaged or mishandled
Energy Density	Lower than Lithium-Ion	Higher, ideal for compact and lightweight devices
Lifespan	Long (up to 10 years)	Shorter (2-3 years)
Weight	Heavier	Lighter
Temperature Range	Wider (-20 to 60°C)	Narrower (0 to 45°C)
Voltage	Lower, more stable	Higher, quicker energy discharge
Cost	Higher upfront, long-term value	Lower upfront, more frequent replacements

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	Postcode	Customer/Consumption Type	Year	Data Type	July	August	September	October	November	December
7615	4875	Business	2022	Energy per customer per day (kWh)	110.755221	115.916882	115.555915	121.418364	125.331313	115.899589
7616	4875	Business	2023	Total Energy (kWh)	2100041	2014868	2004672	2170458	2191130	2272785
7617	4875	Business	2023	Customer Count	598	598	603	600	601	600
7618	4875	Business	2023	Energy per customer per day (kWh)	113.283042	108.688532	110.816575	116.691297	121.526916	122.192753
7619	4875	Business	2024	Total Energy (kWh)	2240612	2248907	2157306	2279532	2382391	2364561
7620	4875	Business	2024	Customer Count	604	604	582	575	574	577
7621	4875	Business	2024	Energy per customer per day (kWh)	119.665264	120.108262	123.557024	127.883986	138.350259	132.194393
7622	4875	Residential	2020	Total Energy (kWh)	1605832	1786725	2104179	2260831	2286052	2350694
7623	4875	Residential	2020	Customer Count	2378	2392	2385	2380	2378	2381
7624	4875	Residential	2020	Energy per customer per day (kWh)	21.783441	24.095441	29.408515	30.642865	32.044461	31.847479
7625	4875	Residential	2021	Total Energy (kWh)	1838673	1818607	2006172	2203389	2214392	2253671
7626	4875	Residential	2021	Customer Count	2392	2389	2379	2379	2380	2377
7627	4875	Residential	2021	Energy per customer per day (kWh)	24.796005	24.556198	28.109465	29.876871	31.013898	30.584382
7628	4875	Residential	2022	Total Energy (kWh)	2028121	2070667	2146215	2262739	2164583	2179657
7629	4875	Residential	2022	Customer Count	2383	2390	2394	2394	2397	2394
7630	4875	Residential	2022	Energy per customer per day (kWh)	27.454163	27.947999	29.883244	30.489381	30.101280	29.369889
7631	4875	Residential	2023	Total Energy (kWh)	1963690	1819954	1635294	1831571	1969678	2229345
7632	4875	Residential	2023	Customer Count	2391	2395	2400	2398	2400	2403
7633	4875	Residential	2023	Energy per customer per day (kWh)	26.493031	24.512813	22.712412	24.638422	27.356643	29.926909
7634	4875	Residential	2024	Total Energy (kWh)	1957669	1957602	1795811	1949725	2087249	2276442
7635	4875	Residential	2024	Customer Count	2398	2398	2176	2146	2121	2113
7636	4875	Residential	2024	Energy per customer per day (kWh)	26.334701	26.333798	27.509353	29.307713	32.802909	34.753249
7637	4875	Solar	2020	Total Energy (kWh)	15773	19453	21339	24016	19919	14364
7638	4875	Solar	2020	Customer Count	51	53	52	53	54	50
7639	4875	Solar	2020	Energy per customer per day (kWh)	9.976427	11.840224	13.679056	14.617293	12.295662	9.266969
7640	4875	Solar	2021	Total Energy (kWh)	14671	16358	17897	19914	17238	14495
7641	4875	Solar	2021	Customer Count	51	55	56	53	53	53
7642	4875	Solar	2021	Energy per customer per day (kWh)	9.279366	9.594049	10.653093	12.120764	10.841646	8.822155
7643	4875	Solar	2022	Total Energy (kWh)	13891	15030	15649	17024	14280	11628