



POWERING
AUSTRALIA

Second-Life Lithium-Ion Battery Systems

Policy Analysis & International Standards Landscape



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01.

EXECUTIVE SUMMARY

Powering Australia Limited ("PAL"), (the team behind the Future Battery Industries Cooperative Research Centre) is currently operating the Powering Australia Industry Growth Centre (Powering Australia) under its four-year, \$34 million Federal funding allocation. The center continues to drive success across the clean-tech manufacturing sector by connecting businesses, accelerating commercialisation activity, and building national workforce capability.

Ratel Consulting LLC ("Ratel") provides market intelligence and advisory services to its clients throughout the energy storage value chain. Since 2017 we have focused on commercialisation and growth strategies in emerging battery technology for startups, corporations, and universities as well as government, industry groups, finance, and professional service providers. Ratel creates business cases, technical marketing content, policy assessments, competitive analysis, product benchmarking, and other custom solutions that add value and build industry presence for clients.

PAL needs a policy assessment of the international regulatory and standards environment governing the repair, reuse, repurposing and remanufacturing of second-life lithium-ion battery systems in stationary energy storage applications. There is no current Australian standard for remanufacturing batteries equivalent to UL1974/IEC63338. This leaves PAL with a strategic choice: integrate remanufacturing requirements into AS5377 as a sub-part, or adopt IEC63338/UL1974 (or another leading standard) entirely.



AUSTRALIA LACKS A STANDARD FOR SECOND-LIFE BATTERIES.

The intended outcome of this engagement is to accelerate adoption of UL1974, or another suitable standard, by informing a standards committee with the research and policy analysis needed to inform this decision.

The EU is closest to integrating repair, reuse, and manufacturing into one legal lifecycle policy (EN18060, EN18061); China moved from relying on voluntary GB/T standards to a legally binding reuse framework. The US relies on a voluntary certification standard, UL1974. Australia currently relies on AS5377, a general hazardous-waste, transport, and e-waste standard that does not cover second-life grading or testing.

RECOMMENDATION.

We recommend PAL oversee a voluntary second-life certifications modeled after UL1974 and IEC63330-1 as selected domain guidance. Longitudinal performance data can inform a future legislative standard for all reuse initiatives.



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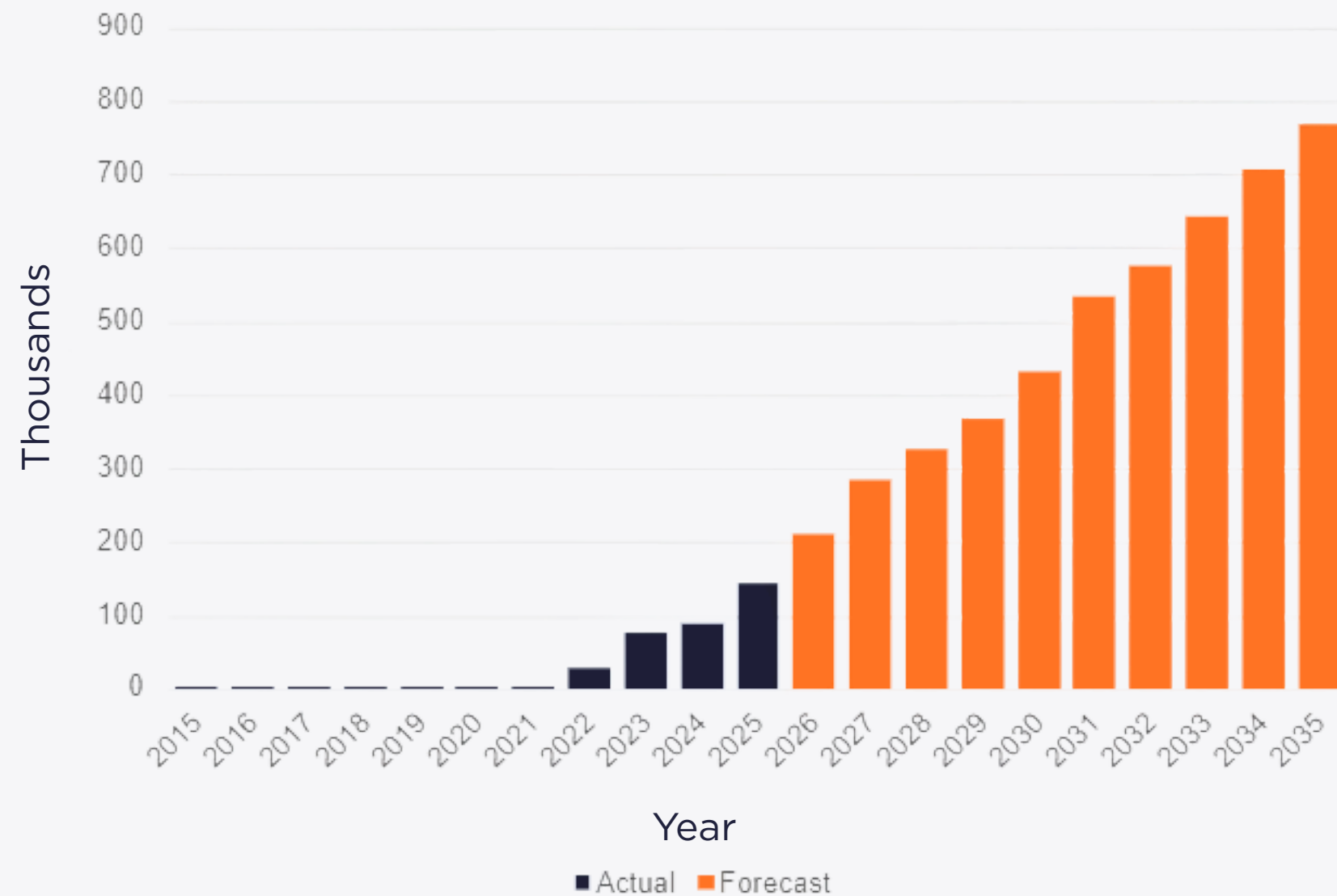
MARKET
CONTEXT

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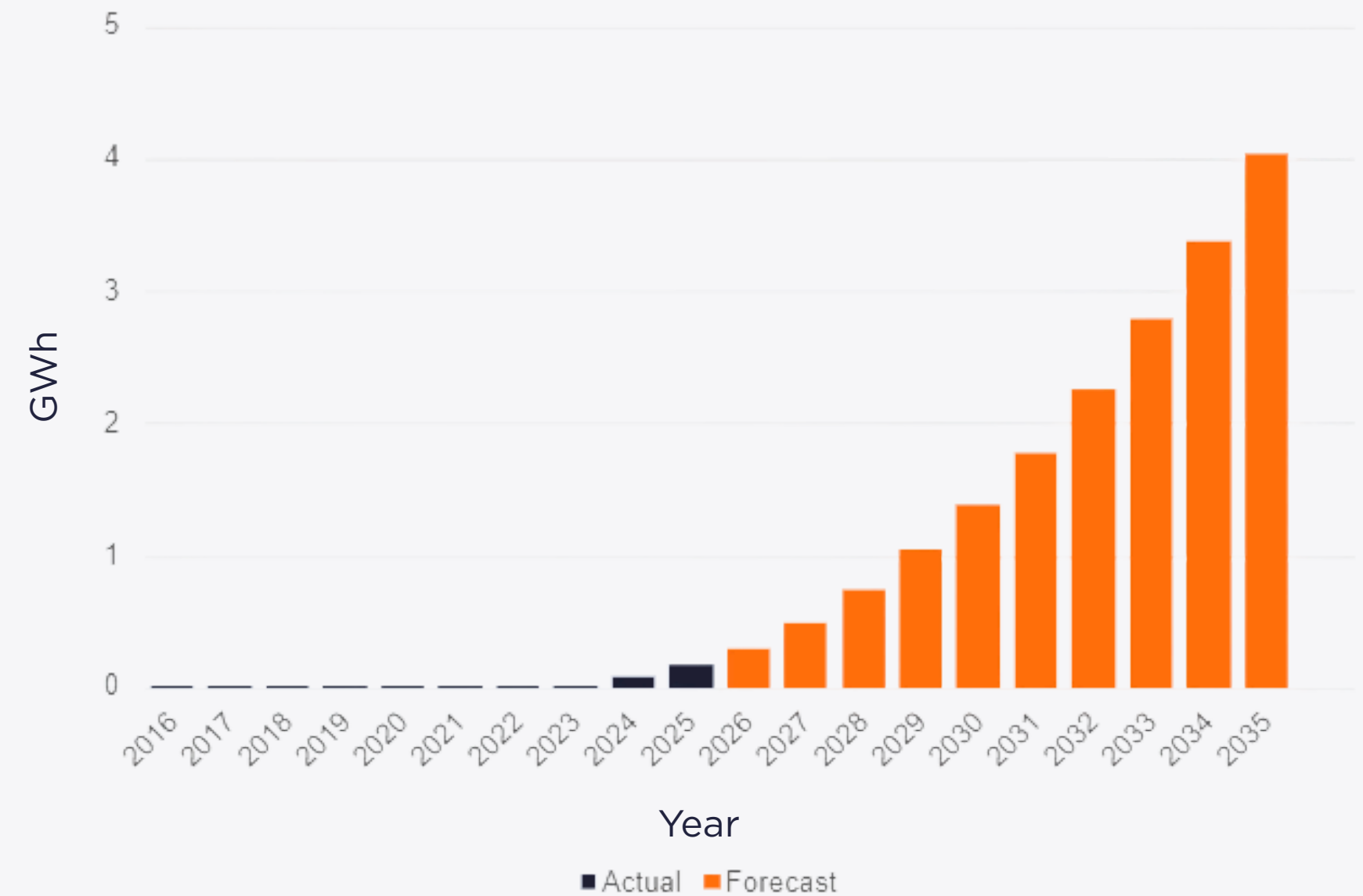
GROWING OPPORTUNITY FOR SECOND-LIFE EV BATTERIES



AU ANNUAL NEW EV SALES



AU SECOND LIFE BATTERY CAPACITY OPPORTUNITY



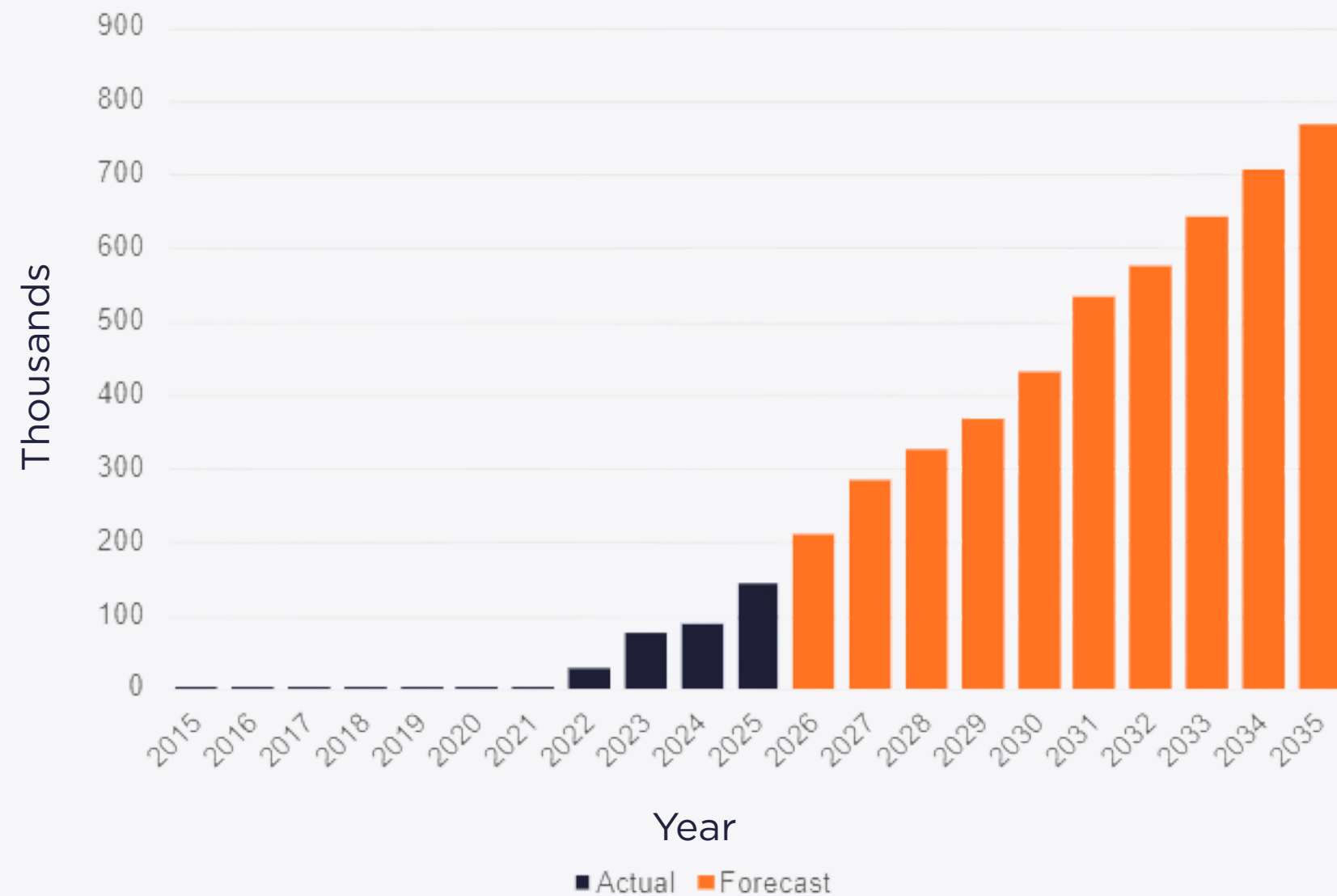
Source(s): Bloomberg, CSIRO, Ratel Consulting

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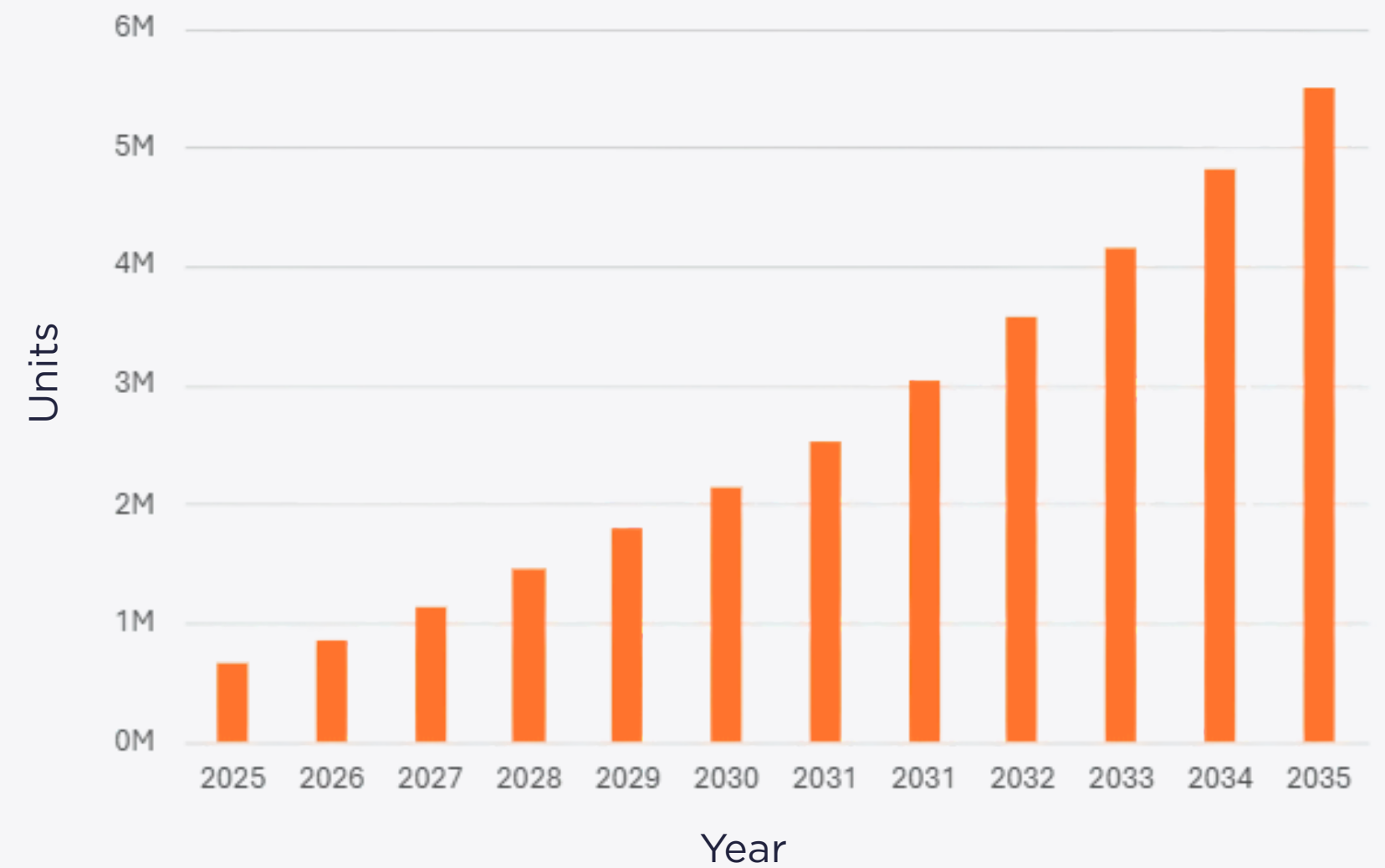
RAPIDLY GROWING EV SALES **& EV FLEET**



AU ANNUAL NEW EV SALES



PROJECTED AUSTRALIAN EV FLEET SIZE (2025-2035)



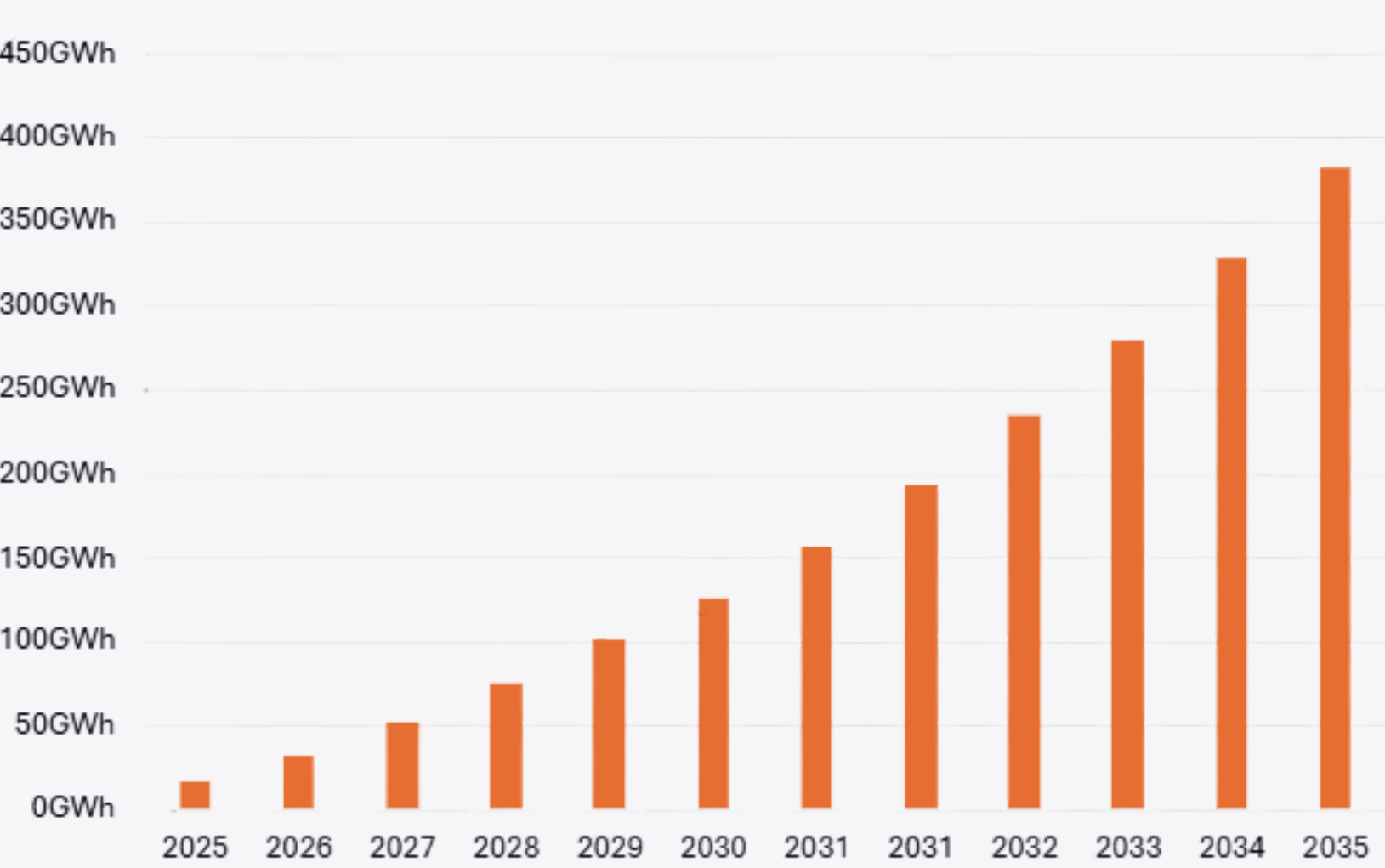
Source(s): Bloomberg, CSIRO, Ratel Consulting

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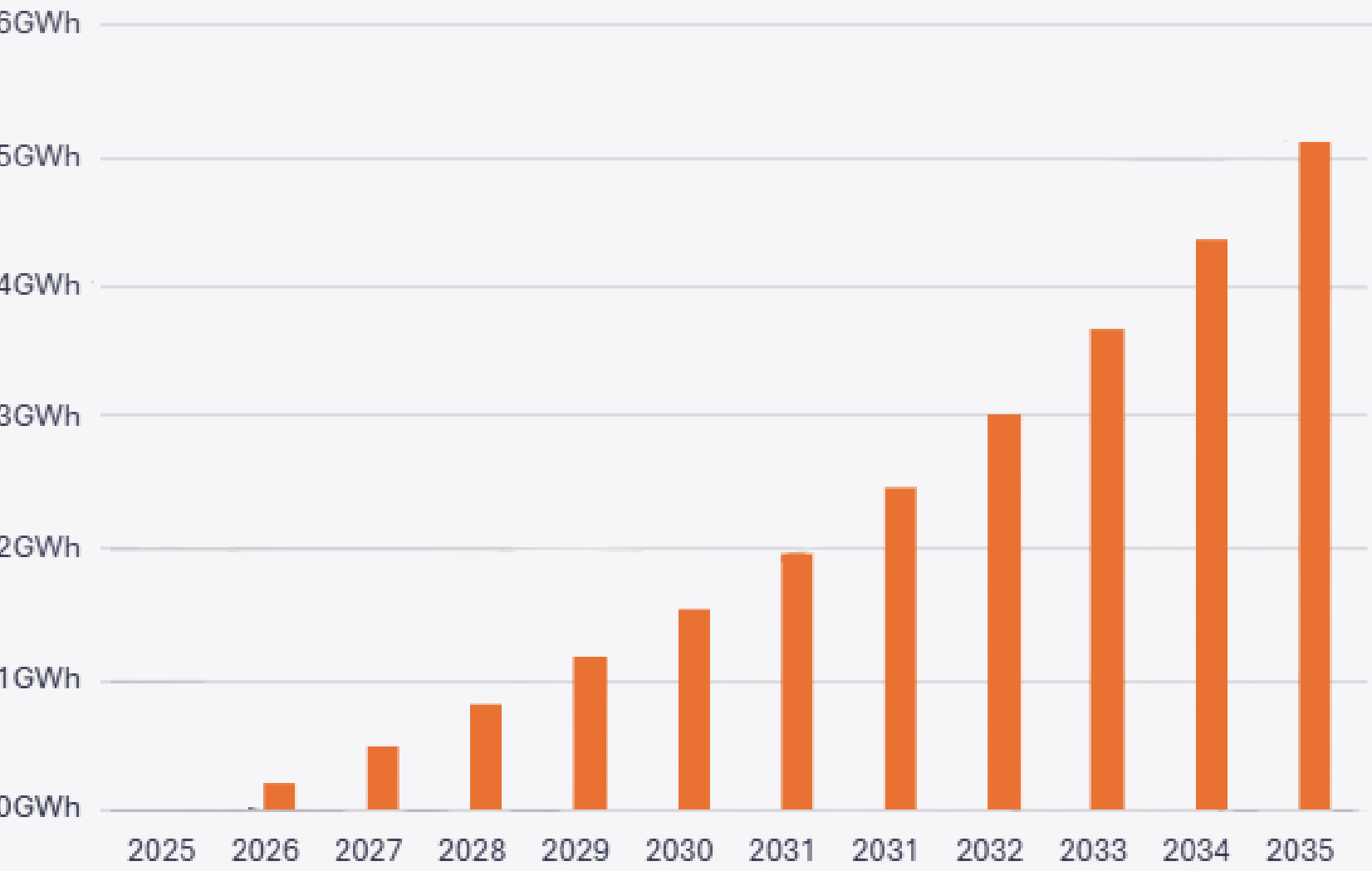
GROWING OPPORTUNITY FOR SECOND-LIFE EV BATTERIES



AU EV BATTERY FLEET



AU EV BATTERY FLEET AVAILABLE FOR 2L



Source(s): Bloomberg, CSIRO, Ratel Consulting



03

AUSTRALIAN POLICY BASELINE



03.

SECOND-LIFE

AUSTRALIAN POLICY



AUSTRALIA LACKS A **DEVELOPED STANDARD** FOR SECOND-LIFE BATTERIES.

Policy	Description
AS5377:2022	General standard for the "Management of electrical and electronic equipment for re-use or recycling." Covers collection and storage, transport, and preparation for re-use or treatment/recycling of end-of-life electronics. It does not include second-life battery grading, safety testing, or repurposing/remanufacturing evaluation protocols comparable to UL 1974 or IEC63330-1.
Regional Stewardship (B-Cycle)	Australia's national, ACCC-authorised, voluntary battery stewardship framework, run by the Battery Stewardship Council since 2022. Focused on collection and recycling of end-of-life batteries. It does not cover repurposing or second-life certification.
Product Lifecycle Responsibility Act 2025 (NSW)	The NSW Environment Protection Agency (EPA), under the Product Lifecycle Responsibility Act 2025, is converting aspects of this voluntary model into mandatory state policy (planned to take effect in October 2026) amid hopes to increase manufacturer responsibility throughout the battery's life cycle.

03.

WHY THE POLICY GAP MATTERS



SAFETY

- No current mandated test protocol comparable to UL1974's grading/evaluation process for repurposed products
- Australia has no equivalent to EN18061's structured repair/reuse safety steps for high-capacity battery handling and use
- Increased risk with ungraded second-life batteries entering stationary storage without independent verification

DOMESTIC MARKET

- An absence of credible standards slows investment into second-life BESS projects
- Liability and uncertainty without a standard poses risks for repurposers and deters new entrants in the second-life markets
- PAL certification could become a new industry standard ahead of formal legislation

GLOBAL POSITIONING

- The EU (EN18060/18061), US (UL1974), and China (2026 Interim Measures) all have current and established national reuse frameworks
- Australia risks falling behind in tech and innovation if it waits for a global technical standard to be imposed



04

GLOBAL STANDARDS LANDSCAPE

LEADING GLOBAL FRAMEWORKS



EUROPEAN UNION	EU Battery Regulation (2023/1542), CEN/CENELEC standards EN18060 (durability/performance) and EN18061 (safety/repair/reuse preparation).
NORTH AMERICA	UL1974 evaluation for repurposing/remanufacturing. Adoption is voluntary/private-certification not legally mandated.
CHINA	Interim Measures and GB/T standards (38698.1-2020, 44132-2024).
INTERNATIONAL REGULATIONS	IEC 63338 is an international safety standard published in August 2024 that provides general guidance on the safe reuse and repurposing of secondary lithium-ion and nickel-metal hydride (NiMH) cells and batteries.

04.

CHINA



Source / Regulation	Legal Status	Battery Scope	Purpose	Safety Testing	Approval / Cert.	Permitted Applications
Interim Measures for Recycling & Comprehensive Utilisation of Waste NEV Traction Batteries	Mandatory Regulation	New Energy Vehicle (NEV) traction batteries (all chemistries)	Establishes China's regulatory framework for the collection, traceability, reuse, and recycling of retired NEV traction batteries	Requires safe management, traceability, and handling; so specific safety testing requirements	Mandatory regulatory compliance; no standalone recycling certification	Recycling, collection/take-back, reuse
GB/T 38698.1-2020 Packing & transporting	Voluntary national standard	Retired lithium-ion power storage battery packs, modules and monomers of traction battery used in electric vehicle; not applicable to lead-acid batteries	Outlines requirements for the safe packaging and transportation of retired traction batteries to reduce safety risks and support compliance	Specifies safe packaging, labeling, and transportation requirements; not a safety testing standard.	No certification (voluntary technical standard)	Collection, packing, transport, storage
GB/T 44132-2024 Recovery of traction battery	Voluntary national standard	Retired traction batteries	Outlines technical requirements for the recovery of retired traction batteries (including collection, storage, transportation, reuse, and recycling)	General safety requirements for battery recovery, handling, storage, reuse, and recycling; not a safety testing standard.	No certification (voluntary technical standard)	Recovery/recycling

Source(s): China Insights

04.

EUROPEAN UNION



Source / Regulation	Legal Status	Battery Scope	Purpose	Safety Testing	Approval / Cert.	Permitted Applications
EU Battery Regulation (2023/1542)	Mandatory regulation	All battery categories (EV, industrial, LMT, portable, etc.)	Legal framework for safety, performance, collection, recycling, and lifecycle management of batteries placed on the EU market.	Requires compliance with applicable safety requirements; does not require specific test methods; references EN18060/18061 as compliant framework	Mandatory regulatory compliance; CE marking may be required where applicable, but no standalone battery reuse certification	Production, use, recycling, reuse
EN18060:2025 Performance & durability	Voluntary harmonised European standard	Rechargeable batteries with internal energy storage. Alkali-Ion (Li-Ion, Na-Ion), Pb, NiMH and combined chemistries EV modules and batteries	Methods for performance evaluation and durability of used EV batteries intended to be reused for second-life purposes	Outlines specific performance and durability testing for second-life battery assessment	No mandatory certification; voluntary conformity assessment/testing	Outlines test methodology, not a repurposing standard
EN 18061:2025 Safe repair & reuse	Voluntary harmonised European standard	Battery systems, battery packs and battery modules designed for EV applications for alkali-ion (Li-ion, Na-ion), Pb, NiMH and combined chemistries	Requirements for the safe repair, repurposing, and reuse of electric vehicle batteries to support second-life applications while maintaining safety and quality	Outlines specific safety protocols, requirements, verifications, and conditions for battery repair and reuse.	No mandatory certification; voluntary conformity assessment/testing.	Steps, conditions and protocols for safe maintenance and repair to facilitate remanufacturing, re-use and preparation for repurposing

Source(s): ITEH Standards

04.

NORTH AMERICA



Source / Regulation	Legal Status	Battery Scope	Purpose	Safety Testing	Approval / Cert.	Permitted Applications
UL1974 (ANSI/CAN/UL 1974:2023) Evaluation for Repurposing or Remanufacturing Batteries	Voluntary private certification standard	Used EV, industrial, and stationary batteries/battery packs, modules, and cells evaluated for repurposing or remanufacturing	Provides requirements for evaluating used batteries to determine suitability for repurposing/remanufacturing.	Requires rigorous evaluation and testing to comply with product standards; includes the following health checks: HV isolation, BMS, OCV, capacity, internal resistance, self-discharge, and visual inspection	Voluntary UL certification conferred (by accredited certification bodies) after thorough audit and evaluation process	Energy storage systems and other repurposed-battery applications; does not cover aftermarket repair by non-OEM entities

INTERNATIONAL – IEC



Source / Regulation	Legal Status	Battery Scope	Purpose	Safety Testing	Approval / Cert.	Permitted Applications
IEC63330-1:2024: Repurposing of Secondary Batteries	Voluntary international standard	Secondary lithium ion batteries, modules, packs, and systems, with lifetime traceability (does not cover the redox flow, Ni-MH and Pb-acid batteries)	Establishes general requirements and evaluation procedures for repurposing used batteries for second-life applications	Requires evaluation of battery performance and safety before repurposing based on recorded BMS data (no independent physical testing mandated)	No certification (voluntary standard)	Repurposing to other applications, e.g. ESS
IEC63338:2024 General guidance on reuse and repurposing	Voluntary international guidance document	Secondary lithium ion and Ni-MH cells/batteries with lifetime traceability.	Provides general guidance on the safety, environmental, and regulatory aspects of battery reuse and repurposing	Guidance on safety assessment and risk management, not a testing standard	No certification (informational guide)	General reuse & repurposing



05

STANDARDS COMPARISON

05.

STANDARDS COMPARISON



Criteria	UL 1974	IEC 63330-1/63338	EN18061/18060	AS4377 (AU)
Scope	Repurposing & remanufacturing of packs/modules/cells	Repurposing (63330-1: Li-ion); reuse/repurposing (63338: Li-ion + NiMH)	Performance testing (18060) + safe repair/reuse (18061) for EV batteries	General e-waste collection/storage/transport /treatment (no second-life scope)
Technical/Test Requirements	Physical testing required: OCV, HV isolation, capacity, resistance, cycling, self-discharge, visual inspection, etc.	Relies on OEM BMS traceability data; no required independent testing	18060 outlines measurement methods; 18061 defines repair/reuse safety steps	None specific to batteries (general hazardous materials handling)
Battery Grading Standard				
Legal Status	Voluntary, private certification (UL Solutions)	Voluntary International framework	Voluntary EU standard (not yet harmonised)	Mandatory regulation for e-waste
Timeline/Notes	2nd edition published November 2023	Both published 2024	Both published 2025; implementation deadline	Current edition 2021/2022; no announced second-life sub-part or future timeline



06

GRADING & REUSE CRITERIA

06.

TOP INDUSTRY BATTERY REUSE & GRADING CRITERIA



NEW MANUFACTURE GRADING

GRADE A



Battery shows little signs of degradation and passes rigorous safety testing.

GRADE B



Battery shows some signs of degradation but passed basic safety testing and has a performance at ~80%-90% of A-grade cells.

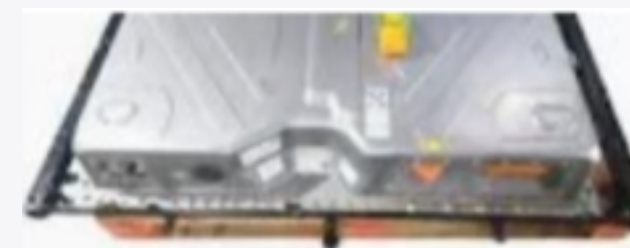
GRADE C



Battery has noticeable appearance issues and significant deviation from performance parameters. There are significant safety risks.

Only A Grade
in EVs

SECOND-LIFE GRADING – CAPACITY/AGE PRICING



LiFePO4 # BAT-2025-00034
Audi Q4 e-tron 35 (2023)
€12,000
Glasgow, United Kingdom
Capacity: 52 kWh Health: 90%
BMS Data Passport



Lithium-ion # BAT-2025-00033
Porsche Taycan Turbo S (2024)
€22,000
Edinburgh, United Kingdom
Capacity: 93.4 kWh Health: 97%
BMS Data

State of Health (SoH) and capacity thresholds, BMS data

Cycle count, cell chemistry, format, and manufacture traceability

No mandated chain-of-custody or provenance documentation

No agreed test protocol to qualify packs for stationary reuse

Source(s): batteryex.co.uk/batteryex-marketplace-is-now-live-in-beta

06.

OPERATIONAL / BMS DATA



RELIES ON OEM BMS DATA: IEC 63330-1 / 63338, EN18060 / EN18061

- State of Health & capacity taken from OEM-recorded history (not independently re-measured)
- IEC6330-1 requires a secondary battery’s operational history and thermal fault records be fully traceable before it can be legally certified for a second-life application
- Requires cycle count/depth-of-discharge (DoD) history as health parameters, does not permit repurposing without it
- Thermal & fault history reviewed from OEM records where available
- A past "critical thermal event" or extreme temperature overexposure logged disqualifies the battery from reuse
- Assumed reliable if OEM-provided, not independently tested

INDEPENDENTLY TESTED: UL1974

- State of Health & capacity independently measured by physical capacity test
- No reliance on OEM data (cycle history reviewed if available, but not required if physical tests pass)
- Visual inspection surveys for burning, leaks, deformations
- Requires "check of BMS controls and protection components"

BMS Data Point	UL 1974	IEC 63330-1/63338	EN18060/18061
State of Health/Capacity	Independently measured via capacity test	Derived from OEM BMS records, independent verification not required	EN 18060 defines measurement methods (rated capacity, power, internal resistance, efficiency)
Cycle Count/DoD	Reviewed if available, not required	Required; repurposing is not permitted without	Referenced as context for reuse safety standards
Thermal/Fault History	Visual inspection covers physical damage signs	Relies on OEM records	Requires review before repair/reuse, storage temperature limits set
BMS Check	Requires "check of BMS controls and protection components"	Not independently tested if traceability data is present (assumed functional)	Not independently tested if traceability data is present (assumed functional)

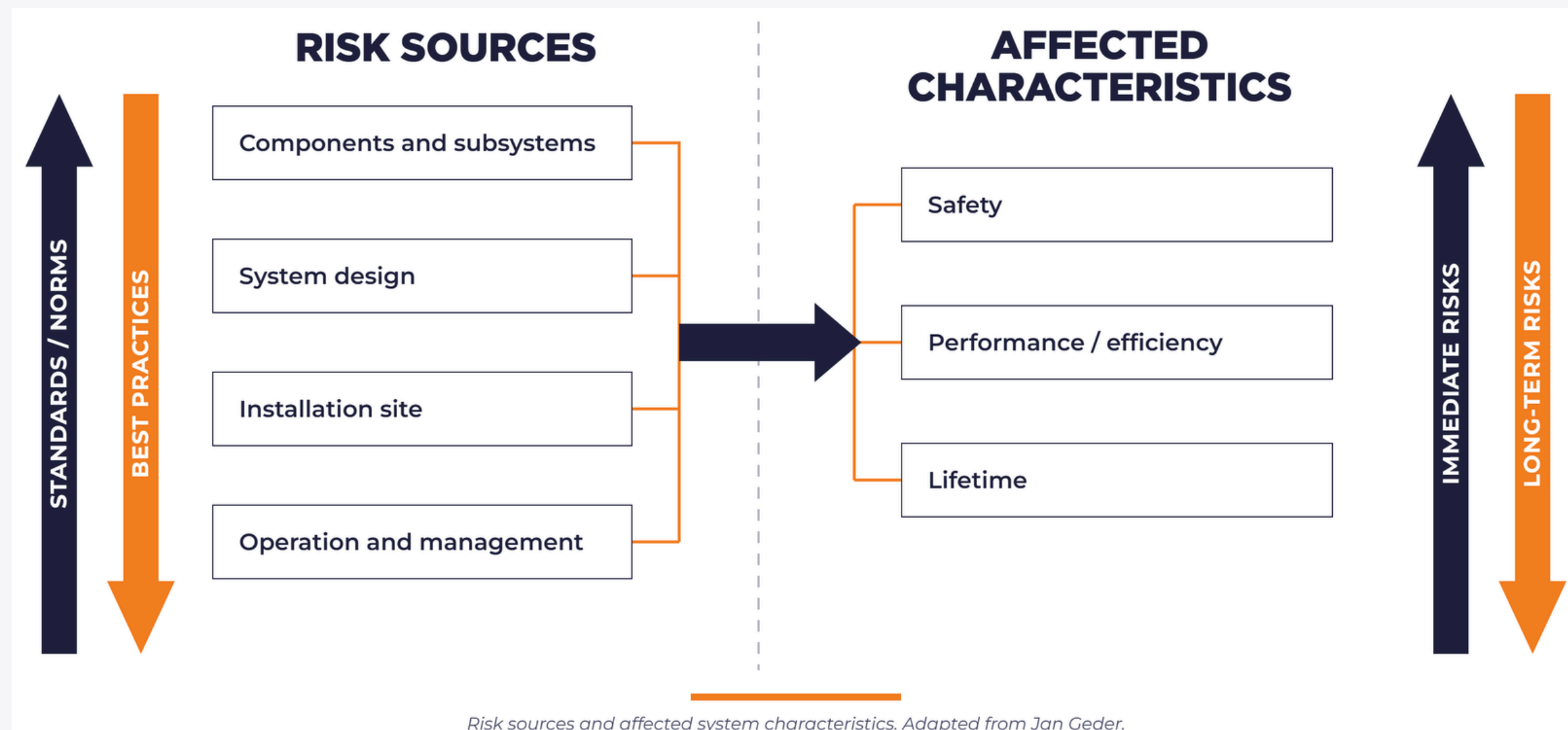
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BANKABILITY / INSURABILITY



TECHNICAL QUALITY ASSURANCE: MITIGATING RISK WHILE MAINTAINING PROFITABILITY FOR LENDERS AND INVESTORS

MAIN SOURCES OF RISK



FURTHER BREAKDOWN

COMPONENTS

Are the cells, modules, BMS, converters, etc. properly tested/certified, and to which standard?

SYSTEM DESIGN

Was it engineered to maintain its cycle and health?

INSTALLATION SITE

Temperature, ventilation, physical security, seismic & weather exposure

OPERATION

Maintenance, monitoring, record-keeping

06.

BANKABILITY / INSURABILITY



MITIGATING RISK: THE STANDARDS QUALITY PYRAMID

TIER 3 — INDIVIDUAL QUALITY CRITERIA

Criteria built for the specific project

TIER 2 — BANKABILITY AND INSURABILITY

Takes into account current market requirement, keeps in pace to create high-quality and standard projects

TIER 1 — STANDARD MARKET CRITERIA

IEC/UL/national standards. REACTIVE approach, only follows basic regulations.

TAKEAWAY FOR PAL.

Tier 1 standards (IEC/UL/national standards) that encourage basic compliance are not enough to engage financing in the second-life market.

To fill this gap, PAL can offer a Tier 2 certification (at the "sweet spot" between bankability, insurability, ROI, and technical safety), to encourage investment and confidence in the present status and future of bankable energy storage systems.



07

POLICY

PATHWAYS

07.

PATHWAY A – INTEGRATE INTO AS5377 AS A SUB-PART



PROS

- Specifically relevant to Australia
- Long term regulatory enforcement and future legislative standard

DRAWBACKS

- Speed to market; slow formal standards development/revision process
- Difficulty aligning to international standards
- Requires development of technical and Grading/SoH standards
- Low flexibility as a formal standard
- Slow Australian data generation

07.

PATHWAY B – ADOPT IEC63338 / UL1974 IN ENTIRETY



PROS

- Fast adoption
- Strong international alignment
- Strong existing technical foundation and grading standards
- Easy industry uptake for companies familiar with existing standards

DRAWBACKS

- May lack relevance to Australia specifically
- Adoption of the standard itself does not create a PAL certification

07.

PATHWAY C – CERTIFICATION BASED ON IEC63338 / UL1974



PROS

- Fast speed to market
- Australian relevance
- Strong international alignment
- Can combine strongest existing technical and grading standards
- Creates a PAL certification
- Creates a practical entry point for industry uptake
- High flexibility as industry evolves
- Generates Australian data

DRAWBACKS

- Voluntary; not a legal enforcement
- Requires thorough scoping so as not to overlap with current standards

07.

DECISION MATRIX



	Pathway A	Pathway B	Pathway C
Timeline for Adoption	✓	✓ ✓ ✓	✓ ✓ ✓
Alignment with Global Markets	✓	✓ ✓ ✓	✓ ✓ ✓
Cost to Develop/Adopt	✓	✓ ✓ ✓	✓ ✓
Industry Standard Safety	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓
Australian Relevance	✓ ✓ ✓	✓	✓ ✓ ✓
Flexibility/Ability to Adapt	✓ ✓	✓	✓ ✓ ✓
Regulatory Recognition	✓ ✓ ✓	✓ ✓	✓
TOTAL	14	16	18



08

RECOMMENDATION & NEXT STEPS PATHWAYS

08.

RECOMMENDATIONS



RECOMMENDED PATHWAY: PATHWAY C.

- Develop a voluntary Tier 2 certification focused on quality assurance, bankability, and insurability rather than mandatory requirements
- Leverage existing UL1974 standard requirements

PRIORITY ACTIONS (12 – 18 MONTHS)

DEFINE CERTIFICATION SCOPE

Identify applications covered, exclusions, and ensure it is complementary to safety regulations

DEFINE CERTIFICATION SCOPE

Standardise capacity test, visual inspection, access to BMS data

BEGIN ENGAGING INSURERS AND FINANCIERS

PILOT CERTIFICATION

Select 2–5 projects across different applications to validate technical requirements, audit process, cost, and market acceptance

OPEN RISKS

MARKET ADOPTION

Developers may not pursue certification if it remains voluntary. Certification needs clear commercial value.

COST BURDEN

Certification may discourage smaller second-life providers.

08.

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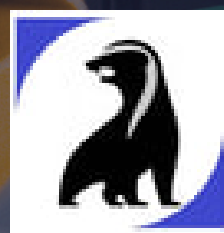
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