Dear respected Sir/Madam,

Re: Submission on Essential Energy's Islandable Microgrids Trial Waiver Application

Please find attached the submission from the Centre for Smart Power and Energy Research (CSPER), Deakin University, titled "Essential Energy Islandable Microgrids Trial Waiver Application." It responds to the Australian Energy Regulator's consultation on Essential Energy's proposal to trial islandable microgrids.

We support the trial in principle, subject to common waiver conditions, site-specific verification and public reporting. We recommend that each site demonstrate safe islanding and reconnection and report how much customer supply it preserves during an upstream outage, for how long and at what cost. Comparing those results with existing restoration and backup arrangements would give the AER a common basis for assessing different sites and ownership models.

Prepared by Dr Alireza Ganjovi and Associate Professor Saman A. Gorji, the submission draws on our work in OPAL-RT hardware-in-the-loop testing and battery diagnostics, our research on operating evidence and shared infrastructure, and our earlier submission on Essential Energy's EV charging waiver. Its six recommendations set out how to assess site entry, verify performance, protect customers, reserve battery capacity for outages, account for costs and revenues, and maintain supply when a site exits the trial.

We welcome the opportunity to discuss these recommendations and help design a trial that gives the AER the evidence it needs to decide where islandable microgrids can improve reliability and resilience for customers.

Yours sincerely,

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Essential Energy Islandable Microgrids Trial Waiver Application

Submission to the Australian Energy Regulator
Centre for Smart Power and Energy Research, Deakin University
Alireza Ganjovi and Saman A Gorji

Submission context

Essential Energy seeks a waiver of up to five years from specified registration, technical and ring-fencing requirements to trial islanding at around ten microgrid sites, with scope to seek approval for additional sites. Each microgrid would operate as part of the grid under normal conditions and could disconnect to supply customers locally during an upstream outage. Existing metering, settlement and tariff requirements would continue to apply [1]. Separately, Essential Energy has announced plans for 8 MWh of battery storage at each of two Far West sites, paired with 3.25 MW of solar at Wilcannia and 3.75 MW at Sunset Strip/Menindee [2]. The trial should establish how much customer load each site can sustain, for how long and under what outage conditions.

Executive summary and recommendations

CSPER supports the trial in principle and recommends that the AER make any waiver conditional on common safeguards, site-specific verification and public reporting. Each site should demonstrate safe islanding and reconnection, then report how much customer supply it preserves during an upstream outage, for how long and at what cost, including when battery charge is low. Comparing those results with existing restoration and backup arrangements would give the AER a common basis for assessing ownership models and deciding which arrangements warrant continued use.

Decision	CSPER recommendation
1. Site entry	Use a signed site dossier and reserve prior AER clearance for novel or out-of-scope deployments.
2. Benefits	Compare each event with existing restoration and backup. Count partial, failed and unattempted islanding.
3. Technical release	Require witnessed commissioning for safe separation, sustained supply and reconnection.
4. Customers and markets	Preserve consumer protections and agree interruption, metering and settlement protocols before operation.
5. Ownership and costs	Apply the same service specification to all owners. Protect the outage reserve and trace costs and revenues.
6. Review and exit	Publish annual results, require corrective action and fund a viable supply fallback at each site.

1. CSPER background and scope

CSPER's work in OPAL-RT hardware-in-the-loop testing and battery diagnostics informs our proposed site checks. These include testing how islanding controllers respond to faults and verifying how much battery energy remains available to sustain supply at low charge [3]. Our Energy Informatics paper links operating measurements to specific operating and regulatory decisions [4]. Our Next Energy paper sets out how to assess what services a shared asset can reliably deliver, what each service costs and who benefits [5]. Our earlier submission on Essential Energy's EV charging waiver informs our recommendations to limit network participation in contestable services, report against measurable conditions and review those conditions during the trial [6].

2. What the trial should demonstrate · Q1–2

Assess reliability by counting how many customers lose supply and for how long. Assess resilience during severe outages by measuring how long priority loads remain supplied and how quickly service returns to the last affected customers [7, 8]. Before commissioning, record each site's electrical boundary, eligible outage types and priority loads. Use up to five years of feeder records, where available, to establish what existing feeder transfers, repairs and backup generation can deliver, including any fuel constraints. The Far West NSW inquiry documented staged restoration and load shedding. Ofgem's Storm Arwen review tracked restoration through to the last customers reconnected [9, 10].

For each eligible outage, compare observed microgrid performance with the restoration expected under existing arrangements for the same fault, premises and reporting window. Estimate unmet demand by comparing delivered supply with demand inferred from comparable metered intervals. Report a plausible range where demand or restoration timing is uncertain. Where live events are sparse, replay historical outages to test low starting battery charge, limited solar generation and loss of equipment. Report these replays and commissioning tests separately from live outage outcomes [11, 12].

Metric	Site-level reporting
Interruptions	Count affected customers and sum customer-minutes across restoration stages. Include switching interruptions and report the longest outage.
Energy unserved	Estimate MWh of unmet demand, including deliberate shedding.
Critical loads	Record time to first loss, hours at the agreed service level and MWh delivered.
Diesel	Where relevant, compare litres, run-hours and generator output under both cases.

Figure 1 shows how islanding can shorten an interruption for some customers while others remain without supply until the upstream network is restored. The trial should compare the observed restoration timeline with an estimate of what would have happened under existing restoration and backup arrangements, using the same fault, premises and reporting window. Include the initial switching interruption and report the longest customer interruption alongside the aggregate benefit so that early restoration for some premises does not obscure prolonged outages for others.

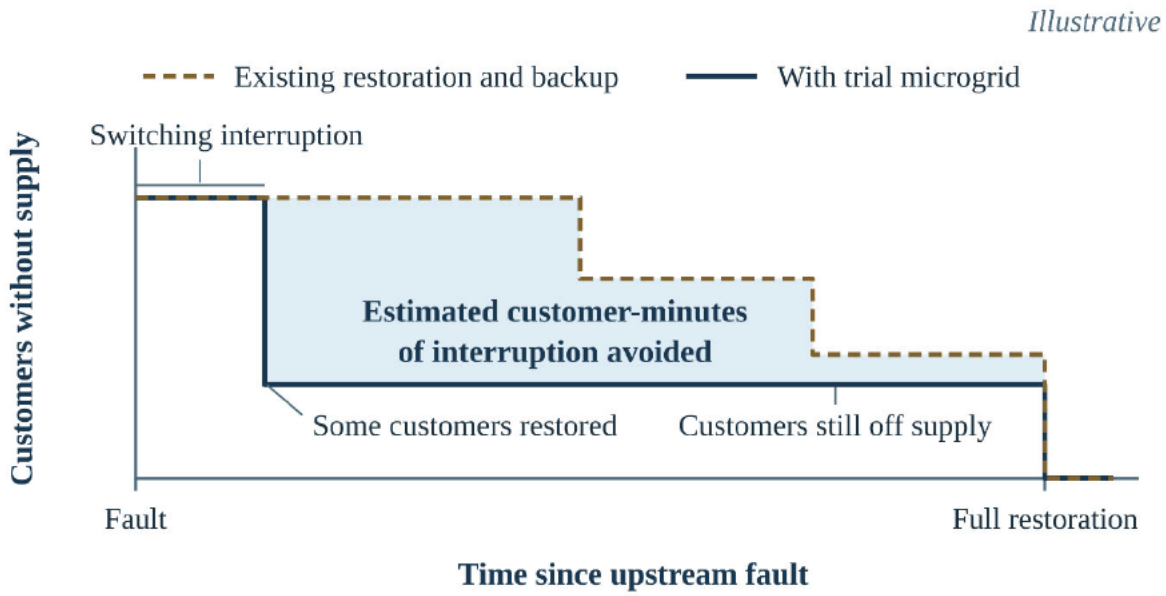

Figure 1. Illustrative comparison of customer interruptions with and without the trial microgrid. The shaded area represents the estimated customer-minutes of interruption avoided.

Sweden's Simris trial illustrates a failed transfer to backup supply. California's Blue Lake Rancheria shows the value of sustaining an emergency response centre [13, 14]. Report physical outcomes before any monetisation, using outage-duration assumptions consistent with AER guidance [15, 16].

3. Program-level waiver and site entry · Q5, Q9

Set common eligibility, safety, consumer, market and ring-fencing conditions. Limit relief at each site to provisions it needs after considering ordinary-rule alternatives. Require an accountable Essential Energy officer to sign the dossier before first reliance, including commissioning that requires relief. Publish a summary. Ausgrid's conditional waiver and California's site studies and operating agreements offer precedents [17-20]. Figure 2 shows how the two site-entry routes converge at commissioning and how material changes trigger reassessment.

Dossier item	Minimum evidence
Site and need	Island boundary, single-line diagram, customer exposure, alternatives and outage baseline.
Relief and authority	Provisions sought, asset owners, switching and dispatch rights, market and metering responsibilities.
Technical limits	Grid-forming source, credible contingencies, available MW and MWh, acceptance limits and test plan.
Customers	Engagement, notices, life-support arrangements, complaints and contingency supply.
Costs and oversight	Funding, regulated cost exposure, revenue allocation, reporting and exit plan.

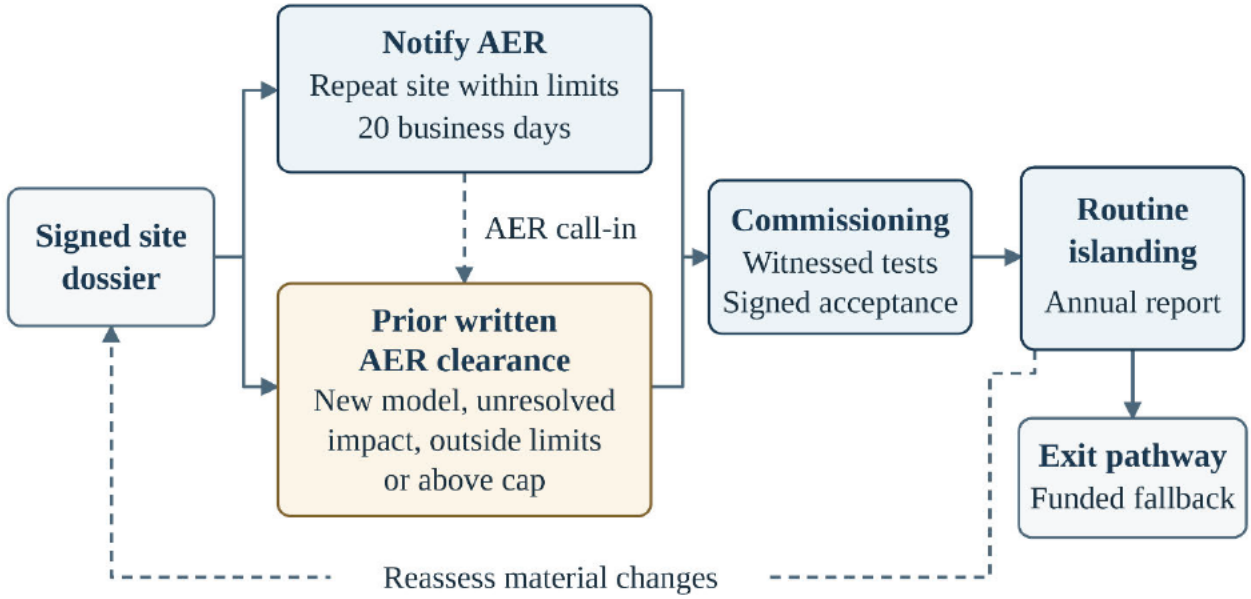

Figure 2. Proposed site entry, review and exit under the program waiver.

For repeat sites within assessed limits and with no new material risks, allow reliance unless the AER calls the site in within 20 business days of confirming the dossier is complete. Require prior written clearance for a materially different operating model, unresolved impacts, departures from assessed limits or expansion. Reassess cumulative changes in topology,

protection, reserve, control, customer exposure, market arrangements or regulated costs against the last accepted dossier [21, 22].

Cap initial reliance at ten independently islandable sections. Count each once from first reliance, including retired sites. Release reservations withdrawn before first reliance and assess each replacement separately. Publish a site register. Above-cap sites require prior clearance and any necessary waiver variation, regardless of funding. Show what each extra site would teach and assess cumulative consumer, competition and cost impacts [1, 17].

4. Safe islanding and reconnection · Q4, Q8

Set site-specific pass limits for voltage, frequency, recovery and fault clearing, with agreed measurement points and windows. Verify protection selectivity and backup clearing in both modes, including earth faults, earthing and inverter current limits [23-26].

Operating case	Evidence required
Planned separation	Verify readiness and demonstrate transfer across permitted import and export conditions.
Unplanned separation	Test upstream faults and breaker failure. Prove isolation and block automatic reclosing onto an energised island.
Sustained operation	Test low charge, source loss, load steps and high solar output. Verify curtailment, shedding and safe shutdown.
Communications loss	Test delay, stale data and link failure. Verify local protection, fallback control and closing interlocks [13, 27].
Load restoration	Test priority blocks, cold-load pickup and black start where offered.
Reconnection	Prove stable upstream supply and verify voltage, frequency and phase at contact closure, allowing for breaker closing time. Restore grid-connected settings. Authorise dead-bus energisation separately.

At minimum permitted starting charge, verify that usable AC energy covers the expected shortfall over the service window with a margin for derating and credible source losses. Verify peak active and reactive power separately. Use validated as-built models and hardware-in-the-loop tests where controls or communications create material uncertainty. Redhouse, Borrego Springs and InterFlex provide precedents. IEEE 2030.8 provides a controller test framework [28-32]. Witness relay injection, breaker timing and controlled transitions. Retain time-aligned traces, settings and signed results. Release routine islanding only after deviations are closed or formally accepted within approved limits.

5. Consumer safeguards and market interfaces · Q3, Q4, Q6, Q12

Customers cannot individually opt out of islanded supply [1]. Keep retail arrangements and consumer protections in force. Give planned interruption notices and accessible outage updates. State which premises have full or partial supply and when the next update is due. Provide a local communications fallback. Reconcile life-support registers and preserve Part 7 obligations, including at least four business days' written notice for planned interruptions where required. During unplanned events, escalate failed contact or likely backup depletion [10, 33-36]. Use a common complaint ID for distributor and retailer handovers. Refer customers to the Energy & Water Ombudsman NSW for independent redress [37, 38].

Party	Responsibility during and after islanding
Essential Energy	Control switching, coordinate the operator, communicate service status and reconcile interruptions.
AEMO	Confirm operational notifications and applicable settlement treatment. Manage market revisions.
Retailers	Maintain customer and life-support contacts. Handle billing, corrections and retail complaints.
Financially responsible market participants	Check exposure at their connection points and raise settlement discrepancies.
Metering Coordinator and Provider	Coordinate metering services and verify configuration, clocks and equipment.
Metering Data Provider	Validate intervals, flag quality and apply authorised substitution or estimation.

Use one event ID to map separation, supply loss and restoration to National Metering Identifiers and trading intervals. Distinguish zero boundary import from customer interruptions and meter communications gaps. Preserve original and revised data. Check whether measured imports, local generation and discharge account for load, charging and losses within metering uncertainty. Assess settlement and unaccounted-for energy separately [39-41].

Before operation, Essential Energy should agree data access, missing-data handling and billing corrections with affected parties. Temporary islanding changes boundary flows and can affect participant exposures even when customers retain supply. AEMO should confirm separation and reconnection interval treatment, dispatch obligations and any applicable stand-alone settlement provisions [42]. The AER and IPART should clarify interruption reporting under their respective frameworks [8, 43]. Resolve these interfaces under existing procedures where possible. Hold affected activities if a material barrier remains. Refer any further waiver to the AER or rule change to the AEMC [1].

6. Ownership, dispatch priority and cost recovery · Q7, Q10–11

Apply the same outage cases, priority load, duration and availability criteria to every delivery model. Compare whole-life costs for equivalent service, including default and early exit [44]. Give providers equal access to service specifications and relevant data. The Ausgrid waiver, British flexibility procurement and EU storage ownership rules inform the proposed procurement safeguards [18, 38, 45].

Delivery model	Evidence specific to the model
Network-owned	Justify ownership against contracted options and identify functions requiring relief.
Third-party	Contract for available MW and MWh, telemetry, performance remedies and step-in rights.
Mixed	Allocate control and maintenance by asset. Test handover and assign default and exit costs.

Give Essential Energy switching authority. Specify who can issue commercial dispatch and override it, and enforce reserve priority in controllers and contracts. Allow commercial dispatch within deliverable capacity remaining after the outage reserve and overlapping commitments. Check MW and duration, set recharge deadlines, log overrides and suspend secondary dispatch when reserve or telemetry is inadequate [5, 12, 46, 47].

The proposal identifies AUD 2.6 million in regulated asset base funding within an AUD 23.8 million program [1]. Require a site ledger for grants, regulated and contestable costs, receipts and customer credits. Assign direct costs to the activity that causes them and document shared cost drivers. Test Essential Energy's proposed proportional allocation of net revenue at asset level, with incremental costs counted once. Ask the AER to confirm site-specific treatment under applicable shared-asset or stand-alone provisions and reconcile credits with regulated recovery [48-50].

7. Reporting, review and exit · Q1, Q13–15

Record every eligible live event, including missed attempts, and keep field tests and modelled replays separate. Use a common record across sites. California's project review and Sandia's resilience framework support reporting failure and recovery alongside successful operation [51, 52].

Event record	Minimum fields
Configuration and chronology	Site and event IDs, settings version, trigger, eligibility and switching and restoration times.
Service and operation	Starting charge, available generation, trips and overrides, interruption and service metrics from Section 2.
Safeguards and action	Notices, life-support escalations, complaints, market exceptions, data quality, action owner and closure.

Publish comparable annual site results and a final report. Report counts of full, partial, failed, unattempted and unverified outcomes. Base the full-service rate on all eligible live events and state when there were none. Include baseline differences, data gaps, costs, waiver use and exit readiness. Give the AER access to underlying records and publish de-identified results as needed. Link each waiver provision to evidence, remaining barriers and recommended disposition [17, 19, 53, 54].

Escalate safety or life-support risks immediately and hold affected operation if safety is in doubt. Follow applicable incident duties and the Guidelines' 15-business-day written breach notice. CSPER proposes formal review after two material failures in 12 months or one exposing systemic risk. Require corrective action and signed retests, independent review for systemic failures and AER clearance where required [17, 21].

Assess operation under ordinary rules, transition to a new framework if enacted, eligible regulated stand-alone supply, or transfer or decommissioning with replacement supply. Require a funded, lawful fallback for expiry and early cessation. Identify the incoming operator, approvals, verified supply path, customer handover and responsibility for interim supply, transfer, removal and recycling. CSPER proposes pathway review 12 months before expiry and approvals and fallback checks six months before expiry. Where extension is needed, follow the Guidelines' notice requirement of at least three months before the exit strategy starts [17, 18, 55].

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