

RENEWABLES INTEGRATION ROADMAP · PHASES 1-5

Alderney Electricity: The Energy Transition Roadmap

An ambitious but controlled pathway to a safer, more resilient, more affordable and increasingly renewable energy system

HOW TO READ THIS ROADMAP

A direction of travel. A disciplined way to decide.

This roadmap is not a fixed forecast or a commitment to any single technology. It is a staged framework for making sound decisions as Alderney's needs, evidence and opportunities develop.

Each phase protects the core utility while building the knowledge, infrastructure and capability required for the next. Technologies progress only where they demonstrate safety, resilience, affordability and whole-system value in Alderney conditions.

2035 AMBITION

By 2035, AEL will operate one of Europe's best-managed small isolated electricity networks, and an effective energy system that is safe, secure, resilient, affordable, increasingly renewable and digitally intelligent.

READ EACH PHASE THROUGH THREE QUESTIONS**01****What must AEL protect?****02****What evidence must be gathered?****03****What decision does that evidence make possible?****FIVE GUIDING PRINCIPLES****01 Safety**

Protect system integrity in every phase.

02 Resilience

Strengthen security of supply and operational flexibility.

03 Affordability

Judge value across the whole energy system and over time.

04 Stewardship

Make choices that leave Alderney stronger.

05 Learning

Measure, test and improve before scaling.

THE INTENT

Alderney's energy future will not be secured by a single technology, but by making the right decisions in the right order – protecting the system today while building the capability needed for tomorrow.

MEASURE — LEARN — RESPOND — IMPROVE

THE STRATEGIC NARRATIVE

The pathway matters as much as the destination.

Alderney's electricity system is not a smaller version of a mainland grid. It is a permanently islanded microgrid: every unit of electricity must be generated, balanced and distributed locally, every second of every day.

That changes the order of operations. Technologies that are routine elsewhere can behave differently when generation is concentrated at one power station, electrical inertia is limited and there is no interconnector to provide reserve or emergency assistance.

AEL's responsibility is therefore broader than installing renewable generation. It is to keep generation, storage, network infrastructure, customer technologies and demand operating as one safe, stable, resilient and affordable system.



Alderney Power Station Controls.

Rapid transition, deliberately sequenced, continuously monitored and founded on evidence.

AT A GLANCE

Compact island system

A small market in which relatively modest changes in generation or demand can have proportionately large system effects.

~2,150 residents

Approximately 1,500 residential properties.

6.2 GWh

Approximate current annual electricity supply.

The 2022 States of Alderney Energy Policy and Island Plan set the ambition: **Increase clean energy used** (reduce carbon footprint) and **reduce energy costs**.

"The emphasis must always be on establishing a sustainable energy system as quickly as is practically achievable." (Chair of the Energy Group, Report to the States of Alderney, October 2022).

AEL believes in energy security, resilience and affordability, with safety, sustainability and island stewardship at its heart. System integrity is enabled by evidence-led, stage-gated renewable integration and innovation.

This roadmap turns those ambitions into a practical transition pathway.

THREE CONNECTED MISSIONS

Three missions. One purpose.

PURPOSE

To secure Alderney's energy future - protecting and strengthening the system we depend upon today, transforming it wisely for tomorrow, and creating knowledge and capability that brings lasting value back to the island.

OUR RESPONSIBILITY - STEWARDSHIP

We are stewards of Alderney's energy system.

That means protecting what has been entrusted to us, improving it wisely, making decisions for the long term, and ensuring that today's choices leave Alderney stronger for future generations.

MISSIONS

01 — Protect

Protect and strengthen the core utility

Maintain a safe, reliable, resilient and affordable supply. Develop our people, strengthen ageing infrastructure and introduce new technologies that reinforce the security of supply and the efficiency and effectiveness of the core utility.

02 — Transform

**Transform the system.
Transform the business.**

Build Alderney's renewable smart grid while developing AEL into the modern, financially sustainable energy business needed to operate it - integrating renewable generation, storage, digitalisation and intelligent energy management while growing services and revenue streams that support customers and the island's transition.

03 — Learn & Export

Learn and build a model that can be exported

Capture the data, operating experience, methods and know-how developed in Alderney and turn them into an exportable **Alderney Model** that can help other small, isolated energy systems.

The Alderney Model

Over time, the transition can create an evidence-based "Alderney Model": a repeatable approach to energy transition combining engineering discipline, real-world experimentation, commercial realism and community consent.

That model only has value if Alderney remains the priority and the proving ground.

THE GOVERNING PRINCIPLE

None of the long-term opportunities should undermine the first mission:

Protect and strengthen the utility

WHY SEQUENCING MATTERS

A small system behaves differently.

Increasing rooftop solar with batteries and growing distributed generation gradually changes the electricity network designed for one-way flow from the power station to customers.

- No external interconnector, reserve power or frequency support.
- Limited electrical inertia and generation concentrated at a single station.
- New inverter-based generation can affect frequency, voltage, protection and fault levels.
- Actual operating evidence must continuously calibrate the system model.

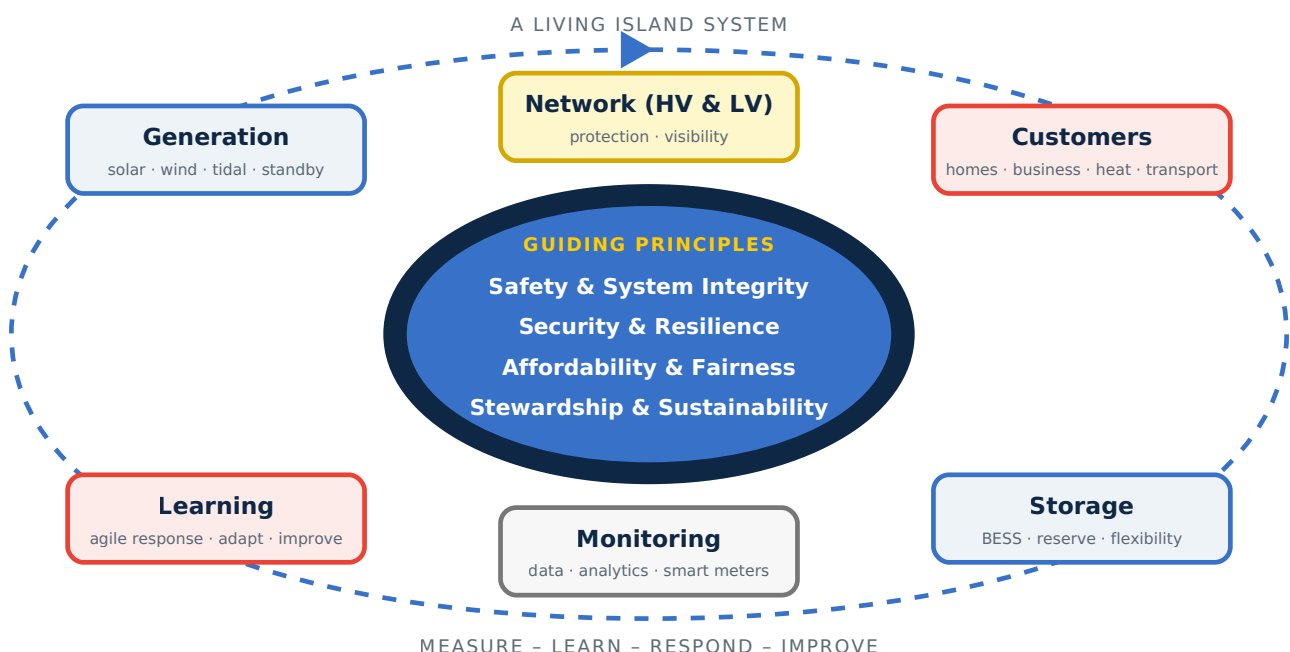


Alderney, 2026

A LIVING MODEL

Grid stability analysis, smart meters, substation automation, power station data, network visibility and active network management create a continuously updating understanding of our island system.

ALDERNEY'S INTEGRATED ENERGY SYSTEM



Six connected elements, governed by four enduring principles. AEL measures the system, learns from evidence and responds as conditions change to improve the system and our service to the island.

ELECTRICITY DEMAND IS THE MOVING TARGET

Read the future system.

Electricity is currently less than one fifth of Alderney's total energy use. As heating and transport electrify, the electricity system will need to become considerably larger.

This roadmap focuses principally on Alderney's electricity system and its growing role in the wider transition of heating, transport and other island energy uses.

That makes the roadmap a redesign of the island's energy system – not simply a project to replace diesel generation.

THE PLANNING QUESTION

How do we build enough clean capacity for the economy Alderney can become?

Generation investment, network reinforcement, tariffs, smart metering, efficiency, electrification, storage and flexible demand must be coordinated.

INDICATIVE ANNUAL ELECTRICITY DEMAND



Source: Alderney Energy Assessment, March 2026.

Heating, Cooling & Insulation

Understand energy efficiency in homes and offices; introduce and conduct energy audits. Move beyond kerosene as the primary source of heating fuel through efficient electric heat and managed demand. Prepare for increased air conditioning and cooling.

Transport

Align EV availability, maintenance and charging with renewable availability and network capacity.

Anticipate the electrification of aviation and maritime craft and prepare the harbour and airport as generators not simply consumers.

Affordability

Use tariff reform to recover shared system costs fairly as behaviour changes, while pursuing generation, storage and demand solutions that reduce or contain Alderney's long-term whole-system energy costs.

BUILD A PORTFOLIO, NOT A DEPENDENCY

Keep the direction clear. Keep the mix adaptable.

No single technology should be allowed to become a premature dependency. Each option must earn its place through whole-life economics, reliability and resilience, fuel displacement, integration needs, environmental and community impacts, financing terms and the system services it provides.



Optimise Alderney's energy mix

01

Solar

First mover. A mature and increasingly tested technology, comparatively quick to deploy and likely to anchor the early transition across rooftops, community buildings, selected land and potentially floating installations.

02

Wind

Likely to become a major long-term contributor. Alderney's strong year-round wind resource is better aligned than solar with winter and overnight demand and could materially reduce generation costs.

03

Tidal

A strategically important longer-term opportunity. Alderney should preserve the option, support controlled pilots and build operational evidence as the technology matures.

04

Flexible uses

System inefficiency becomes economic opportunity. When the economics justify it, hydrogen, ammonia, water desalination, heating, agriculture, refrigeration, laundry, distillation and other energy-intensive uses can absorb surplus renewable energy that would otherwise be curtailed,

The mature system is likely to be both **agile and diverse by design**: renewable generation, robust storage, flexible demand and standby generation working together rather than competing as isolated projects.

1 Phase 1 - Understand, strengthen and prepare

CURRENT PHASE - UNDERWAY

The phases describe a sequence of maturity, not a rigid timetable. They will overlap where appropriate – particularly Phases 2 and 3 – and progression will be governed by evidence and decision gates. This roadmap establishes direction and sequencing; it is not a commitment to any single technology, supplier, project scale or investment.

Build the technical, financial and organisational foundations required for larger-scale renewable integration – and establish the evidence base from which the transition can be measured.

Understand the network

Complete stability and integration studies. Establish hosting capacity. Assess protection, voltage, frequency, fault-level and reverse-flow implications.

Improve visibility

Roll out smart meters. Expand substation monitoring and automation. Strengthen HV/LV asset data and active network management.

Build the evidence base

Set baselines, common data standards and performance measures. Record assumptions, operating decisions, outcomes and lessons.

Start controlled implementation

Enable rooftop solar, install PV on AEL assets and introduce a properly specified grid-scale BESS.

Make the foundations trusted

- ✓ Complete tariff reform and clarify connection and export arrangements.
- ✓ Use procurement and partnership terms that protect AEL's rights to its own data, know-how and intellectual property.
- ✓ Explain the island system and publish the reasoning behind major decisions.
- ✓ Demonstrate visible but proportionate early progress.

PHASE 1 DECISION GATE

Before significant renewable scale, AEL must be satisfied that:

- Operating limits are understood.
- Critical protection risks are resolved.
- The BESS provides the required system services.
- Tariffs recover system costs fairly.
- Projects remain financeable and affordable.
- Community understanding is sufficient.

PHASE 1 OUTCOME

AEL understands where renewable generation can connect, has greater operational control and visibility, and possesses the storage, tariff and governance foundations required to move safely towards larger projects.

2 Phase 2 - Deploy proven technologies at meaningful scale

Reduce diesel generation using commercially mature technologies while retaining system stability and operational flexibility.



Ground-mounted solar

Develop appropriately sized projects on suitable sites with low environmental impact. Expand incrementally as operational evidence permits.



Floating or alternative solar

Assess where land use, planning and engineering conditions justify it. Pilot before committing to full-scale deployment.



Demand-side flexibility

Introduce time-based and flexible tariffs. Encourage EV charging, water heating, customer batteries and controllable loads during renewable surplus.



Network reinforcement

Upgrade substations, protection and communications where justified. Use monitoring, managed connections, curtailment and storage where they provide better value.

MEASURE AND CODIFY DEPLOYMENT

Performance

Compare forecast with actual generation, curtailment, storage behaviour and diesel displacement.

Practice

Document procurement, engineering, commissioning and operating lessons in repeatable form.

Transfer

Identify which tools, processes and decision rules could help another small island system.

PHASE 2 OUTCOME

Solar and storage make a material contribution. Diesel run-hours begin to fall, AEL gains confidence operating a mixed-generation system, and the network becomes increasingly capable of supporting electrification.

Proceed where evidence supports it

Whole-system costs are competitive with the realistic alternative, including displaced diesel generation and any necessary storage, network, financing and retained standby costs.



3 Phase 3 - Experiment, validate and diversify

Test technologies capable of delivering greater year-round renewable generation, and build a measured evidence base for the long-term portfolio.

A

Wind pilot

Assess resource, planning, environment and connection. Measure output, availability, noise, maintenance and grid interaction.

B

Tidal pilot

Preserve marine areas, cable corridors and landing points. Test predictability, survivability, maintenance, environmental effects and grid behaviour.

C

Live validation

Recalibrate models with live data. Reassess BESS power, energy capacity and grid-forming capability across the mix.

Bring the community into the evidence

Before major wind and tidal decisions, explain visual, environmental, commercial and cost implications. Share pilot results openly-and show where evidence changed or strengthened the decision.

Find productive demand

Explore water production, heating, agriculture, refrigeration, data processing, synthetic fuels and other flexible uses of surplus renewable energy.

PHASE 3 DECISION GATE

Scale only where the pilots show:

- Technically credible performance.
- Competitive whole-life cost.
- Acceptable environmental impact.
- Realistic maintenance and supply chain.
- Financing terms that protect customers.
- Network capacity and community support.

PHASE 3 OUTCOME

AEL has practical evidence about wind and tidal performance in Alderney conditions, can make informed decisions about the long-term generation portfolio, and has the beginnings of a codified Alderney Model.

4

Phase 4 - Scale, optimise and create value

Move from partial renewable integration towards a more resilient, affordable, less fuel-dependent and increasingly electrified island energy system – scaling renewable generation where the evidence and economics support it.

Larger-scale wind

Following the pilot study, deploy at a scale supported by operational evidence to optimise for the island. E.g. This might be 2 - 3 medium size turbines or an array of smaller vertical helix wind turbines, depending on technology, impact on energy mix, costs and benefits.

Near-shore tidal

Progress where reliability, affordability and investability are demonstrated. Preserve larger marine opportunities where justified.

Optimised storage and demand

Expand storage where power or duration is economic. Use smart tariffs and automated demand response to align consumption with availability.

Productive use of surplus

Develop commercial activity around curtailed energy. Explore hydrogen or derivative fuels when conversion economics become credible.

THE WHOLE-SYSTEM DEMONSTRATION

A resilient electricity system dominated by renewable generation, with diesel retained for strategic reserve, resilience and exceptional conditions.

The evidence should span reliability, affordability, fuel displacement, emissions, renewable penetration, resilience and customer impact.

Codify what is repeatable

Package the system architecture, technical standards, performance benchmarks, decision gates, commercial approaches and operating lessons that form the Alderney Model.

Keep the boundary clear

Distinguish what is specific to Alderney from what can travel – and maintain clear governance between core utility responsibilities and future off-island activity.

5 Phase 5 - Share and export the Alderney Model

THE ALDERNEY MODEL

Export the learning, not the risk.

Alderney is a naturally contained proving ground. The long-term opportunity is to turn measured experience into services, methods and capability that can help other small islands.

Off-island growth should begin only when the approach has been demonstrated here, AEL has the right to use the relevant knowledge, and commercial activity can be pursued without weakening the core utility. Improve Alderney first, capture what we learn, and share or commercialise it only where doing so creates further value for the island.



Alderney Electricity technicians at work.

Evidence

Measured operational data, customer-demand profiles, project economics and technology-trial results.

Methods

Diagnostic, benchmarking and planning tools; technical standards; decision criteria; operating playbooks.

Capability

Consultancy, advisory, training, knowledge transfer, peer support and programme-management expertise.

Governance

Clear rights, privacy, confidentiality, cyber-security, ring-fenced risk and a protected Alderney priority.

Commercial routes

Advisory services · licensing · training · partnerships · joint ventures or special-purpose vehicles where AEL's evidence creates genuine value.

Scale without weakening Alderney

Ring-fence financial, delivery and reputational risk. Keep statutory and operational responsibilities to Alderney as the overriding priority.

PHASE 5 OUTCOME

A credible route to growth beyond the natural limits of the Alderney market – while Alderney remains the proving ground and principal beneficiary.

THE FIVEFOLD TEST

Every major initiative must protect the core utility and demonstrate long-term value for Alderney.

The five tests reinforce one another and should be considered together; no opportunity should compromise safety, reliability or the long-term interests of the island.

01 Safety, Reliability & Resilience

Does it maintain or strengthen the safety, reliability, stability and resilience of AEL's core utility?

02 Affordability & Whole-System Value

Does it improve long-term affordability or whole-system value for Alderney consumers?

Consider capital, financing, operation, maintenance, storage, network, standby and realistic alternative costs – not simply the headline cost of generation.

03 Energy Security & Transition

Does it reduce Alderney's exposure to imported fossil fuels and advance a cleaner, more secure and increasingly renewable energy system where the evidence and economics support it?

04 Learning & Capability

Does it add useful evidence, capability, data, methodology, experience or intellectual property that strengthens AEL and the Alderney Model?

05 Stewardship & Service to Alderney

Will it leave AEL and Alderney stronger than we found them?

Does it create lasting value for the island, strengthen our capability and infrastructure, protect what has been entrusted to us, and serve the interests of current and future generations?

Our commitment

- Move with urgency, but not recklessness.
- Support innovation, but not uncontrolled risk.
- Use modelling and learn from practical implementation.
- Pursue long-term affordability without confusing the cheapest component or today's lowest price with the best whole-system value.
- Stay open to viable technologies and new ideas as evidence develops.

What success looks like

A safer, more resilient, more affordable and increasingly sustainable energy system – less exposed to imported fuel, capable of supporting Alderney's community and economy, and managed responsibly for generations to come.

The destination is a stronger energy system for Alderney. Increasingly competitive renewable generation is one of the principal ways we intend to get there.

AEL RENEWABLES ROADMAP

Safer.
More resilient.
More affordable.
Less dependent on imported fuels.

Protect the utility.
Transform the system & business.
Capture the learning.

Build the future with evidence,
care and community confidence

NOTE

This brochure is an editorial design condensed from various documents and discussions, including AEL's:

'Long-term Strategy' document, dated 29 January 2026,
'What we are doing and why' document, dated 30 January 2026,
'Renewables Roadmap - Phases 1-5', dated 15 July 2026.

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