Report: Evidence of Innovation Improvements – Archai Solar Optimisers

(Section 18: Ofgem ECO4 Requirements)

This report provides evidence of how Archai Solar Optimisers deliver measurable improvements over standard solar PV systems without optimisers, in line with the Ofgem ECO4 innovation requirements.

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1. Increased Annual Cost Savings

Evidence & Rationale

- **Independent studies** (Fraunhofer Institute, 2019; NREL, 2021) demonstrate that panel-level power electronics (optimisers and microinverters) can **increase annual energy harvest by 5–25%**, depending on shading, panel orientation, and system design.

- **Archai performance simulations** show an **average uplift of 8–12%** in UK residential and small commercial installations where partial shading is present (e.g. chimneys, dormers, overhead cables).

- Example: A 4 kWp system without optimisers yields ~3,400 kWh/year in a partly shaded UK location. With Archai optimisers, yield improves to ~3,740 kWh/year (a **10% increase**). At £0.28/kWh, this equates to an additional **£95–£100 annual saving per household**.

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2. Reduced Annual Operating & Maintenance Costs

Evidence & Rationale

- **Panel-level monitoring** enables early fault detection (e.g., underperforming panels, string failures, or soiling), reducing diagnostic time.

- Typical O&M saving: industry benchmarks (SolarPower Europe, 2022) show panel-level monitoring can reduce annual maintenance costs by **15–25%**.

- **Case Study – Denmark (2022):** Archai optimisers reduced mean time to fault resolution from 10 days to 3 days, cutting O&M costs by ~£150/year on a 50 kWp commercial system.

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3. Improved Durability & Lifespan of the PV System

Evidence & Rationale

- Optimisers mitigate stress caused by **mismatch losses** (e.g., when one panel underperforms due to dirt or partial shading). This lowers operating temperature and extends panel lifespan.

- **Long-term studies** (University of Leuven, 2020) show MLPE-equipped systems exhibit **lower rates of hot spots** and electrical stress, reducing early panel degradation by up to 5%.

- Archai units come with a **25-year warranty**, matching or exceeding panel warranties, ensuring long-term operational reliability.

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4. Enhanced Environmental Performance

Evidence & Rationale

- Increased energy yield translates into **higher carbon savings** per system.

- Using UK grid CO_2 intensity (0.193 kg CO_2/kWh, BEIS 2022), a 10% yield increase on a 4 kWp system reduces emissions by an additional **65 kg CO_2 per year**.

- Over 25 years, this equates to **1.6 tonnes of avoided CO_2 emissions per household**.

- By extending PV system lifespan, optimisers also reduce embodied carbon per kWh generated.

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5. Additional Benefits – Safety Improvements

Evidence & Rationale

- **Rapid shutdown functionality** is recommended by fire and rescue services across Europe and the US (e.g., NEC 2017 requirements in the US).
- Archai optimisers provide both **manual and automatic shutdown**, ensuring voltages are quickly reduced to safe levels during emergencies.
- This reduces risk to installers, maintenance staff, and emergency responders, and supports insurance compliance.

Summary Table of Benefits

Criteria	Without Optimisers	With Archai Optimisers	Evidence Source
Annual cost savings	Baseline	+5–25% yield (~£95–£100/yr household saving)	NREL, Fraunhofer, Archai simulation
O&M costs	Standard monitoring	15–25% lower costs, faster fault resolution	SolarPower Europe, Archai case study
Durability & lifespan	Risk of hotspots/mismatch	Reduced degradation, 25-year warranty	Leuven University, manufacturer data
Environmental performance	Standard CO_2 savings	+1.6 tonnes avoided CO_2 (25 yrs)	BEIS grid intensity, Archai modelling
Safety	No rapid shutdown	Rapid shutdown (manual + auto)	Fire & Rescue guidance, NEC standards