



INTEROPERABILITY

Solar Appliance Snapshot

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EFFICIENCY FOR ACCESS COALITION

Interoperability enables systems, appliances and devices to operate in the same environment and interact with no adverse effects. Interoperability could yield large gains for the energy access sector via greater technology flexibility and adaptability, and improved consumer and distributor choice.

MARKET INSIGHTS

The market value of interoperability in the off- and weak-grid settings has not been estimated. As the market grows, interoperability becomes an increasingly important way to cost-effectively integrate a growing range of products and create a competitive market without technology isolation.

One early indicator of improved interoperability is the widespread use of power converters. Power converter use in off- and weak-grid settings for alternating current (AC) and direct current (DC) appliances has increased in India. Hybrid solar systems, which integrate solar, batteries and AC grid power, have also become more popular. GOGLA estimates 1.9 million households in India access energy this way.

SECTOR IMPACTS

Interoperable off-grid systems and components are critical to the expansion of energy services and can help achieve United Nations Sustainable Development Goal 7 (Clean Energy) at least cost.

Standardisation can help promote interoperability and economies of scale, especially at the component level. It can also lower the high-cost barrier for customers to enter and move up the energy ladder and enable a secondary market for appliances. By reducing the risk of technology obsolescence, interoperability also drives reduction in e-waste and appliance dumping.



Lower Costs

Standardisation of components through interoperable systems allows for providers to benefit from economies of scale.



More Choice

Additional market efficiencies could be unlocked if consumers' ability to buy or sell appliances is not limited by a lack of compatibility.



Less e-Waste

Interoperability would reduce component obsolescence and reduce the rate at which these components enter e-waste streams.



Consumer Protection

Coupled with quality assurance, interoperability could build a competitive market based on quality and price rather than absolute customer retention.

CURRENT SUCCESSSES

The [Connect Initiative](#), led by GOGLA and Efficiency for Access, is developing a set of standards for connectors and firmware for 12 volt (V) SHS kits and appliances. The result will enhance interoperability, reduce barriers to pairing SHS kits with lights and appliances and increase flexibility and choice whilst reducing cost.

Private sector R&D is also improving. [Angaza](#) has developed a solution that allows device-to-device communication by cloud services in a common language. [Solaris](#) has developed a free [Open Source Token System](#) to make any product pay-as-you-go (PAYGo) compatible. Finally, [Green Empowerment](#) is creating an open source Solution for Smarter Load Management and [Omnivoltaic](#) is developing a dashboard and hardware for Device Data Discovery as a Service.

REMAINING CHALLENGES

Integrating new technologies, redefining and redesigning working models of energy delivery; requiring new levels of collaboration; and regulating the new interoperable future for fairness and consumer protection will not be without its challenges. The low price point needed for energy access solutions, and the lag in adoption of standards and regulations do not provide manufacturers much leeway in terms of designing for overarching compatibility with each other. Many of these challenges stem from the entrenched energy delivery modes prevalent in the market. Examples include: a lack of sector collaboration, business risk, standardisation, risk of orphaned technology, limited data, competing priorities and lack of expertise at the government level.

RECOMMENDATIONS AND PATHWAYS TO SCALE

Interoperability can help promote standardisation and economies of scale, especially at the component level. Building industry consensus, beginning with the lowest-hanging fruit, and investing in further research will help lay a strong foundation for future work.



Convene industry, reach consensus

Accounting for the diverse perspectives of stakeholders will be key to developing a shared vision for interoperability and driving industry support. GOGLA and Efficiency for Access are working to lay this foundation via the Connect Initiative.



Increase public funding & research

Consumer research is needed to assess awareness and potential challenges. Field testing is critical to validate technical guidelines. Finally, a quality assurance framework and more insight into the technical and economic aspects of interoperability in higher voltage applications are needed.



Start with low-hanging fruit

When addressing interoperability, the sector should begin with the least complex and easily attainable step. Physical and electrical connectivity and interoperability is least controversial and an easier sell for consensus having had precedence for standardisation in other related sectors.



Pursue standardisation on a longer time scale

Coalescing the sector towards agreed solutions, developing technologies and standards, ensuring their adoption and widespread use will take time. Funding for the practical demonstration and application of interoperability long-term can help to ensure success.