



# Faraday Battery Challenge

## Workshop and recommendations

The BSI Faraday Battery Challenge Standards Programme originally sponsored by Innovate UK led to the creation of fast track PAS standards to provide guidance to the UK's growing battery industry, reflecting key market priorities identified at the time. From 2019-2021, the BSI Faraday Battery Challenge developed three PAS standards covering parts of the battery supply chain:

- PAS 7060 for vehicle design and battery integration
- PAS 7061 for battery packs and modules
- PAS 7062 for cell manufacturing

These PAS standards were published in 2021 after extensive industry consultation.

In June 2023, we held a workshop to review the PASs. Participants who helped develop and use the standards discussed:

- If they still meet industry needs
- Challenges in applying them
- How to address emerging industry challenges through the review

Workshop feedback highlighted opportunities to:

- Expand and update the scopes of the existing standards to cover new technologies
- Provide more technical detail or create separate standards for specific topics
- Improve regulatory references

In summary, the existing PAS standards provide an initial baseline, with ongoing improvements needed to ensure they remain relevant and actionable as the UK battery industry continues to grow rapidly. Regular updates that expand the scope and specificity of guidance will help manufacturers improve sustainability, performance, and compliance for the quality, safety and environmental consciousness of their battery manufacturing processes.

The recommendations from this workshop will inform the next phase of the Faraday Battery Challenge Standards Programme and benefit both UK battery manufacturers and the wider industry.

## Below are the recommendations from the workshop:

### As 7060: 2021 Electric vehicles – Safe and environmentally-conscious design and use of batteries

PAS 7060 provides useful guidance on vehicle design for electric vehicles. However, opportunities to strengthen the standard were identified:

- **Scope expansion:** Including e-bikes and scooters was recommended given their fast growth, though updated technical definitions may be needed. New EU regulations on these vehicles could support this.
- **References:** Some documents referenced are now out of date and should be updated. Technical framework: The core technical guidance remains largely valid but may require more significant updates in 5 years as the industry evolves.
- **International approach:** Adapting references to have a more global applicability would benefit the international alignment of guidance.
- **Quality/safety:** The quality section was valuable but linking product quality even more closely to product safety could improve it.
- **Toxic hazards:** Including guidance on toxic and chemical hazards from cells would help cover human and environmental safety.
- **Safety limits:** Encouraging OEMs to have standardized limits on cell/pack emissions in a thermal event could help design for safety.

In summary, while PAS 7060 provides a useful baseline, suggestions to extend its scope (e.g. to micro mobility), update references, broaden applicability, and include more safety guidance were made.

Overall, PAS 7060 provides an important foundation but should evolve in parallel with the rapidly changing electric vehicle industry.

### PAS 7061:2020 Batteries for vehicle propulsion electrification – Safe and environmentally-conscious handling of battery packs and modules – Code of practice

PAS 7061 focuses on safe and environmentally conscious handling of battery packs and modules during production. While it provides useful recommendations, several areas for improvement were identified:

- **Design guidance:** could provide more specific guidance on design trade-offs between environmental goals, performance, costs, and other factors. A dynamic standard, such as a Flex, that is regularly updated could help keep design guidance current.
- **Regulatory compliance:** new regulations on measuring and reporting the carbon emissions from battery production are emerging. PAS 7061 should incorporate this guidance to ensure compliance.
- **Structure product design:** little guidance exists on how to structure product design processes to optimize performance, reparability, recyclability, and life cycle impacts.
- **Total life cycle considerations:** while regulations will largely drive battery life cycles, manufacturers still pursue smaller, lighter, cheaper products. Considering the total life cycle from the beginning of design is critical to achieve this.

Vertical integration: There could be more integration of guidance from vehicle standards (e.g. PAS 7060) when designing battery packs and modules covered by PAS 7061. These improvements could help PAS 7061.

In summary, PAS 7061 provides useful recommendations for the handling of battery packs and modules, but opportunities exist to strengthen it by:

- Providing more design guidance on trade-offs and an iterative updating mechanism
- Including new regulatory requirements
- Guiding the design process to account for total life cycle factors
- Integrating to a greater extent with guidance in the vehicle standard PAS 7060

These improvements could help PAS 7061 provide more actionable recommendations for manufacturers to optimize the environmental performance and design of battery packs and modules.

### **PAS 7062:2021 Electric vehicle battery cells – Health and safety, environmental and quality management considerations in cell manufacturing and finished cell**

PAS 7062 provides recommendations for battery cell manufacturing quality, environment, and safety. Feedback identified opportunities for improvement:

- **Testing:** The standard could recommend more electrochemical tests (like impedance) to thoroughly ensure cell quality and safety before shipping.
- **Regulations:** PAS 7062 could provide more details on compliance with regulations like REACH for materials, and potential future rules requiring a minimum percentage of recycled materials in cells.
- **Emergency response:** Additional guidance on tools and procedures for safely handling damaged cells would improve occupational safety. A separate life cycle emergency response standard could benefit the whole industry.
- **Fire safety:** A separate standard covering fire risks and safety procedures across the full cell life cycle would help manage significant fire risks.
- **Separate paths:** sodium-ion and other non-standard batteries likely require separate manufacturing standards due to their unique chemistries and sensitivities.
- **Need for specifics:** Separate PAS standards are likely needed to provide the specific test procedures, pass/fail criteria, and other actionable guidance to answer questions like:
  - How do you thoroughly test cells for quality and safety?
- **R&D:** Including information for researchers performing non-standard activities like cell opening could improve safety for research and development tasks.

In summary, suggestions to expand PAS 7062 include: more comprehensive testing criteria; additional regulatory and emergency response guidance; separate fire safety standards; and separate PAS documents for specific technologies.

#### **Next steps...**

Please email any questions or comments to [faradaybatterychallenge@bsigroup.com](mailto:faradaybatterychallenge@bsigroup.com)  
More details can be found on the Faraday Battery Challenge webpage [here](#)