BCE ALLIANCE

PREVENTION BY DESIGN

Building sustainable digital infrastructure through better collaboration

London | 18 senior participants | Cross-supply-chain discussion



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THE PRINCIPLE

We don't believe sustainable digital infrastructure is created by better products alone. We believe it is created through better collaboration

Executive Summary

BCE Alliance convened 18 senior leaders from across the mission critical ecosystem to examine a deliberately broad question: how can the sector design, procure, deliver and operate digital infrastructure in a way that prevents avoidable waste, rework, downtime and risk?

The composition of the room was intentional. Architecture, engineering, project and cost management, OEM and technology provision, digital construction, cooling and water, operations, procurement, sustainability, investment and redevelopment were represented. This made it possible to examine not simply where individual disciplines perform well, but where value, information and accountability are lost between them.

The strongest conclusion was that the sector's sustainability challenge cannot be solved through product efficiency alone. Many of the risks discussed are created at the interfaces between organisations: changing requirements, fragmented handovers, late supply-chain engagement, inconsistent standards, weak lifecycle feedback and insufficient planning for maintainability, adaptation and end-of-life.

BCE ALLIANCE NORTH STAR

BCE Alliance exists to improve collaboration across the mission critical supply chain, enabling the delivery of more resilient, sustainable and future-ready digital infrastructure.

1. The Roundtable Question

Prevention by Design asked the group to look upstream. Rather than treating sustainability, reliability and operational risk as separate workstreams, the discussion explored how early decisions create downstream consequences across the full asset lifecycle.

- What risks are being embedded during concept and design that operations later inherit?
- Where are specification changes and information gaps creating avoidable redesign, procurement disruption and material waste?
- How should the sector balance speed-to-market with resilience, maintainability and future adaptability?
- What should be standardised, and where must flexibility remain?
- How can sustainability be measured beyond a narrow focus on operational energy efficiency?
- How can supply-chain organisations collaborate earlier without losing commercial clarity or accountability?

2. Three Core Findings

CORE ISSUE 1 — Collaboration gaps are creating avoidable risk

The traditional linear model of design → specification → procurement → construction → operations is increasingly misaligned with the speed of change in mission critical infrastructure. Requirements can move repeatedly during a project, while downstream teams are still expected to procure, build and maintain against decisions made earlier. The result can be redesign, delayed procurement, inconsistent campuses, increased cost and operational risk.

CORE ISSUE 2 — Sustainability must be defined across the lifecycle

PUE remains useful but is not sufficient as a complete sustainability story. The discussion repeatedly widened the lens to include water, resilience, maintainability, embodied impact, procurement integrity, critical resources, failure prevention, adaptability, reuse and whole-life performance. A data centre that performs efficiently on paper but creates repeated redesign, premature replacement or avoidable failure cannot be considered fully sustainable.

CORE ISSUE 3 — Failure prevention must begin at design stage

Operations teams frequently inherit decisions they did not shape. Liquid cooling maintenance, filtration, purging, leak risk, access, pressure requirements, structural

loads, heat rejection, second-life planning and future density were examples where earlier cross-disciplinary decisions materially affect later risk. Prevention therefore needs to become a design and procurement discipline, not an operational response.

3. What Participants Raised

Rapid technology change vs. long infrastructure cycles

Participants described a sector designing assets with 10–15 year expectations while technology and OEM requirements can change within weeks or months. Rack density, flow rates, pressure drops and tenant requirements can shift during design and even during construction. The question is no longer simply how to 'future-proof' everything, but how to create a resilient basis of design with controlled ranges, decision gates and transparent assumptions.

Standardisation — necessary, but not simplistic

There was support for selective standardisation where it accelerates delivery and improves interoperability, including naming conventions, information management, load cases and repeatable modules. However, participants cautioned against standardising individual components without understanding whole-system consequences, geography, seismic requirements, pressure, pumping, elevation and commercial realities.

Liquid cooling and operational readiness

Liquid cooling illustrated the central Prevention by Design challenge: a technology can be strategically necessary while introducing new maintenance, reliability and environmental considerations. The group highlighted the need for preventive maintenance regimes, fluid management, testing, filtration, leak-risk planning and second-life strategies to be considered before operational handover.

Retrofit, reuse and material efficiency

Power constraints and speed-to-market are increasing interest in adapting existing assets. Participants discussed reused steel, structural reinforcement, modular approaches and the limits of standardisation in retrofit environments. The opportunity is significant, but only where suitability is assessed early enough to avoid moving waste from one stage of the lifecycle to another.

Information flow and procurement

A recurring concern was the loss of the 'why' behind a requirement as information passes between client, consultant, designer, procurement, contractor, supplier and operator. When suppliers understand only the specification rather than the intended outcome, their ability to optimise, challenge or offer lower-risk alternatives is reduced.

Community, resources and social licence

Water, power, heat reuse, embodied impact and public perception increasingly influence planning and community acceptance. The group recognised that the sector needs to communicate its contribution more effectively, while also accepting that community confidence must be earned through tangible outcomes rather than sustainability messaging alone.

4. What This Means for BCE Alliance

The roundtable was not designed to produce a finished industry standard in one session. It was designed to identify where the system is asking for change. The cross-supply-chain format made the pattern clearer: the sector needs a neutral environment where stakeholders can challenge assumptions before those assumptions become embedded in projects.

BCE's role is therefore developing beyond convening conversations. The ambition is to use successive roundtables to turn cross-supply-chain insight into a practical collaboration framework — one that supports better decisions from concept through design, procurement, delivery, commissioning, operations, adaptation and end-of-life.

5. External Perspectives We Have Begun to Explore

Since the roundtable, BCE Alliance has begun exploring how external organisations can add perspectives that the mission critical sector cannot generate from inside the sector alone. These are early avenues of collaboration rather than established BCE programmes. Their value is precisely that they can challenge our assumptions, connect our infrastructure decisions to wider global issues and help the sector participate more constructively in how data centres are understood.

Ellen MacArthur Foundation — circular economy, critical minerals and lifecycle value

BCE has opened discussions with the Ellen MacArthur Foundation around its developing work in data centres, circular economy and critical minerals. The Foundation brings a system-level perspective: as digital infrastructure expands, the sector's demand for equipment, energy infrastructure and critical minerals cannot be separated from questions of resource security, reuse, recycling, procurement and second life.

In our discussion, the Foundation described engagement with major technology organisations including Google, Microsoft and Amazon, alongside work across broader critical-mineral value chains. A particularly relevant opportunity is to connect the

ambitions of large operators with the OEMs, designers, contractors and solution providers that actually determine how circular principles can be implemented in projects.

- Explore circular procurement principles for mission critical equipment and infrastructure.
- Understand where critical-mineral visibility should enter design and procurement decisions.
- Consider reuse, refurbishment, recycling and second-life requirements before assets arrive on site.
- Create a forum where hyperscaler ambitions and supply-chain delivery realities can be tested together.
- Use circularity as both an environmental strategy and a resilience, supply-security and business-value strategy.

UNICEF — the human and community lens

BCE has also begun exploring dialogue with UNICEF around sustainable futures and the community effects of data-centre growth. This introduces a different but complementary question: beyond technical performance, what does responsible digital infrastructure mean for the people and future generations living alongside, depending on and ultimately inheriting the systems we build?

An external human-development perspective creates an opportunity for the mission critical community to participate in the wider conversation about data centres rather than allowing the sector to be defined only by headlines around power, water, land or growth. It also asks the industry to demonstrate — not simply communicate — how digital infrastructure can contribute positively to society.

- Improve understanding of community concerns and the sector's social licence to operate.
- Explore how infrastructure planning can better recognise local resource, education and community priorities.
- Create clearer, credible communication between technical experts and non-industry audiences.
- Consider future generations as a stakeholder in long-life infrastructure decisions.
- Identify where the mission critical ecosystem can contribute expertise, innovation and resources to wider societal challenges.

WHY THE EXTERNAL VIEW MATTERS

The aim is not to allow external organisations to define the mission critical sector for us. It is to invite credible perspectives into the room, understand the wider consequences of our decisions, and give our sector a stronger opportunity to shape — and live up to — the story of what sustainable digital infrastructure can be.

6. Proposed Roundtable Two

COLLABORATIVE BY DESIGN

Improving collaboration from concept through procurement

This session will move directly from the first roundtable's most consistent finding: too many downstream problems begin as upstream disconnects. The purpose will be to identify where collaboration must happen earlier, what information each stakeholder genuinely needs, and which decisions require cross-supply-chain visibility before specification or procurement lock-in.

Proposed discussion structure

- Stage 0–3 alignment: which stakeholders need to be present, and at what decision points?
- Design assumptions: how should rack density, temperature, flow, structural load and technology uncertainty be expressed as ranges rather than false certainty?
- Specification stability: where should change be allowed, and where are clearer design or procurement freeze points needed?
- Supplier engagement: how can OEMs and specialist providers contribute expertise without turning early engagement into a sales exercise?
- Whole-system optimisation: how do we prevent individual component decisions from shifting cost, energy use or risk elsewhere?
- Sustainability and risk: which design-stage decisions have the greatest impact on rework, material waste, maintainability and failure prevention?
- Information continuity: how do we preserve the rationale behind requirements from client through to operations?

Potential outputs

- A draft BCE early-engagement map defining key stakeholder involvement by project stage.
- A shortlist of design assumptions that should be visible and challenged cross-functionally.
- Principles for responsible early supply-chain engagement.
- Proposed information handover requirements that preserve the 'why' behind specifications.
- A set of prevention-by-design checkpoints linking sustainability, risk and maintainability.

7. Proposed Roundtable Three

CONNECTED THROUGH THE LIFECYCLE

Delivering resilient, sustainable and future-ready digital infrastructure through supply-chain collaboration

The third session will follow the asset beyond design and procurement. Its focus will be the continuity of decisions through delivery, commissioning, operations, adaptation and end-of-life — ensuring that sustainability and resilience survive the transition from design intent to operational reality.

Proposed discussion structure

- Operational readiness: what must be designed, documented and resourced before handover?
- Maintainability: how can maintenance access, fluid management, testing, filtration and replacement strategies be embedded earlier?
- Feedback loops: how should operational experience return to designers, OEMs and future projects?
- Adaptability: what constitutes sensible future-readiness without overbuilding for uncertain technology?
- Circular lifecycle planning: how can second-life, reuse, refurbishment and recycling be planned before decommissioning?
- Community and resource impact: where can water, heat, energy and material strategies create wider value?
- Measurement: what broader indicators should sit alongside PUE to show whole-life sustainability and resilience?

Potential outputs

- A draft lifecycle collaboration model linking design intent to operational responsibility.
- Minimum principles for maintainability and preventive maintenance planning before handover.
- A feedback-loop model for lessons learned across operators, consultants, contractors and OEMs.
- Circular end-of-life and second-life questions to be included in project planning.
- A proposed broader sustainability scorecard covering operational, resource, resilience and lifecycle considerations.

8. Proposed Roundtable Four

FUTURE-READY BY DESIGN

Balancing standardisation, adaptability and lifecycle resilience in a rapidly changing mission critical sector

This session will address one of the most significant tensions identified at the first roundtable: the sector is designing infrastructure for 10–15+ year lifecycles while technology, rack density and OEM requirements can change within weeks or months. The challenge is to create infrastructure that can adapt to what comes next without overengineering, unnecessary material use, stranded capacity or avoidable operational risk.

Central question

How do we design infrastructure that can respond to technology we cannot yet fully predict — without creating unnecessary cost, waste, complexity or operational risk today?

Proposed discussion structure

- Future-proofing vs. overengineering: how far ahead should infrastructure be designed when future rack densities and technology requirements remain uncertain?
- Standardisation vs. flexibility: which interfaces, design parameters, load cases and information structures should be standardised, and where must adaptability remain?
- Technology cycles vs. infrastructure cycles: how can long planning and construction programmes respond to rapidly changing OEM and tenant requirements?
- Specification stability: where are clearer decision gates, design ranges or procurement freeze points needed to prevent repeated redesign and downstream disruption?
- Retrofit and adaptability: how can today's assets be designed to accommodate tomorrow's technology through adaptation rather than premature replacement?
- Failure prevention: which future-readiness decisions made at design stage have the greatest impact on maintainability, reliability and operational resilience?
- Sustainable future-readiness: when does future-proofing itself become unsustainable because capacity, materials or infrastructure are provided for requirements that may never materialise?

Potential outputs

- A set of BCE Future-Ready Design Principles balancing adaptability, resilience, cost and resource efficiency.
- A decision framework for assessing when to standardise, when to design within ranges and when project-specific flexibility is required.
- Proposed specification and design decision gates that reduce unnecessary redesign while retaining controlled adaptability.
- A future-proofing assessment that considers CAPEX, operational risk, embodied impact, maintainability and the probability of future demand.

- Lifecycle principles connecting adaptability with circularity — including reuse, refurbishment, material recovery and second-life planning.

This topic also creates a natural point at which emerging external perspectives can add value. Circular-economy thinking from the Ellen MacArthur Foundation can help test whether 'future-ready' also means adaptable, maintainable, reusable and less dependent on unnecessary virgin material demand, while the wider human and community lens being explored with UNICEF can help keep long-life infrastructure decisions connected to the future society they are intended to serve.

9. The Developing BCE Framework

The intention is for each roundtable to contribute to one connected body of work rather than become an isolated event. Over time, BCE aims to consolidate the findings into a practical mission critical collaboration framework.

STEP	PRINCIPLE	INTENT
01	ALIGN	Create shared outcomes and assumptions at concept stage.
02	DESIGN	Build resilience, maintainability and prevention into the basis of design.
03	ENGAGE	Bring relevant supply-chain expertise in before decisions become expensive to change.
04	DELIVER	Protect design intent through procurement, construction and commissioning.
05	OPERATE	Use operational feedback to improve current assets and future projects.
06	REUSE	Plan adaptation, second life and end-of-life as part of

		the lifecycle, not as an afterthought.
07	CONTRIBUTE	Measure success not only by infrastructure performance, but by responsible resource use and wider societal value.

10. An Invitation to Build This Together

The value of the first roundtable came from the willingness of 18 leaders to speak beyond organisational boundaries. That same principle needs to continue.

We welcome direct feedback on this report: what is missing, what should be challenged, what your organisation is already doing well, where you see the greatest collaboration failure, and which issue you believe the next group must address.

We also invite you to nominate specific cross-supply-chain issues that should be tested at the second Roundtable. If you have a suggestion, please contact either **admin@bcealliance.com** or **fatima@bcealliance.com**.

THE MISSION

If the sector is going to build at unprecedented speed and scale, collaboration cannot remain an informal benefit. It needs to become part of how sustainable mission critical infrastructure is designed and delivered. BCE Alliance intends to provide the platform where that work can happen — with the industry, not around it.