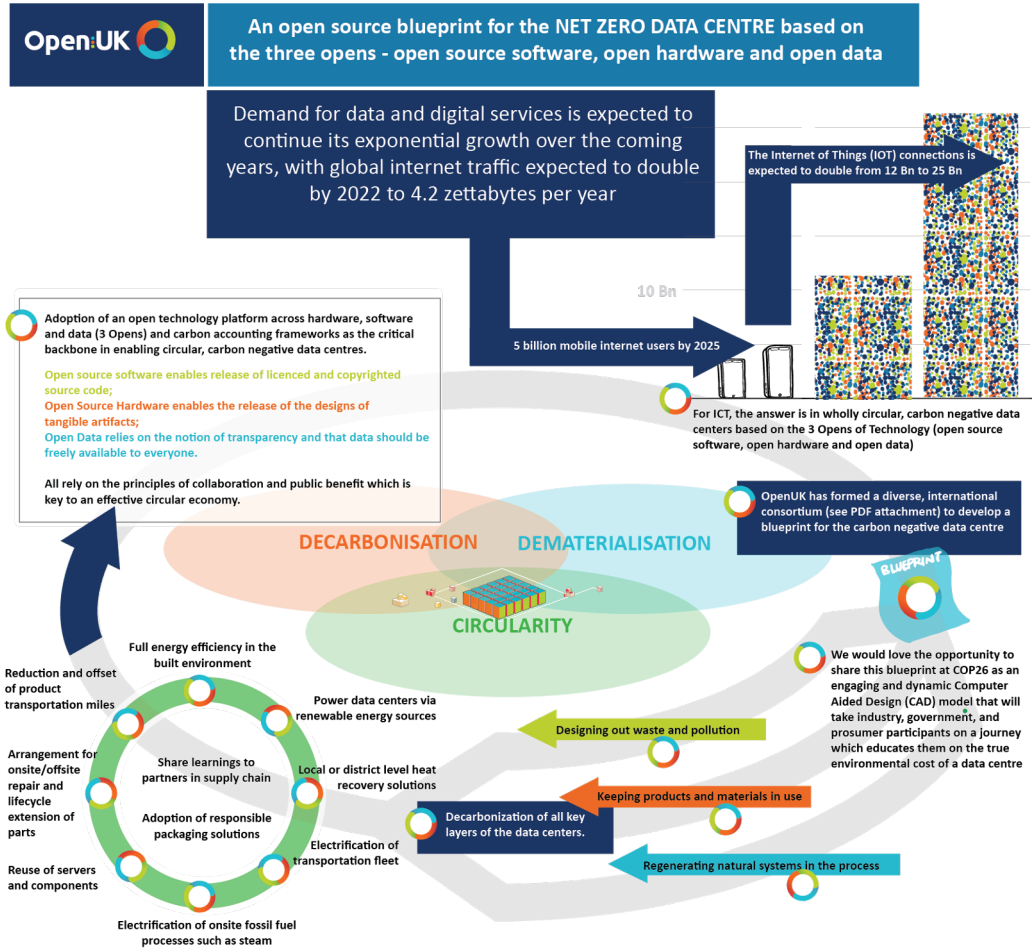
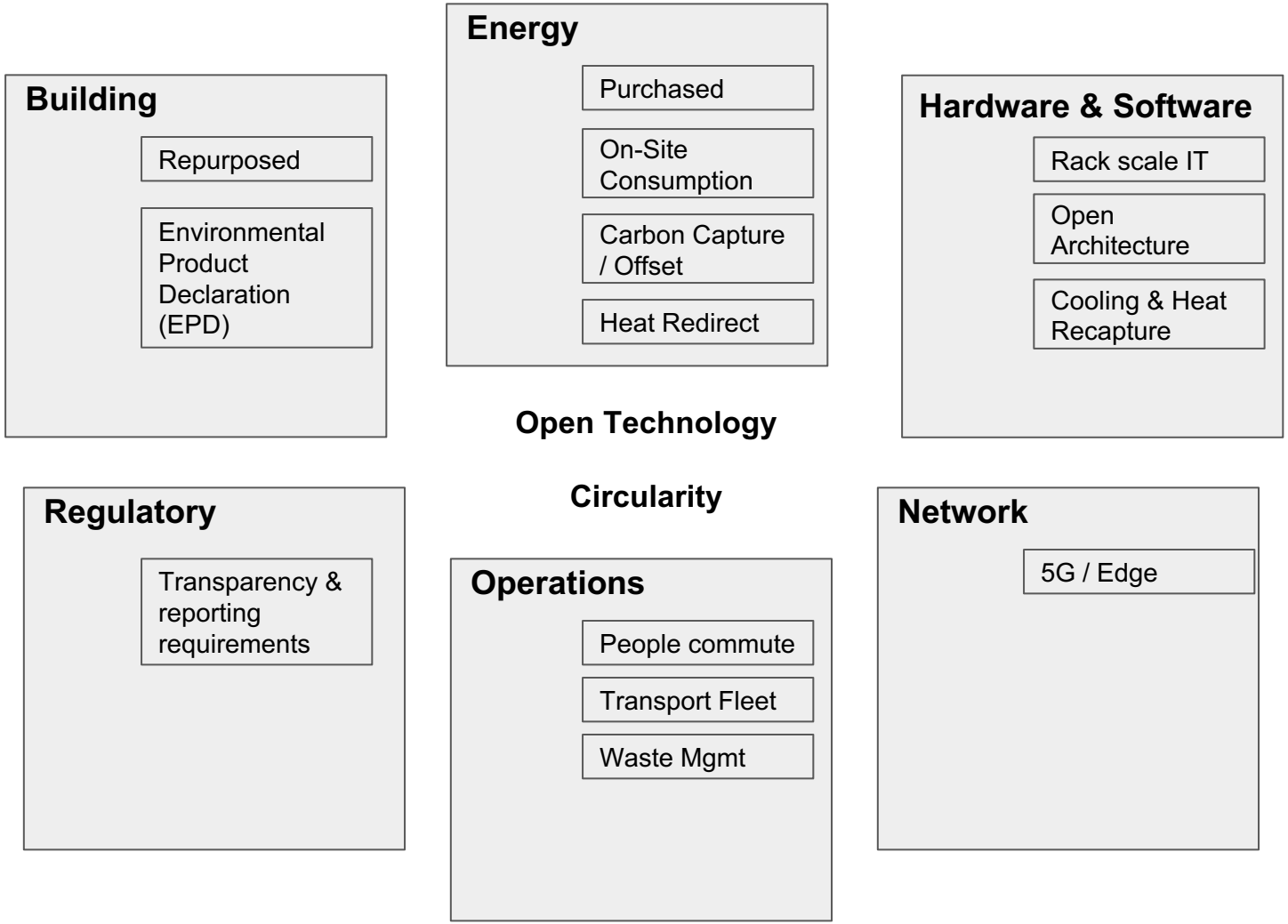


Original blueprint narrative


Energy
Purchased
On-Site Consumption
Carbon Capture / Offset
Heat Redirect
Building
Repurposed
Environmental Product Declaration (EPD)
Hardware & Software
Rack scale IT
Open Architecture
Cooling & Heat Recapture
Open Technology
Circularity
Regulatory
Transparency & reporting requirements
Operations
People commute
Transport Fleet
Waste Mgmt
Network
5G / Edge

	Approach	Potential Impact	Resources
Building Repurposed Environmental Product Declaration (EPD)	With flexible working and edge computing as rising trends, there will be less office and retail space requirements in city centres and more central data centre requirements for edge computing. Combining these trends presents an opportunity to reuse existing buildings, minimising reliance on new construction materials, and eliminating most of the embodied carbon associated with new buildings. Refurbishing to high environmental standards will also improve site energy efficiency, waste management and heat reuse.	Embodied carbon savings of up to 88%	**Resources** The greenest data centre is the one that's never built Can we reboot office buildings as data centers? The factories of the past are turning into the data centers of the future Recycled Buildings. Abandoned properties are being turned into data centers **Case Studies** Holistic cooling at the world's most efficient data center Chilled efficiency building Boden's type data center one

	Approach	Potential Impact	Resources
Building Repurposed Environmental Product Declaration (EPD)	Open software and open data as the enablers to transparently communicating the environmental performance and impact of building materials.	Market differentiation Regulatory and legal compliance Shared learning / collaboration	**Resources** A simple guide to Environmental Product Declarations (EPD) Open EPDs **Case Studies** Microsoft: Reducing Embodied Carbon in Construction

Energy

- Purchased
- Carbon Capture / Offset
- Heat Redirect

Approach

While the ultimate goal is to source 100%, verified renewable energy, this may prove difficult in many cases today. A transitional approach is required which includes:

Offsetting through carbon capture programs. Purchasing Renewable Energy Certificates (RECs) for these programmes should only be treated as a transitional step.

Initially establish green supply agreements with local utilities, then transition to achieving 100% renewable energy matching through Power Purchase Agreements (PPAs).

24x7 Renewable Energy, 100% of the time by combining PPAs with local storage capacity

Transparent, open data reporting across energy sourced, consumed, offsetting and matching.

Potential Impact

Resources

Resources

How data centre operators can transition to renewable energy

Renewable energy for data centres

Case Studies

Google's solar deal - Nevada data center would be largest of its kind

Energy

- Purchased
- Carbon Capture / Offset
- Heat Redirect

Approach

Offsetting should be treated as a temporary and transitional solution to achieving 100% Renewable Energy in the data centre.

Offsetting through the purchase of Renewable Energy Certificates, need to exclusively be based on carbon capture programs (tree planting or technology) which respect local bio-diversity and ecosystems (including indigenous communities).

Open Data and Open Software should be adopted to transparently report across offsetting requirements, RECs purchase, and programmes behind RECs

Potential Impact

Resources

Resources

How data centre operators can transition to renewable energy

Renewable energy for data centres

Case Studies

Energy

- Purchased
- Carbon Capture / Offset
- Heat Redirect

Approach	Potential Impact	Resources
Heat generated in data centres, which is traditionally considered as waste, should be repurposed towards applications which can benefit from it, for example sustainable agriculture, or leverage an edge-based architecture to recycle heat into the homes of marginalised communities in order to reduce costs and replace the reliance on natural gas.	Up to 30% savings on air conditioning costs	**Resources** Heat recovery from data centres: A win win situation Utilisation of waste heat in the data centre **Case Studies** Blockheating and ITRenew

Hardware & Software

- Rack scale IT
- Open Architecture
- Cooling & Heat Recapture

Approach

Open hardware, optimised by open software, with a circular model in order to keep assets in highest utility value for as long as possible, maximising lifetime value and sustainability. This requires:

- Internal repair, reuse and reclaim
- Rack scale recertification
- Remanufacturing for edge form factors
- Recertification and remarketing of components
- Responsible recycling

This recertification avoids corresponding amount of emissions tied to manufacturing and enables a zero carbon IT supply chain.

Potential Impact

Combined with an open architecture approach:

Capex Reduced by up to 50%

Opex Reduced by up to 30%

GHG Emissions reduced by up to 25%

Dematerialisation of Data Centre by up to 90%

Resources

Resources

Open Compute Project (OCP) reference designs

How the circular data center model benefits the environment and the bottom line - ITRenew

3 Reasons to adopt new data center models - ITRenew

Open Hardware and the Circular Economy

Case Studies

ITRenew and Atlanticis

Hardware & Software

- Rack scale IT
- **Open Architecture**
- Cooling & Heat Recapture

Approach

An open architecture enables the circularity required to achieve carbon zero.

Open hardware leverages standard components, enabling recertification, reconfiguration, testing and integration to lower capex and opex while reducing GHG emissions from extended lifetime and delayed reliance on new materials.

Open systems firmware enables updates and security across multiple lifetimes, lowering opex.

An open architecture is also best suited for enabling innovation through its broad support, cost accessibility and flexibility.

Potential Impact

Combined with server and racks approach:

Capex Reduced by up to 50%

Opex Reduced by up to 30%

GHG Emissions reduced by up to 25%

Dematerialisation of Data Centre by up to 90%

Resources

Resources

The future of power efficient data centers

Case Studies

Comcast Central Office showing 90% dematerialisation

Hardware & Software

- Rack scale IT
- Open Architecture
- Cooling & Heat Recapture

Approach

Cooling accounts for up to 40% of all energy consumed by data centres.

Closed looped water cooling systems, combined with OCP architecture to leverage full power and space efficiency, is emerging as the leading cost-effective and environmentally friendly solution to cooling.

Heat generated in data centres should be repurposed towards applications which can benefit from it, for example sustainable agriculture, or leverage an edge-based architecture to recycle heat into the homes of marginalised communities in order to reduce costs and replace the reliance on natural gas.

Potential Impact

Power and cooling costs reduced by up to 30%

CO2 and Pollution reduction of up to 30%

Resources

Resources

Data Centres and Environment - Submer

Ten Considerations for Data Center Direct Liquid Cooling

Waste Heat Utilization is the Data Center Industry's Next Step Toward Net-Zero Energy

Utilisation of Waste Heat in the Data Centre

Case Studies

Nautilus and ITRenew

Blockheating and ITRenew

	Approach	Potential Impact	Resources
Network 5G / Edge	Deployment of an edge-based network architecture, enabled by 5G connectivity, can:	Increase speeds by up to 10 times that of 4G Reduce latency by bringing compute capabilities into the network and closer to end users Reduce commute time of employees and travel distance of transportation fleet Enable local and district heat redirect solutions due to proximity of data centres	**Resources** **Case Studies**

Operations

- People commute
- Transport Fleet
- Waste Mgmt

Approach	Potential Impact	Resources
		Resources **Case Studies**

Operations

- People commute
- Transport Fleet
- Waste Mgmt

Approach	Potential Impact	Resources
Electrification of the full transportation fleet.		**Resources** The road to fleet electrification Data - the key to fleet electrification **Case Studies**

Operations

- People commute
- Transport Fleet
- Waste Mgmt

Approach	Potential Impact	Resources
Adoption of responsible packaging solutions, including all packaging materials from recycled content and for them to be further reusable, recyclable, or compostable - eliminate single use plastic in IT asset packaging, and dramatically reduce packaging weight.		**Resources** **Case Studies**

	Approach	Potential Impact	Resources
Regulatory Transparency & reporting requirements	Reducing critical Scope 3 emissions is highly dependent on the transparency, reporting and commitment from the entire supply chain. Voluntary reporting has demonstrated inconsistency in data and lack of transparency, so the introduction of regulations to ensure full transparency and reporting across all scopes (1,2,3) is required. Furthermore, governments should require full transparency and disclosure from their data centre supply chain. An open data model is essential to enable collaboration and public benefit.		**Resources** SDIA Open Data Hub UK Government should have a centralised register of all its data centres **Case Studies** https://www.scaleway.com/en/transparency/