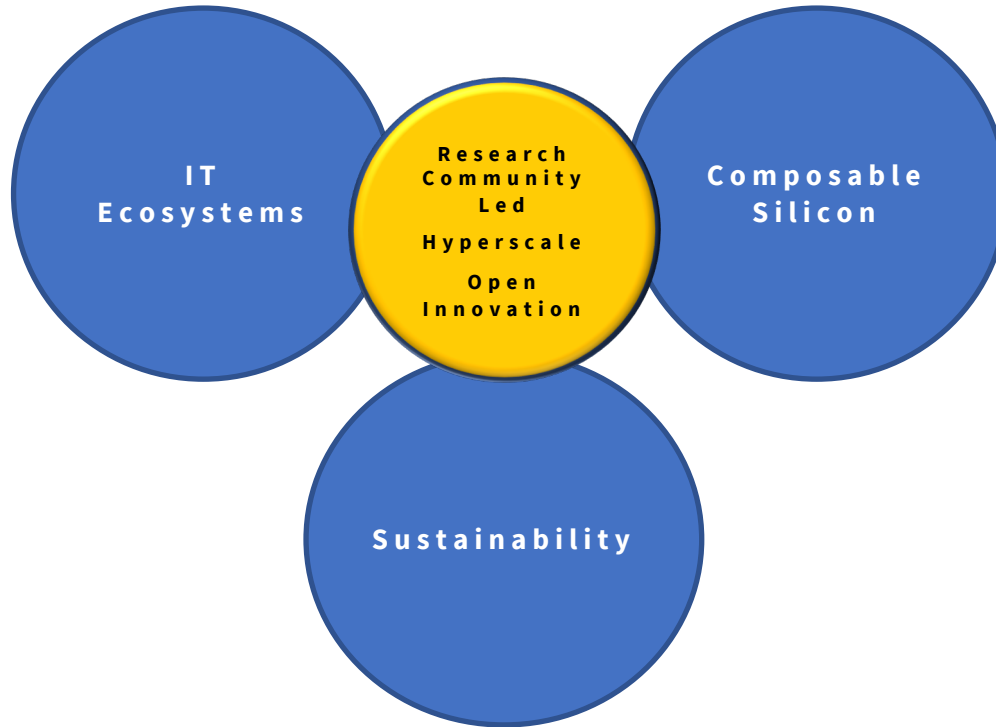**OCP Global Summit**
November 8, 2021 | San Jose, CA

Driving Data Center Innovation

Keynote Presentation
OCP Futures Symposium
November 8th San Jose Convention Center

Cliff Grossner, Ph.D.
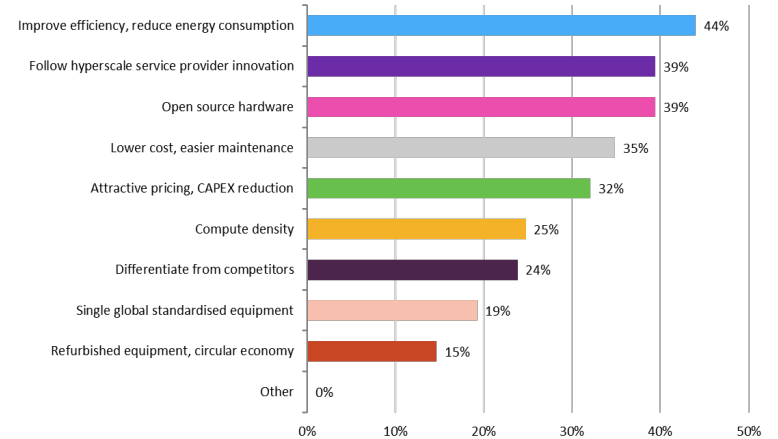Vice President Market Intelligence
Open Compute Project Foundation

Setting an agenda for research

Hyperscale innovation accelerates market shifts

- Those very familiar with OCP are looking to leverage hyperscale's innovations
  - Energy efficient equipment designs
  - Operational methods for reduced energy consumption
- Automation allowing reduction in ratio of personnel to IT equipment under management
- Customizations enabled by open hardware and firmware
- Improved compute density per rack to handle AI and other computational intensive workloads
- Colocation providers look to differentiate through OCP ready facilities
- Some look to OCP for standardization such as NIC and accelerator card form factors
- Circular economy is becoming more important especially as supply chains for new equipment remain tight
- Potential for lower cost of operations

OCP Recognized Equipment Drivers

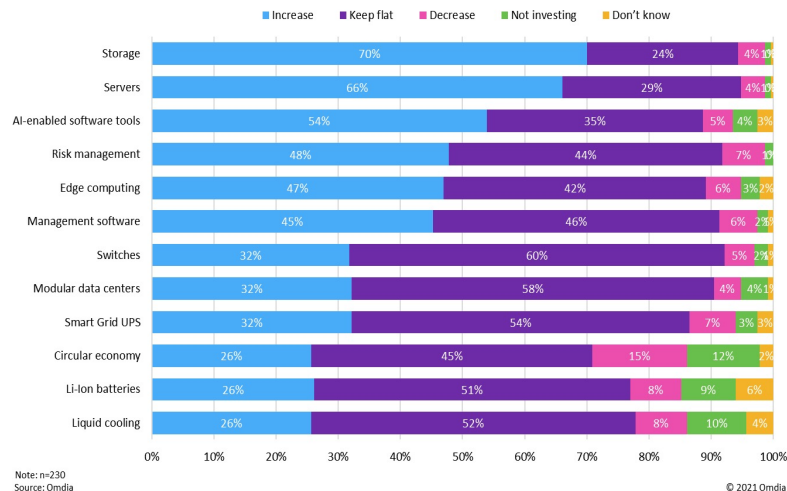| Driver	Percentage
Improve efficiency, reduce energy consumption	44%
Follow hyperscale service provider innovation	39%
Open source hardware	39%
Lower cost, easier maintenance	35%
Attractive pricing, CAPEX reduction	32%
Compute density	25%
Differentiate from competitors	24%
Single global standardised equipment	19%
Refurbished equipment, circular economy	15%
Other	0%

Note: n=109
Source: Omdia

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IT Ecosystems form with adoption of edge computing

- Edge computing a significant investment area, will see increased compute at edge locations: User edge, SP edge (Comm and Cloud)

- Edge will contain significant hardware for accelerated computation

- Software technologies such as software containers and microservices architectures are critical element to enabling a write once, run everywhere capability
  - Need software compatibility with on-device firmware
  - Need orchestration on very wide scale

- Remote management must be built into equipment

- Physical security must be maintained for street mounted equipment

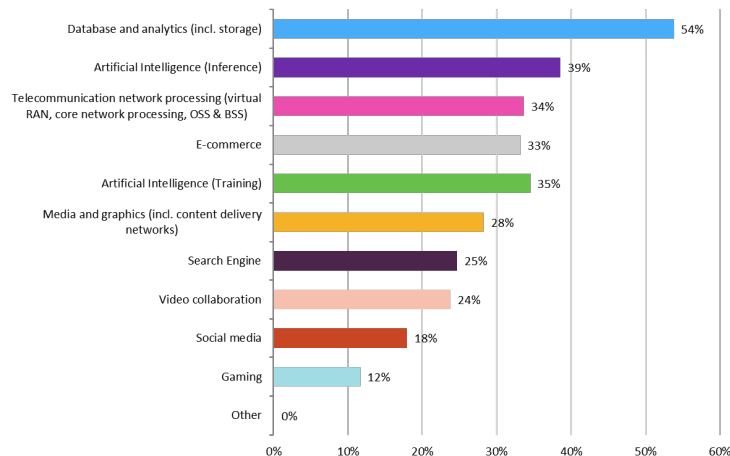- Prepare for self-contained enclosures: wall box, single and multiple rack

DC Investment Plans

Legend: ■ Increase ■ Keep flat ■ Decrease ■ Not investing ■ Don't know

Category	Increase	Keep flat	Decrease	Not investing	Don't know
Storage	70%	24%	4%	1%	
Servers	66%	29%	4%	1%	
AI-enabled software tools	54%	35%	5%	4%	3%
Risk management	48%	44%	7%	1%	
Edge computing	47%	42%	6%	3%	2%
Management software	45%	46%	6%	2%	
Switches	32%	60%	5%	2%	
Modular data centers	32%	58%	4%	4%	1%
Smart Grid UPS	32%	54%	7%	3%	3%
Circular economy	26%	45%	15%	12%	2%
Li-Ion batteries	26%	51%	8%	9%	6%
Liquid cooling	26%	52%	8%	10%	4%

Note: n=230
Source: Omdia

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Composable silicon matches workload diversity

- Workloads needing parallel, analog, computational architectures continue to multiply and quantum computing may be in the horizon
  - Analytics & data pipeline
  - AI and ML
  - Security
  - Packet processing

- Integrated circuits assembled for specialized workloads will become desirable for edge computing with targeted applications

- Enable integrated circuit co-packaging of diverse components to deliver best-in-class workload targeted computational performance.

- Achieved through open die-to-die interfaces and

- Establishment of a marketplace where components can be bought and sold and

- Supplier agreements allowing a IC integrator to assemble and sell a assembled integrated circuit

Fastest Growing Software Workloads

| Workload	Percentage
Database and analytics (incl. storage)	54%
Artificial Intelligence (Inference)	39%
Telecommunication network processing (virtual RAN, core network processing, OSS & BSS)	34%
E-commerce	33%
Artificial Intelligence (Training)	35%
Media and graphics (incl. content delivery networks)	28%
Search Engine	25%
Video collaboration	24%
Social media	18%
Gaming	12%
Other	0%

Note: n=233
Source: Omdia

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OCP familiar DC operators invest in sustainability

- Sustainability finally seems to be moving from the realm of discussion without action to investment

- Collaborations needed between OCP and other sustainability organizations

- Need to be sure OCP focuses on sustainability related to the entire IT ecosystem:

  - DC buildings, physical infrastructure, IT Infrastructure

  - Edge locations

- But maintain specialization on learning from deployments at scale

Active Sustainability Projects

Don't know, 3%

No, 27%

Yes, 70%
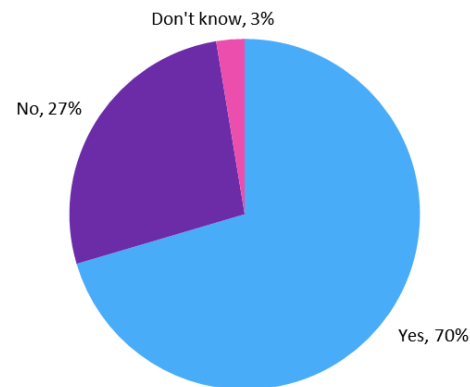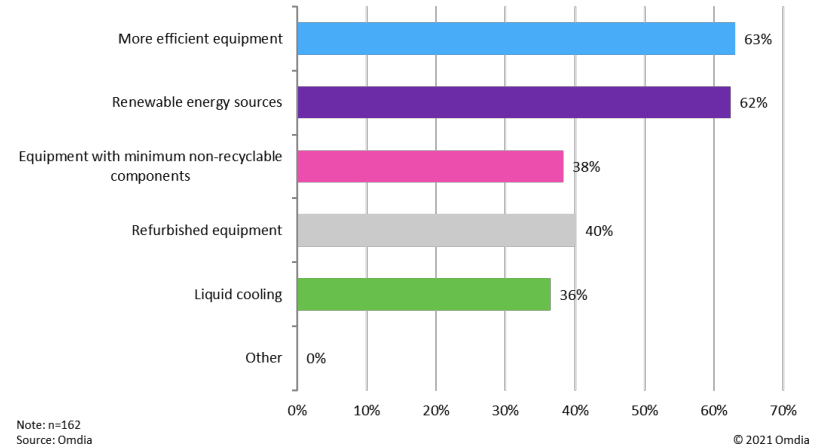
Note: n=230
Source: Omdia

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Top projects equipment efficiency, renewable energy

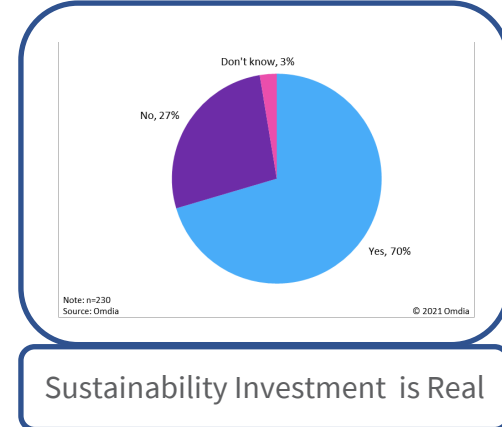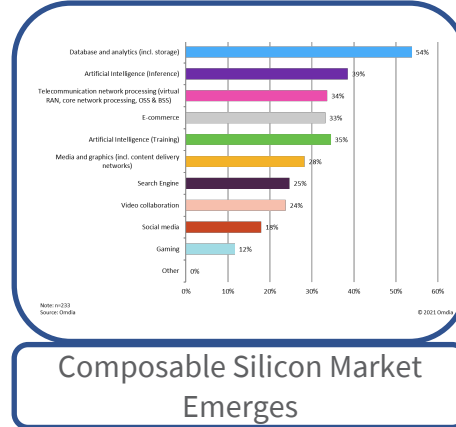## What can the OCP do to help with sustainability?
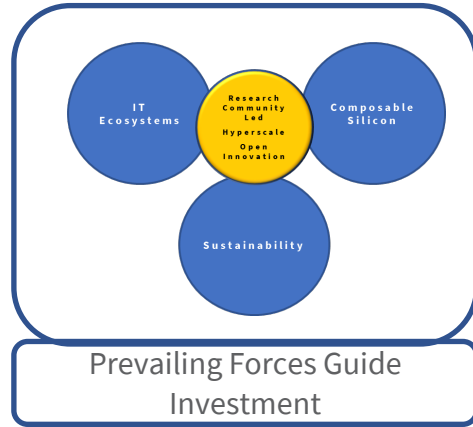
- Lead the way through focused projects and working groups

- Help set reasonable targets for sustainability

- Provide metrics that are easy to track

- Provide guidance on best practices to achieve sustainability goals

- Promote companies that take an active role in sustainability as encouragement

DC Sustainability Projects

Project	Percentage
More efficient equipment	63%
Renewable energy sources	62%
Equipment with minimum non-recyclable components	38%
Refurbished equipment	40%
Liquid cooling	36%
Other	0%

Note: n=162
Source: Omdia

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Takeaways

Prevailing Forces Guide Investment

Composable Silicon Market Emerges

Sustainability Investment is Real