A Study of Energy Efficiency in European Data Centers

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Study methodology

- **IHS Markit data center power and energy expertise**
  - 10+ years of research

- **2018 Study on OCP Market Assessment**
  - Market sizing and forecasts

- **Data center equipment supplier interviews**

- **End-user and data center operator interviews**
Data center operator and OCP product vendor survey results
Cooling, then compute

Q: What recent improvements have you made to your data center’s energy efficiency?

<table>
<thead>
<tr>
<th>Improvement</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase use of free air cooling</td>
<td>50%</td>
</tr>
<tr>
<td>Install Containment Panels</td>
<td>40%</td>
</tr>
<tr>
<td>Increase Server Inlet Temp</td>
<td>30%</td>
</tr>
<tr>
<td>Use liquid heatsink cooling</td>
<td>20%</td>
</tr>
<tr>
<td>Use OCP Hardware</td>
<td>20%</td>
</tr>
<tr>
<td>Heat energy reuse</td>
<td>20%</td>
</tr>
<tr>
<td>Automate equipment tuning</td>
<td>20%</td>
</tr>
<tr>
<td>Use immersion cooling</td>
<td>10%</td>
</tr>
<tr>
<td>Upgrade UPS to more efficient model</td>
<td>10%</td>
</tr>
<tr>
<td>Use Low Heat Lighting</td>
<td>10%</td>
</tr>
<tr>
<td>Use of virtualized servers</td>
<td>10%</td>
</tr>
<tr>
<td>Match compute requirements to server capacity</td>
<td>10%</td>
</tr>
<tr>
<td>Increased server density</td>
<td>10%</td>
</tr>
</tbody>
</table>

Source: IHS Markit

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Respondents realized significant savings

Q: What was the improvement in energy consumption?

Top improvements cited:

- Cooling systems
- Migrate to immersion cooling
- Raise room temperature to 35C
- Use OCP servers
- Use 12V to server
- Increase rack density

Source: IHS Markit
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Liquid cooling more than just a science experiment

Q: What plans do you have over the next 2 years to improve data center energy efficiency?

- Heat energy reuse: 22%
- Use liquid heatsink cooling: 22%
- High voltage (400VDC): 11%
- In-rack battery: 11%
- Designing chips for specific workloads: 11%
- Transition to 48V: 11%
- Running equipment in parallel: 11%
- Increased server density: 11%
- Increase use of free air cooling: 11%
- Install Containment Panels: 11%

Source: IHS Markit

Heat reuse requires multiple stakeholder involvement.
Opportunity for system integrators to deliver complete racks

Q: Commission complete racks?

Q: Considering new suppliers?

Rack Integration

100%

Commission new rack

33%

Integrate equipment into existing rack

25%

Consider alternative vendors

75%

Stay with traditional vendors

Source: IHS Markit

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Budgets grow as ROI timeframe shortens

Q: DC energy efficiency budget? 33% Organization has a specific budget, 67% Organization does not have a specific budget

Q: ROI time period? 20% <5 Years, 60% <1 Years, 20% <3 Years
Operational expenses must come down

Q: Drivers for improving energy efficiency in data centers?

- Improved TCO / reduced operational expenses: 60%
- Maximizing DC power available: 50%
- Maximizing DC footprint: 30%
- Social responsibility: 30%
- Regulatory compliance: 20%
- Building a new data center: 20%
- Market positioning: 10%
- Reuse of energy: 10%

Source: IHS Markit

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Q: Barriers for improving energy efficiency in data centers?

- Unable to replace legacy equipment: 30%
- No budget: 30%
- Lack of support from traditional vendors: 20%
- Building not designed for modern equipment: 20%
- Involves multiple stakeholders: 20%
- Risk with new equipment (and new suppliers): 10%
- Upgrading skills to operate new equipment: 10%
- Lengthy ROI: 10%
- Increased demand for compute: 10%
- Unable to tolerate downtime for replacement: 10%

Source: IHS Markit

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Q: Awareness of EU Eco-design?
- Yes: 78%
- No: 22%

Q: Affecting change?
- Yes: 67%
- No: 33%

Source: IHS Markit
Q: OCP equipment a part of plans for energy reduction?

- Yes, plan to investigate: 44%
- Yes, has deployed: 11%
- No, not a part of energy efficiency plan: 11%
- Don’t know: 11%
- NA (Respondents are colocation provider): 22%

Source: IHS Markit
Market trends and key takeaways
OCP addresses cooling and compute, and adoption is growing

OCP Non-Board by Product

Source: IHS Markit © 2018 IHS Markit

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Use of renewable energy limits negative impact of electricity consumption

Percentage of hyperscale data center power produced by renewable energy over time

Note: stating that a data center is powered by 100% renewable energy does not mean that the data center only consumes renewable energy. Because data centers are still connected to the grid, they are consuming non-renewable sources also used by the utility companies. Even data centers that have onsite renewable generation are connected to the grid as they need a redundant power source in the case primary power source fails.
Liquid and ‘free cooling’ forecast to grow double digits

Key Market Takeaways:

Liquid and “free cooling” have highest growth trajectories

Direct expansion and chilled water currently account for ~70% of revenues
Takeaways

Energy efficiency is a fundamental part of data center design.

Today, it’s about cooling. Tomorrow, about compute.

Adoption of OCP will aid in all these, and is growing.
Case study in
data center
energy efficiency

The London Internet Exchange
LINX Goals

• A new network architecture that offered quick development of new features, better resilience and robustness

• Make deployment more modular, cost and energy efficient

• Adopt automation to manage complexity

• Increase bandwidth to 100G and prepare for 400G

• Improve data center interconnect – better redundancy and transparency for workloads

• Improve density and maximize space utilization in data centers

Key decision making criteria

• Flexibility
• Simplicity
• Comprehensive quality of service
• Visibility on network issues
• Accommodate 800+ customers
• Total cost
**Previous mode of operation**
- Chassis switch-based architecture with fixed format switches at the edge
- Aggregated hardware and software supplied by traditional switch vendor
- Expanding capacity done in 15RU increments
- Power draw fixed at 3kW per rack
- Limited ability to add inter-site connectivity

**The new architecture**
- Fixed-switch architecture
- Adopt disaggregated approach with switches from Edgecore and switch OS from IP Infusion

**Vendors evaluated**
- Traditional switch vendors
- Vendors offering integrated solutions
- New vendors offering disaggregated solutions

Vendors were asked to propose recommended architecture for new solutions.
Results

More speed, less power, higher density and ready for automation

• 40% reduction in energy consumption
• Over 50% savings in space
• Move to 100G, ready for 400G
• Increased troubleshooting visibility

What’s next?

• Increased analytics for troubleshooting
• Policy infrastructure for automation
• Increase deployment speed for new features
Thank you!
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