HP-SEE

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HP-SEE TRAINING

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ICE Cube™

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Topics

- SGI Customers, Target Markets, and Product Focus
- A Key Challenge for Future HPC Systems – The System Interconnect
  - Applications Analysis
  - The SGI ICE Approach
  - The SGI UV Approach (solves the large memory problem at the same time)
- A Futuristic Data Center – SGI ICE Cube
- The Structure of large HPC Data Centers in Europe

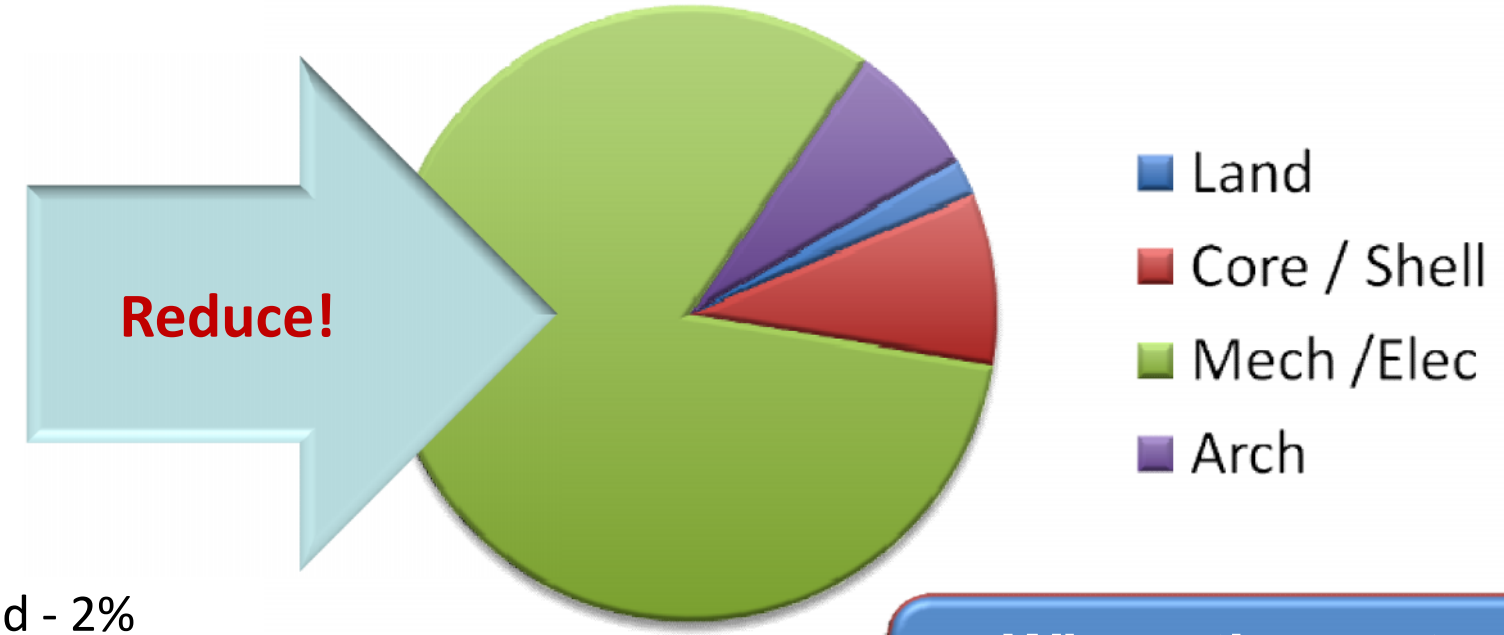
Topics

- “Brick and Mortar” Data Center Challenges
- ICE Cube Value Proposition
- Deployment Scenarios
- The “Dual Row ICE Cube” Container
- Video: The „construction“ of a new Data Center

“Brick and Mortar” Data Center Challenges

- **Technology Drivers**
  - Existing data centers are not designed or instrumented to handle the demands of the changing technology requirements
  - Increasing varied redundancy and reliability requirements are emerging
  - Current data center designs standards generally cannot meet these needs without waste
  - Increasing power and cooling demands
  - Increasing application sophistication and environmental awareness
  - Future potential impact of commodity cloud services
- **Business Factors**
  - Time to market: 12–18 months
  - High upfront capital cost
  - Business need to remain nimble and move quickly
  - Speed and flexibility 25–30 years solutions

Data Center Construction Costs



- Land - 2%
- Core & Shell Costs – 9%
- Architectural – 7%
- **Mechanical / Electrical – 82%**
  - Since 2004 -16% increase year to year

Where the costs are:
>80% scale with power
<10% scale with space

Completing the Options

Traditional Data Center

Scale & Control

Modular Data Center

Modular & Mobile

Cloud

On Demand

Move freely between the environments

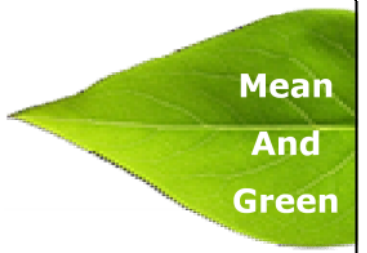
ICE Cube Value Proposition

ICE Cube Value Proposition (Part 1)

- **Fast time to results**
  - Just-in-time data center: weeks vs. months or years
  - Optimizes Capital Expenditures and Operational Expenditures
- **Optimize capital outlay**
  - Just-in-time delivery of ICE Cube modular data centers means deploying data center infrastructure when needed vs. buying capacity up-front anticipating several years of growth
  - ICE Cube substantially reduces power & mechanical infrastructure costs that are 82% of the cost of traditional data centers
  - The bulk of shell costs are also eliminated
- **Extreme density (up to 46,080 cores / 29.8PB storage)**
  - Self-contained modular data center

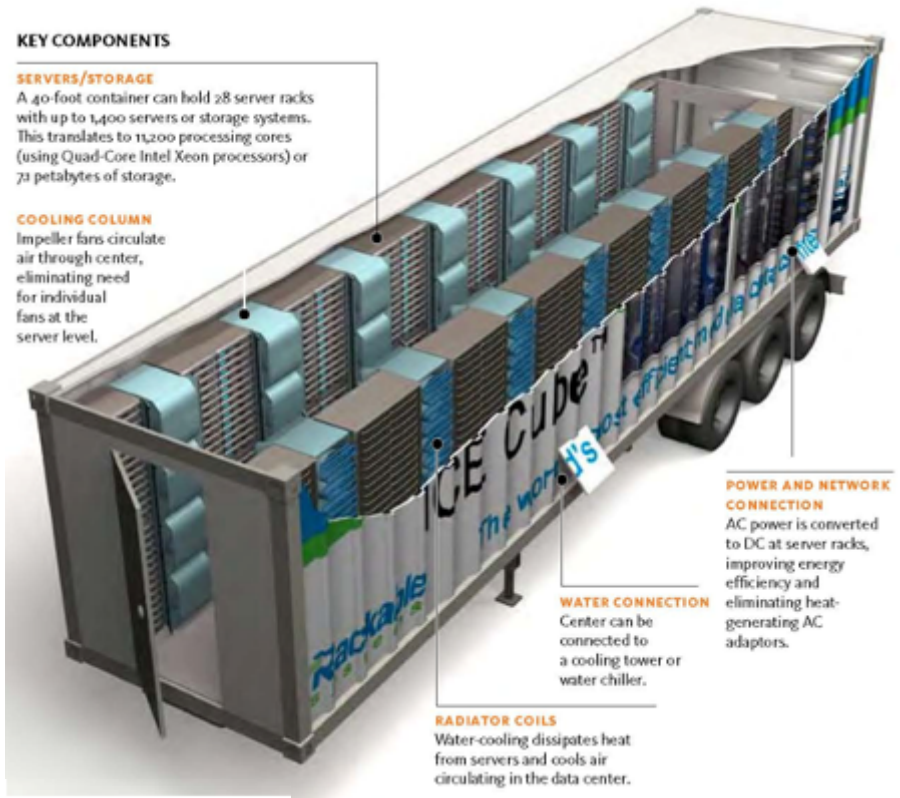
ICE Cube Value Proposition (Part 2)

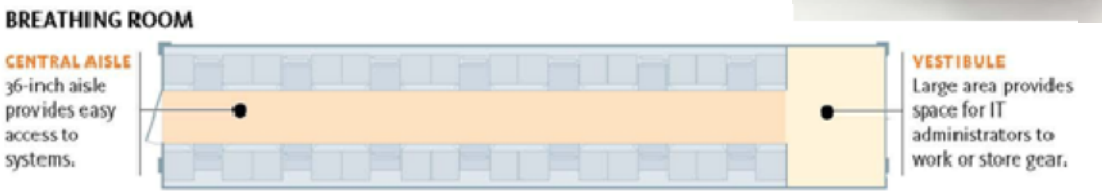
- **Eco-Logical™: PUE <1.12**
  - Maximum utilization of available power
  - Optimizes use of 480V three-phase power
    - Minimize number of power conversions
    - High voltage to rack alone can save >5% over 208VAC approach
  - Efficient & reliable UPS battery strategy
    - >20% of traditional data center cost is in power redundancy
    - Instead, localize UPS functions to the rack
    - Batteries supply up to 12 min
  - Choice of chilled water or air cooling
    - Match container model to deployment location for best PUE
  - Ability to operate at elevated temperatures
    - Reduced cooling cost



Introducing ICE Cube

Thinking outside the box…with a Cube!





A Look Inside

Deployment Scenarios

Rapid, World-Wide Deployment

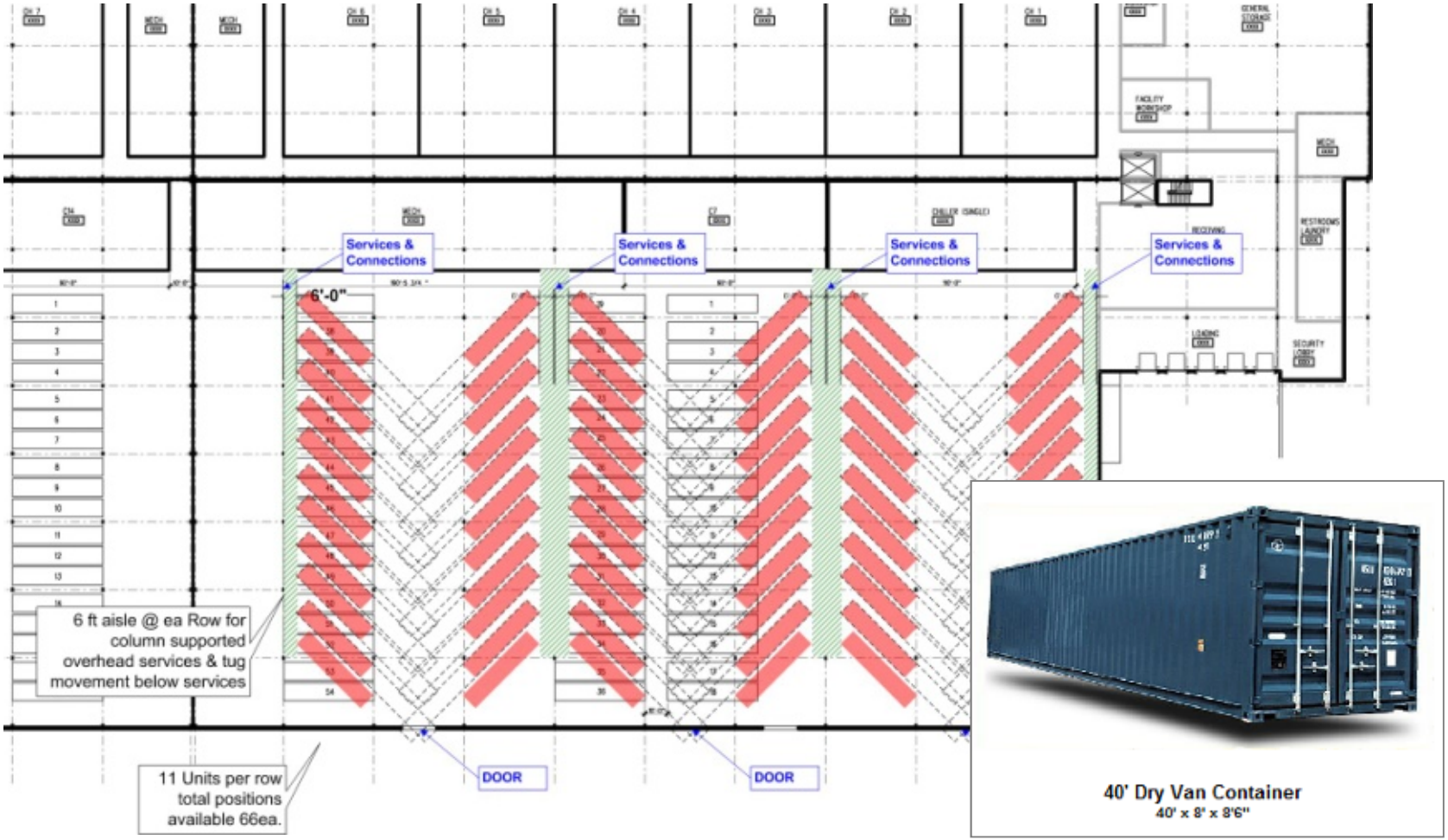
Mobility

Augment Existing Locations

Optional Support Module

- Support container with generator and chiller available
- Ideal for mobile environments or for disaster recovery sites
- Run free-standing without outside resources other than fuel and water source for cooling

Modular Data Center Site of the Future



Ideal Deployment Location Can Improve PUE

- **Many locations have a ready source of <65°F water. Big opportunity to cut cooling costs.**

- **Example:**
  Lake Michigan Water Temp (right) is <65°F most months. Rarely requires actively running a chiller.

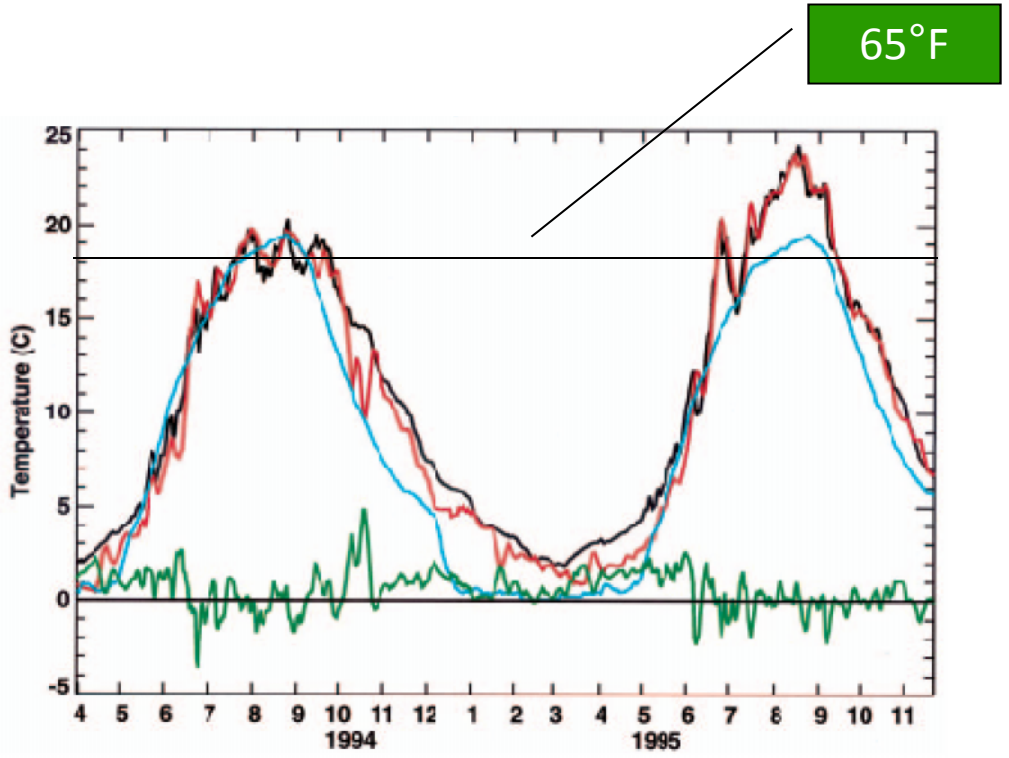
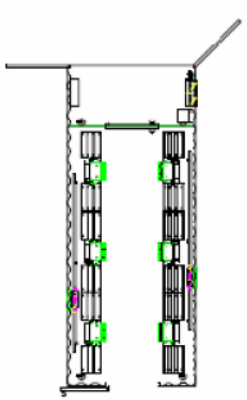


Plate 4. Time series of climatological (blue line), observed (red line), and modeled (black line) lake surface temperature in 1994–1995. Green line represents the difference between modeled and observed temperature.

ICE Cube Models

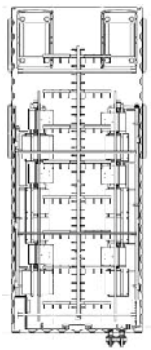
Dual Row: Physical Layout

IC2012DR:
20 ft. (12 rack)

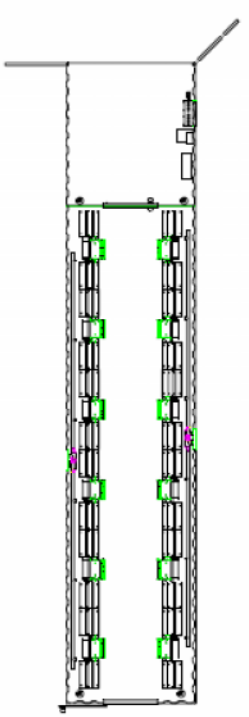


IC2010HY:
20 ft. (8+2 rack)
Hybrid

New!

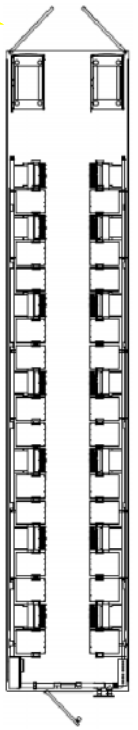


IC4024DR:
40 ft. (24 rack)

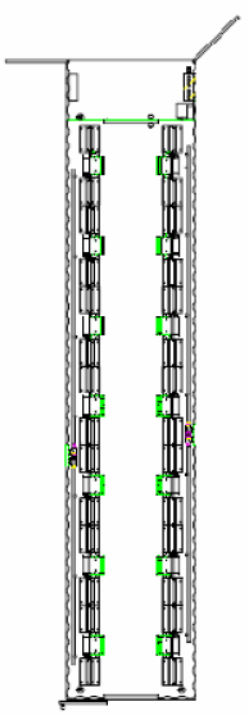


IC4026HY:
40 ft. (24+2 rack)
Hybrid

New!

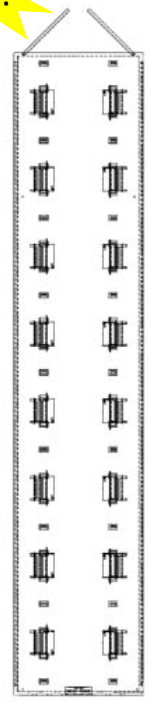


IC4028DR:
40 ft. (28 rack)



IC4032DR:
40 ft. (32 rack)

New!



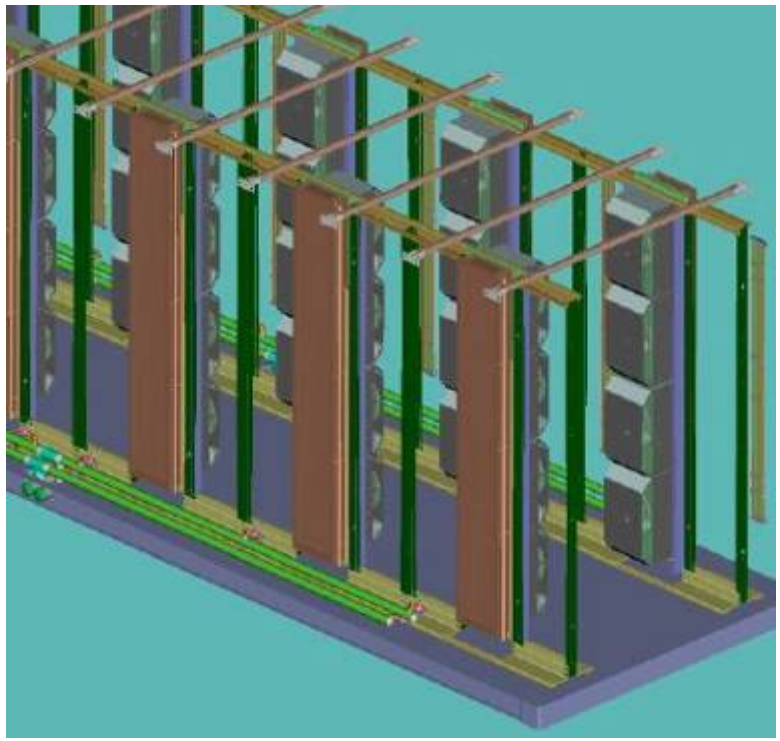
Dual Row: Power Consumption

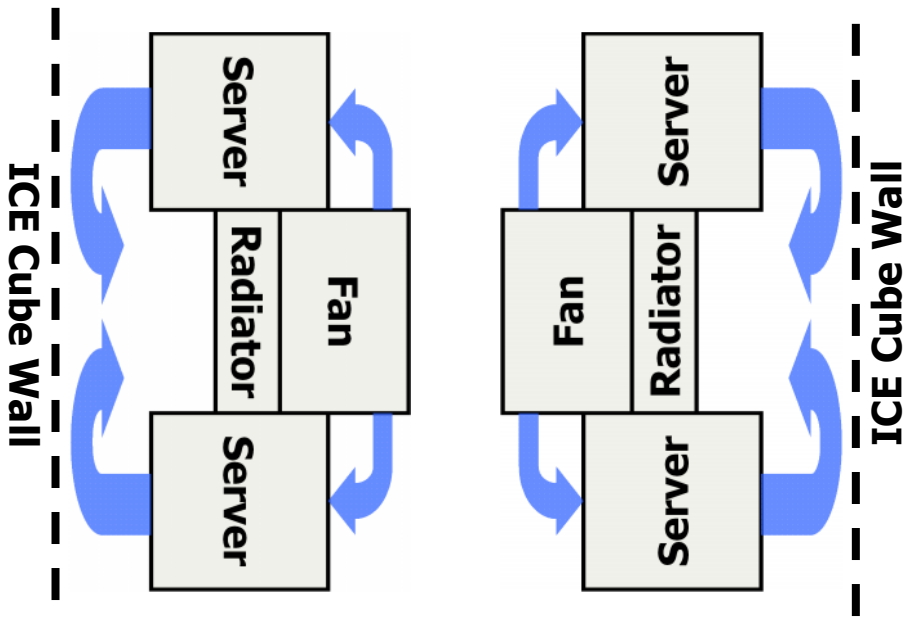
Power Consumers at Max. Load (W):

	12 Racks	24 Racks	28 Racks	32 Racks
Systems	168,884	289,745	337,769	386,022
Quanta Host Switches	5,320	9,120	10,640	12,160
Cisco 4900M	795	1,272	1,590	1,817
Digi CM-32	100	160	200	229
Batteries	43	75	87	99
Fan Assembly	3,825	6,480	7,560	8,640
Lighting	192	384	384	384
Total	179,159	307,236	358,230	409,351
Total (@ Rectifier input)	191,614	328,595	383,134	437,809
Total (@ Main Circuit Input)	196,520	337,007	392,942	**449,017**

Dual Row: Advanced Cooling Design

- ICE Cube has water supply and return lines
- Fans draw air through radiators between each rack
- Air is cooled immediately before passing through the servers
- Tight integration allows for higher water loop temp and reduced air handler power usage





Dual Row: Hybrid Container in Production

Watch the „construction" of a new Data Center