Modular / Prefab Construction: Speed, Reliability, Quality

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**New Paradigm: “Data Center as a Solution”**—This Reduces the Total Cost of Ownership.
What is a Pre-Fabricated Data Center?

- **Traditional “Stick-Build”**
  - **Design**
  - **Build** = creating physical structure
  - **Install** = adding critical infrastructure and IT gear

- **Pre-Fabricated Modules**
  - **Design**
  - **Manufacture** = pre-fabricating modules in factory, comprising critical infrastructure equipment
  - **Install** = placing modules inside an existing structure, or outside, connecting utilities, and adding IT gear

- **Pre-Fabricated Building**
  - **Design**
  - **Manufacture** = pre-fabricating structures in factory, plus pre-fabricating critical infrastructure modules
  - **Assemble** = combining structures into one superstructure, loading modules, connecting utilities, and adding IT gear
Pre-Fabricated Data Center
Value Prop: **Rapid Deployment**

- **Customer Need:**
  - Quicker Response to their Customers’ Unforecasted Demand
  - Faster Time to Revenue

- **Differentiation: Vertical Integration**
  - Collapse the supply chain by procuring/producing Subsystems
  - All Subsystems pre-assembled, fully integrated, and tested in factory, with proven Quality Assurance processes (ISO-9001).
  - Fabrication and transportation occur in parallel with site selection, preparation, civil works, and construction.

*Source: Emerson Network Power Asia Pacific*
Emerson Network Power
Pre-Fabricated Data Center Examples

- **Australia**
  - 10 Turnkey Data Centers, 40MW Total Capacity
  - Concurrent Nationwide Deployment in 12 Months
  - End-to-End Project Mgmt. & Civil Works Partnership

- **T-Sysmets- Spain**
  - MCDC Size = 1200m² / 12,900 sq ft Capacity = 1.1MW
  - 38 x 2-Story Modules Delivered 6 Months After Order

- **Myanmar**
  - 3 Data Centers, 3.3MW Total Capacity
  - 17 "Meccano" Module Kits Erected on Site

- **facebook Sweden**
  - Pre-Fabricated Data Center Size
  - End-to-End Project Mgmt. & Civil Works Partnership
  - Project Ongoing: 15-Month Program, 9-Month Deployment

Continuum of Design Techniques to Meet Customers’ Needs
Pre-Fabricated Data Center Reference Design – 15MW Building

Water Treatment Modules

Energy Hall

Power Modules

Unit IT Modules

Evaporative Air Handler

Unit IT Modules

Data Hall A

https://www.facebook.com/LuleaDataCenter
Pre-Fabricated Data Center Reference Design – 1.5MW Modules
1.5MW Design Concept 1

- Expandable modular building
  - Unit IT for Data Hall, Office Space, Storage
  - Modules for Power, Water Treatment, Sprinkler Room

- Direct evaporative cooling (N+1)
  - incl. external water pump and tank

- Centralized UPS system (N+1)
  - incl. 10-min backup VRLA batteries (N+1)

- LV Switchgear

- MV Switchgear (two grid sources) and MV/LV Transformer

- 300kW Generators (2N) for the critical IT load only (300kW)
  - 330 racks @ 4.5kW/rack = 1.5MW full load

- Dry sprinkler and VESDA detection

- Building Monitoring System
Pre-Fabricated Data Center – Modular Building Components

Modules dimensions

UNIT IT

POWER CONTAINER

3657.6mm [12']

12192mm [40']

3657.6mm [12']

12192mm [40']
Power Container – Power Skid
Power Hall Building Block

Factory Production – not
Field Construction
Rapid Deployment Data Centers

- Integrated packages, built and pretested in factory environment
- Simplified configuration and greater scalability
- Systems right-sized during design phase
- Simplify and increase speed of deployment
- Most can be deployed in 14-16 weeks

Skidded Condensers

Enclosures

Power Skids
Configuration Concepts
1500kW using 500kW Base Module Ratings

R = Rectifier
B = Bypass
Configuration Concepts
1600kW using 800kW Base Module Ratings

System Bus A
- UPS 1-1 800kW
- UPS 1-2 800kW
- PDU 300kW
- Dist
- PDU 300kW
- Dist
- PDU 300kW
- Dist

System Bus B
- UPS 1-1 800kW
- UPS 1-2 800kW
- PDU 300kW
- Dist
- PDU 300kW
- Dist
- PDU 300kW
- Dist

R = Rectifier
B = Bypass

Future

R = Rectifier
B = Bypass
### Liebert NXL 1100kW, Skid Mounted Design

- Production not Construction
- Skid and/or stick / equipment
- Uniquely integrated, fully commissioned, rapidly deployed
- Produced at Liebert AC Power Factory
Liebert NXL 1100kW or 2x625kW (N+1) Skid Mounted Design
Emerson Network Power
Data Center Deployments: NBN Co., Australia

- **On-Site Activity**
  - Local Site Preparation
    - Local codes managed seamlessly through PMO and partners
    - Contractor cost minimized with Emerson Procurement Process
  - Project Management Office expedited and minimized Change Management
    - 50+ member team: Project Directors, Schedulers, Surveyors, Auditors, Procurement, Supply Chain, Contracts, Engineering, Testing & Commissioning

**Experience and Execution:**
Integrated and Managed 40MW Capacity at 10 Sites Concurrently
Skid Power

- Engineered to 1.5MW to match IT Hall
- ISO-Container sized skids for easy transport
- Fully pre-wired at the factory, ready for plug-and-play
- All system level components factory tested
- Eliminate field wiring issues – connections, terminations, size, polarity, grounding, etc.
Adiabatic Cooling Module

Factory Production – not Field Construction
Emerson Network Power
Selected Deployments – Last Three Years

Sao Paolo, Brazil
Lagos, Nigeria
Washington, USA
Ontario, Canada
Florida, USA

Amsterdam, Netherlands
Kaiserslautern, Germany
Hanau, Germany
Ljubljana, Slovenia
Sicily, Italy
Barcelona, Spain

Oslo, Norway
Stockholm, Sweden
Orebro, Sweden
Orebro, Sweden

Moscow, Russia
Arhangelsk, Russia
Moscow, Russia
Siberia, Russia

Mariehamn, Aland Island
Turku, Finland
St. Petersburg, Russia

Amsterdam, Netherlands
Kaiserslautern, Germany
Hanau, Germany
Ljubljana, Slovenia
Rome, Italy
Sicily, Italy

Washington, USA
Ontario, Canada
Florida, USA

Boras, Sweden
Borás, Sweden

Zagreb, Croatia
Almaty, Kazakhstan

Canada
USA

IT / Data
Telecom
Industrial
Pre-Packaged Power

- Coming to a Data Center near you, soon!
  - Quicker ‘Go Live’ times
  - Reduced overall facility costs
  - Improved Quality
  - End-to-End tested systems
  - Easier installation
  - Faster start-up and commissioning
  - Improved serviceability
Q & A

- Thank you!
- The floor is open

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