

**ALEXANDER
SCHNEIDER**

THE POWER OF EXCELLENCE



Revenue Opportunities for UPS Owners

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Energy Systems Product Manager



About Alexander Schneider

140 Employees

2 Countries:
Israel & USA



Aerospace
Quality
Standard

24X7
Service

**ALEXANDER
SCHNEIDER**
THE POWER OF EXCELLENCE

500
Active Customers

55 Years of Excellence
Privately Owned & Operated

0 Debt

Warehoused in
Countries **5**

About Vertiv



MANUFACTURING SITES: 20
ENGINEERING CENTERS: 15
OPERATIONS: 50 COUNTRIES



EMPLOYEES
~18,000



CUSTOMERS INCLUDE

**America Movil, Apple, AT&T,
China Mobile, China Tower,
Ericsson, Facebook, Microsoft,
Reliance, Verizon, Walmart**

Offering



- Power Mgmt
- Services
- Thermal Mgmt
- Software & Solutions

Broad range of power, thermal, and infrastructure management portfolio

Geography



- Americas
- EMEA
- AP

Global, well-established footprint and supply-chain network

End Market

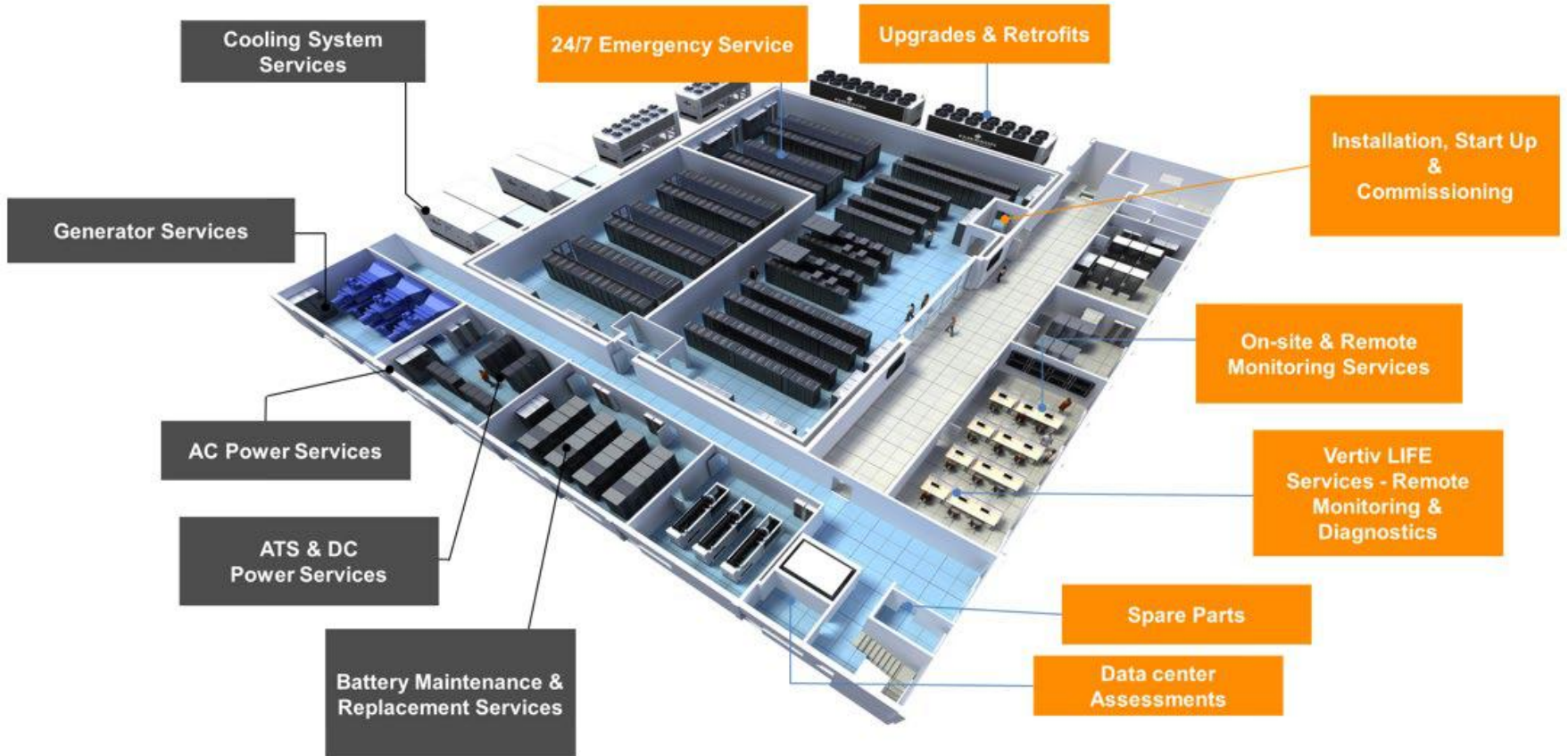


- Data Centers
- Communications
- Commercial & Industrial

Serve vital applications in data centers, communication networks, and commercial/industrial environments

Vertiv & Alexander Schneider

The Leaders in Datacenter Infrastructure



Which Trends in Energy Storage are Driving the Evolution of the UPS?



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What Do UPS Systems Do Today?

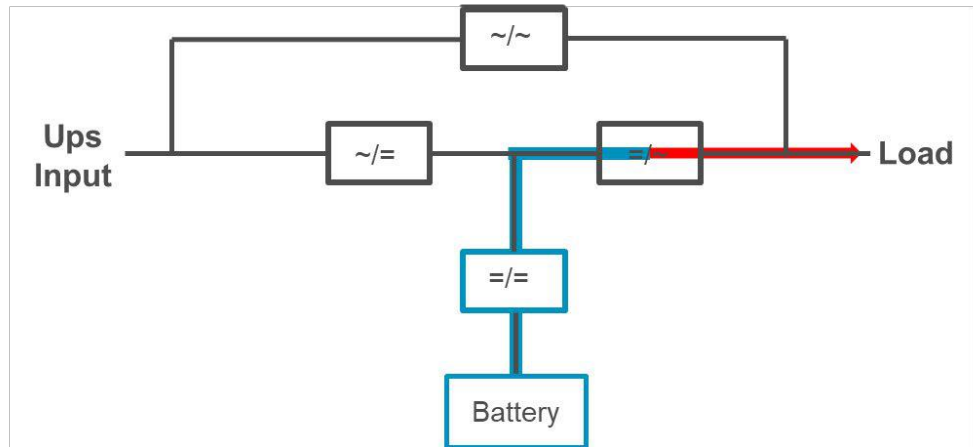


Vertiv Liebert® eXL UPS

Traditional UPS Services

Backup Power

Power Quality



Next Generation UPS Services



Vertiv Liebert® eXL UPS

Traditional UPS Services

Backup Power

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Next-gen UPS Services

Backup Power

Power Quality

Demand Management

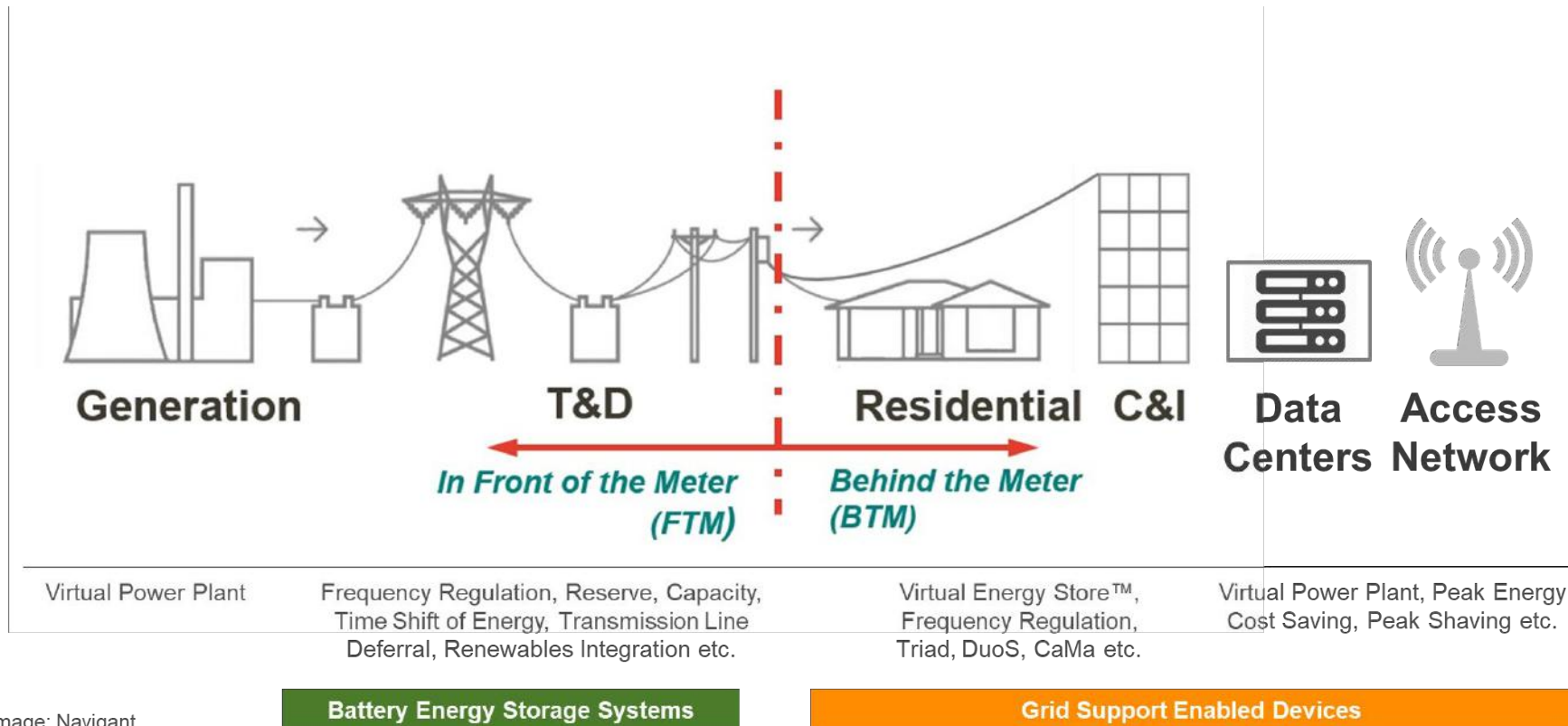
Energy Arbitrage

Grid Services – Ancillary Services

*Additional services use excess battery capacity, provide
no increased risk to traditional UPS services*

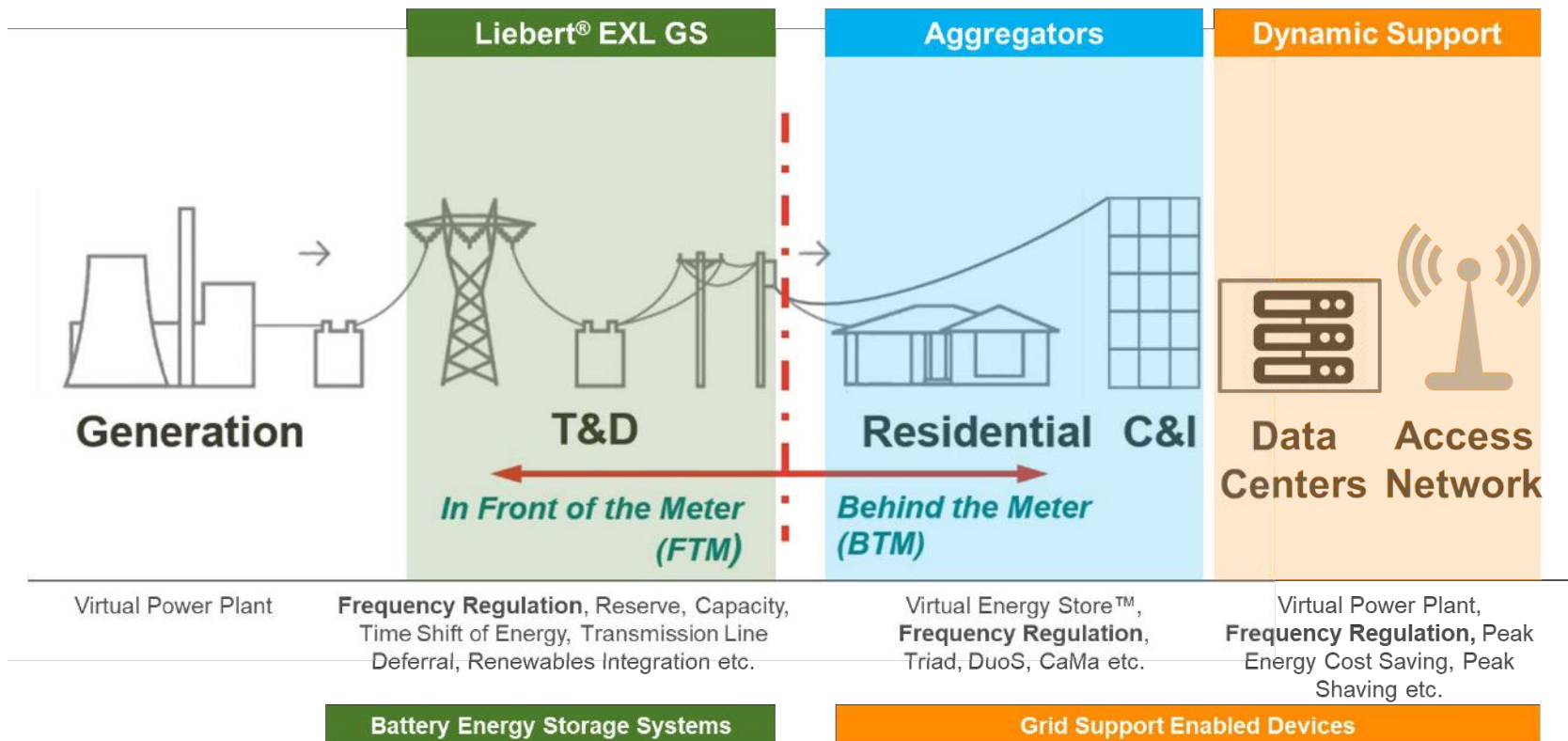
Energy Storage Market Segments:

Behind-The-Meter (BTM) VS. Front-Of-Meter (FTM)



Energy Storage Market Segments:

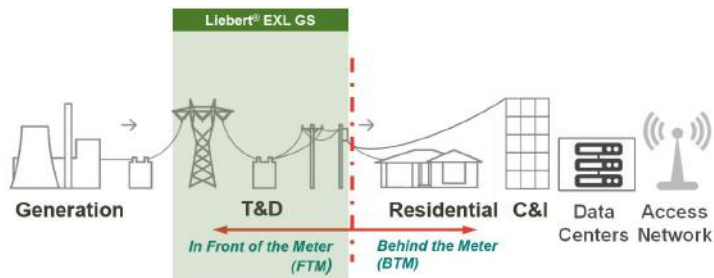
Behind-The-Meter (BTM) VS. Front-Of-Meter (FTM)



FTM Applications: Liebert® EXL GS

FTM Applications

- > Frequency Regulation
- > Time Shift of Energy
- > Transmission Line Deferral
- > Renewables Integration
- > Capacity Markets



Technical Solution

- > 4-Quadrant Bi-Directional Converter
- > Power range 1.0 to 1.25 MW
- > Current Mode Grid Interactive
- > Mode selection and AC parameters control via field bus
- > Wide DC voltage range for maximum battery flexibility



FTM Site Example: Liebert® EXL GS



The Impact of Trends Across Four Energy Storage Topics

**Cost of
Li-Ion Batteries**

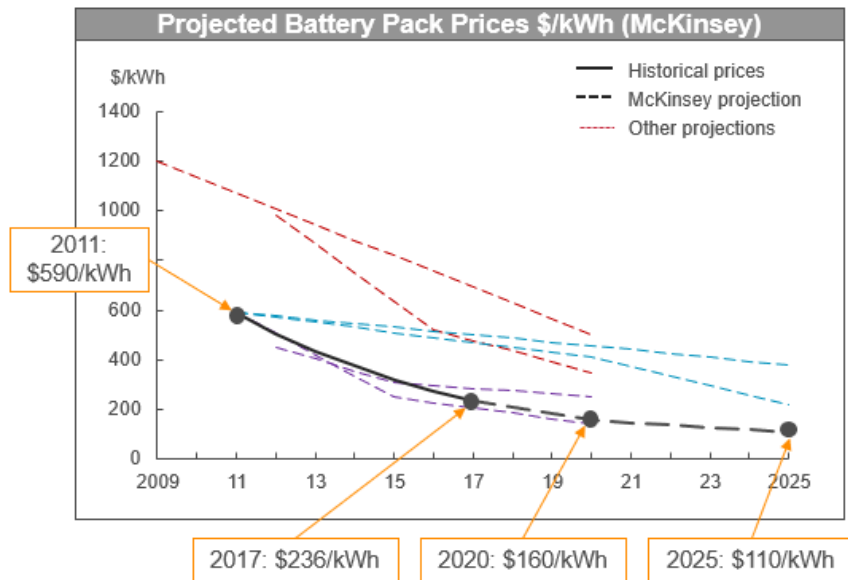
**Energy Density
of Li-Ion Batteries**

**Cloud-based Analysis &
Dispatch Platforms**

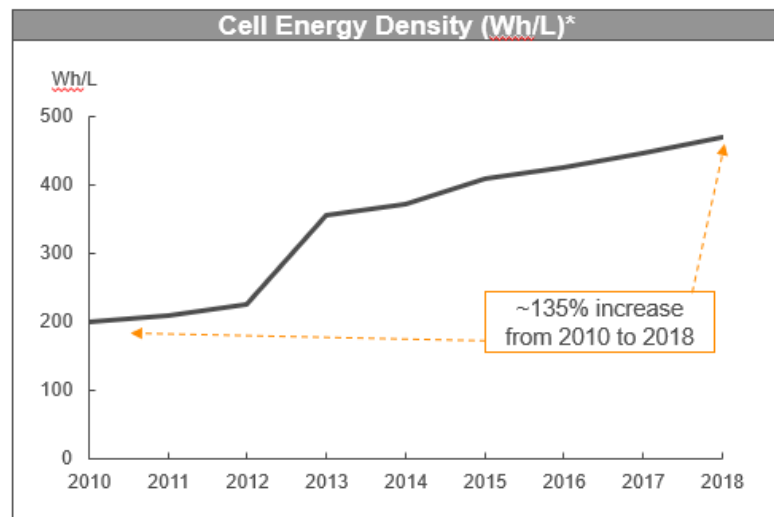
Aggregation

Trends in Lithium-ion Battery Cost & Density

Cost of Li-Ion Batteries



Energy Density of Li-Ion Batteries

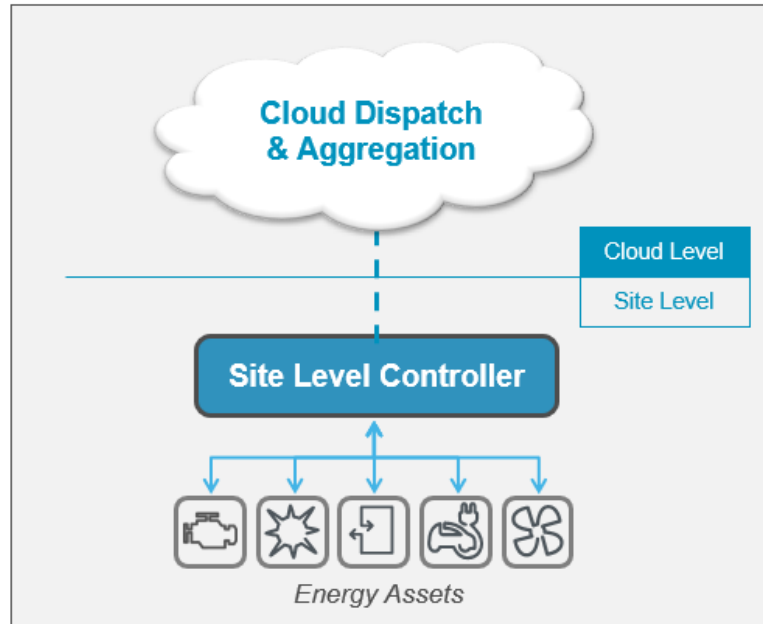


*Energy density progression for prismatic form factor cells

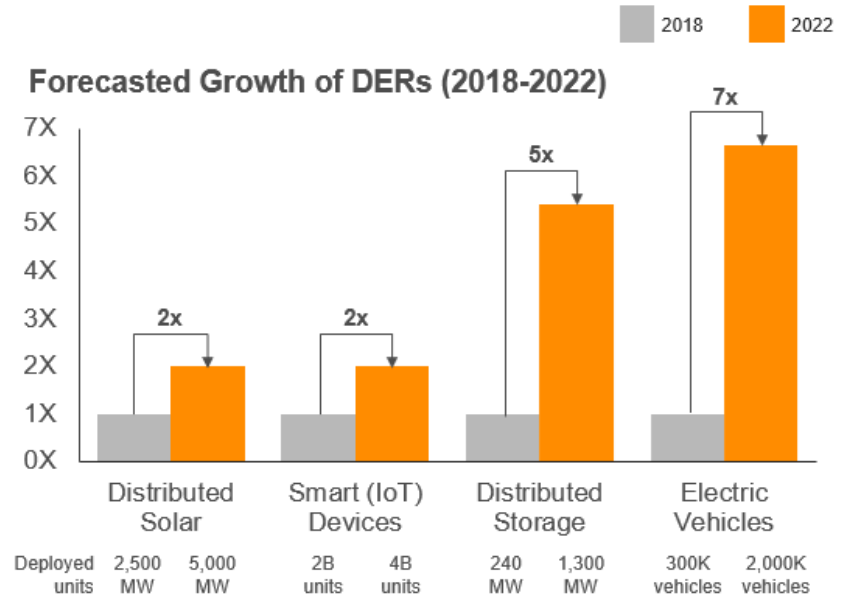
Battery pack costs will continue to fall even as energy density at the cell- and pack-level continue to increase

Trends in Cloud-Based Analysis, Dispatch & Aggregation for Energy Storage

Cloud-based Analysis & Dispatch



Aggregation



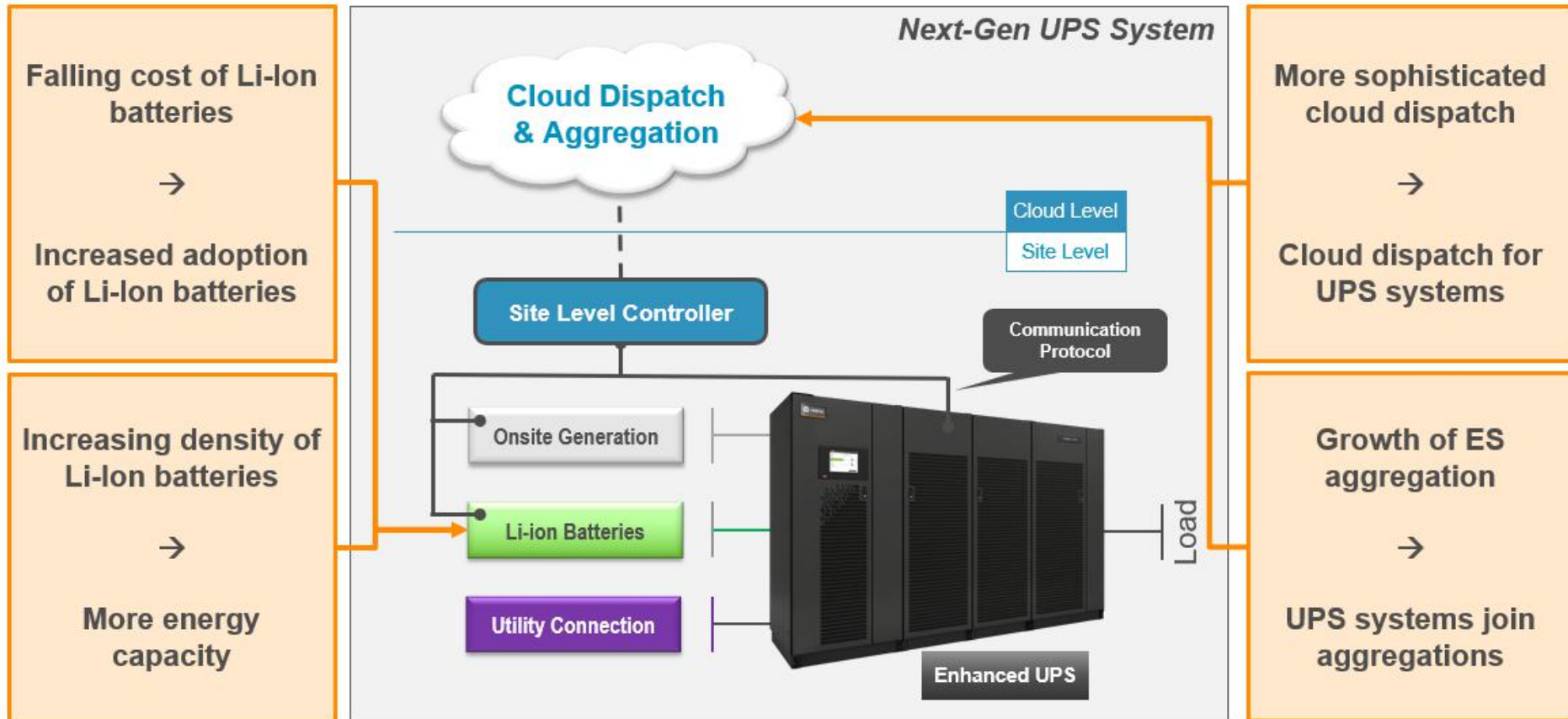
Use of increasingly sophisticated cloud-based analysis, dispatch, and aggregation tools will proliferate

How will these Trends Influence the Future State of the UPS?



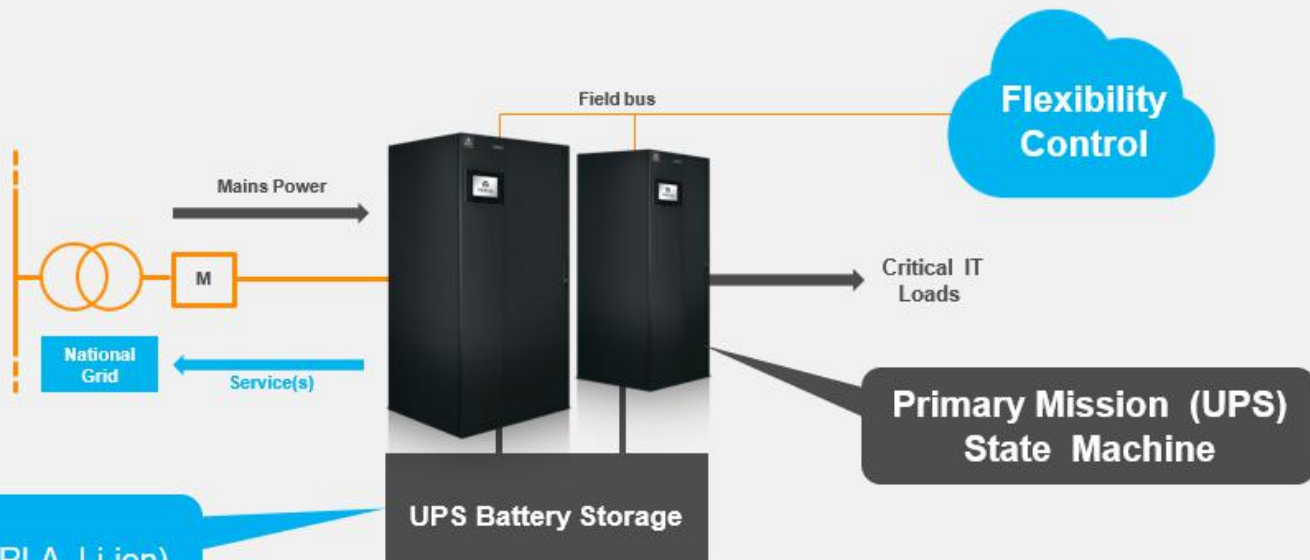
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The Next Generation UPS



BTM Applications: GRID Support Enabled Devices

Data Center «Prosumers»



Additional revenues from grid services, UPS primary mission untouched

Next Generation UPS Services



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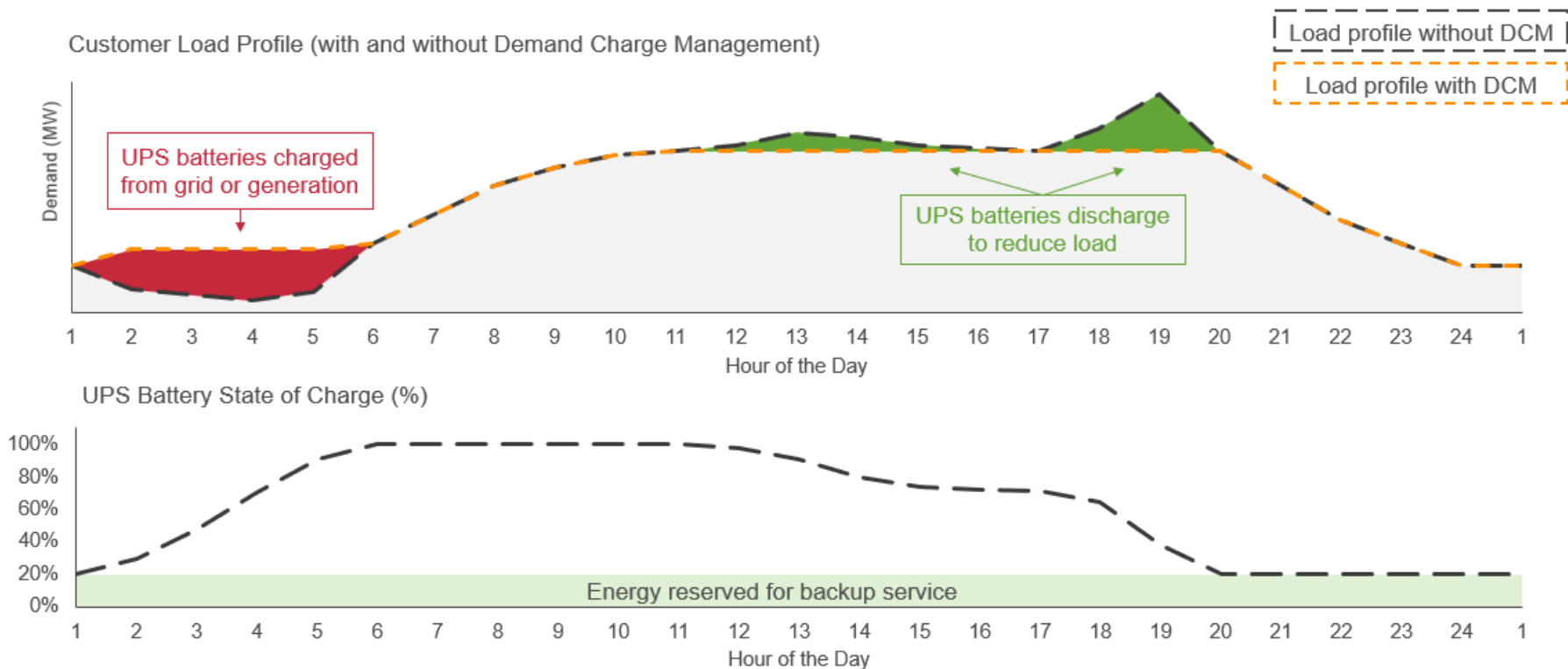
Demand Management

Energy Arbitrage

Grid Services – Ancillary Services

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Next Generation UPS: Demand Charge Management



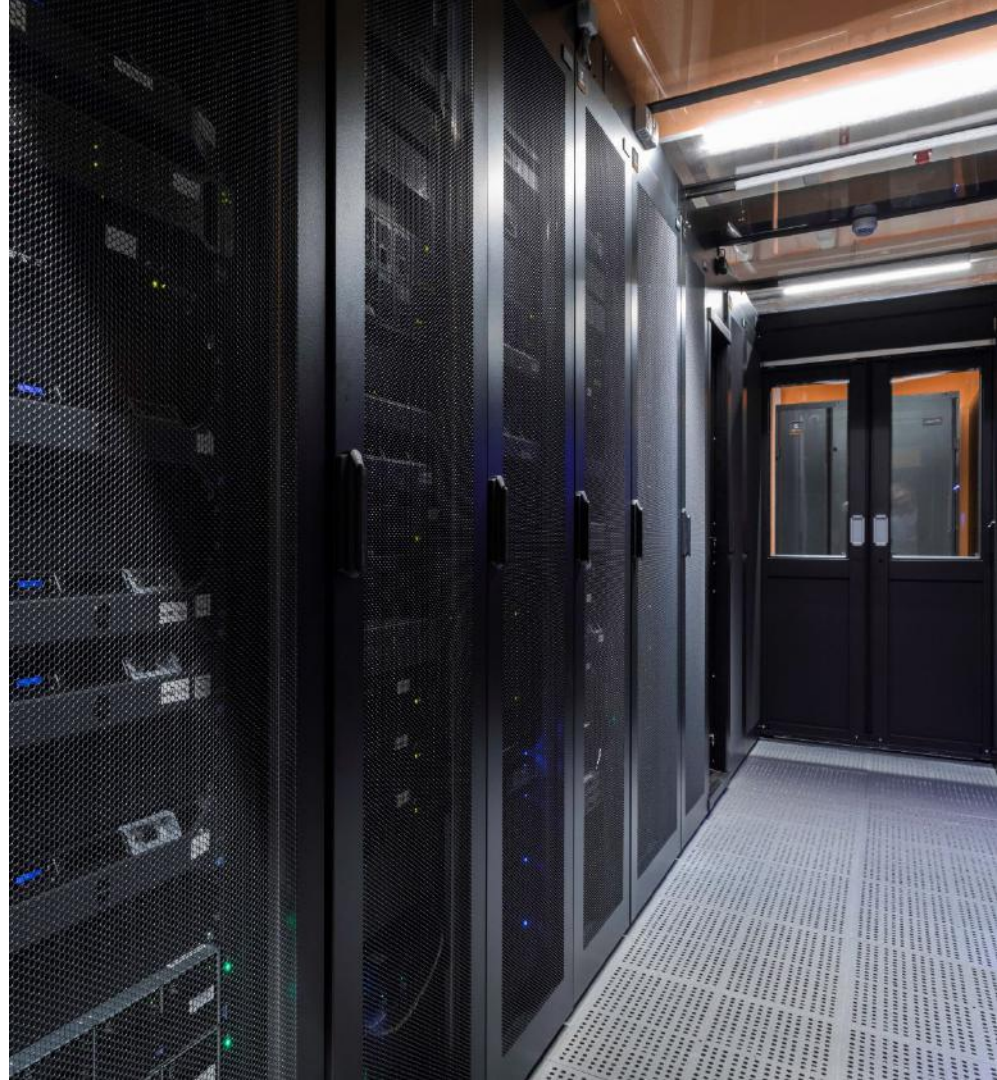
Careful sizing needs to be considered for the battery, between the «traded» quota and the «backup» reserve

Conclusions

Data center operators and C&I customers have a new way to monetize existing asset, always keeping critical load protected.

Vertiv technology helps critical users to optimize the cost of energy and to participate in the grid support market.

This is becoming key as renewable energy sources are challenging the traditional electricity production.



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Let's Talk



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