

Johnson
Controls



DISTRIBUTED ENERGY STORAGE

ELECTRICITY STORAGE REVOLUTION

NATIONAL CONFERENCE OF STATE LEGISLATURES

August 5, 2017

Agenda

- Introduction
- How Do Batteries Help Electric Security
- How Do Batteries Save Money
- What Is A Battery System
- How Are They Paid For
- Case Study: NJ Hospital
- Conclusion

Johnson Controls is a \$30B global company

BUILDING TECHNOLOGY & SOLUTIONS (\$23B)

- Building Management
- Temperature Controls
- HVAC
- Fire and Security



POWER SOLUTIONS (\$7B)

- Conventional Automotive Batteries
- Rechargeable Automotive Batteries
- Rechargeable Building Batteries



The Distributed Energy Storage group works across both parts integrating building and battery technology for our customers

Electricity

- Must be created at the same time it is consumed
- Electricity demand is volatile and occurs in a very wide range
- As grid demand peaks, more expensive and dirtier generators are dispatched
- Grid demand drives cost

Batteries

Battery and microchip similarities:

- Rapidly evolving technology
- Basic technology can deliver a broad array of functions
- Best thought of as part of a system (PC or Battery System)

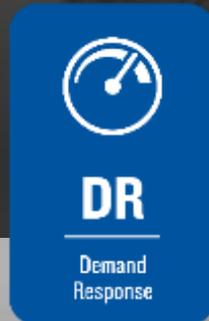


Why Batteries Improve Electricity Reliability

- Batteries reduce electricity peaks resulting in less stress on distribution, transmission and generating equipment
- Batteries improve grid power quality (voltage, frequency)
- Batteries by themselves and in combination with other equipment allow facilities to operate in 'island' mode when grid is down due to natural disasters or unauthorized access
- Batteries play a large role in ensuring critical infrastructure continues to operate during grid outages
- Batteries can be cost-efficient alternatives to building transmission and generation

How Batteries Save Money

- Managing building peak electricity demand, which drives what are often the most expensive parts of an electric bill
- Battery Systems improve financial result of Solar PV systems by effectively smoothing the output
- Enables building (battery, building HVAC, lighting, etc.) to respond to price signals
- Allow participation in Demand Response, Frequency Response and other programs

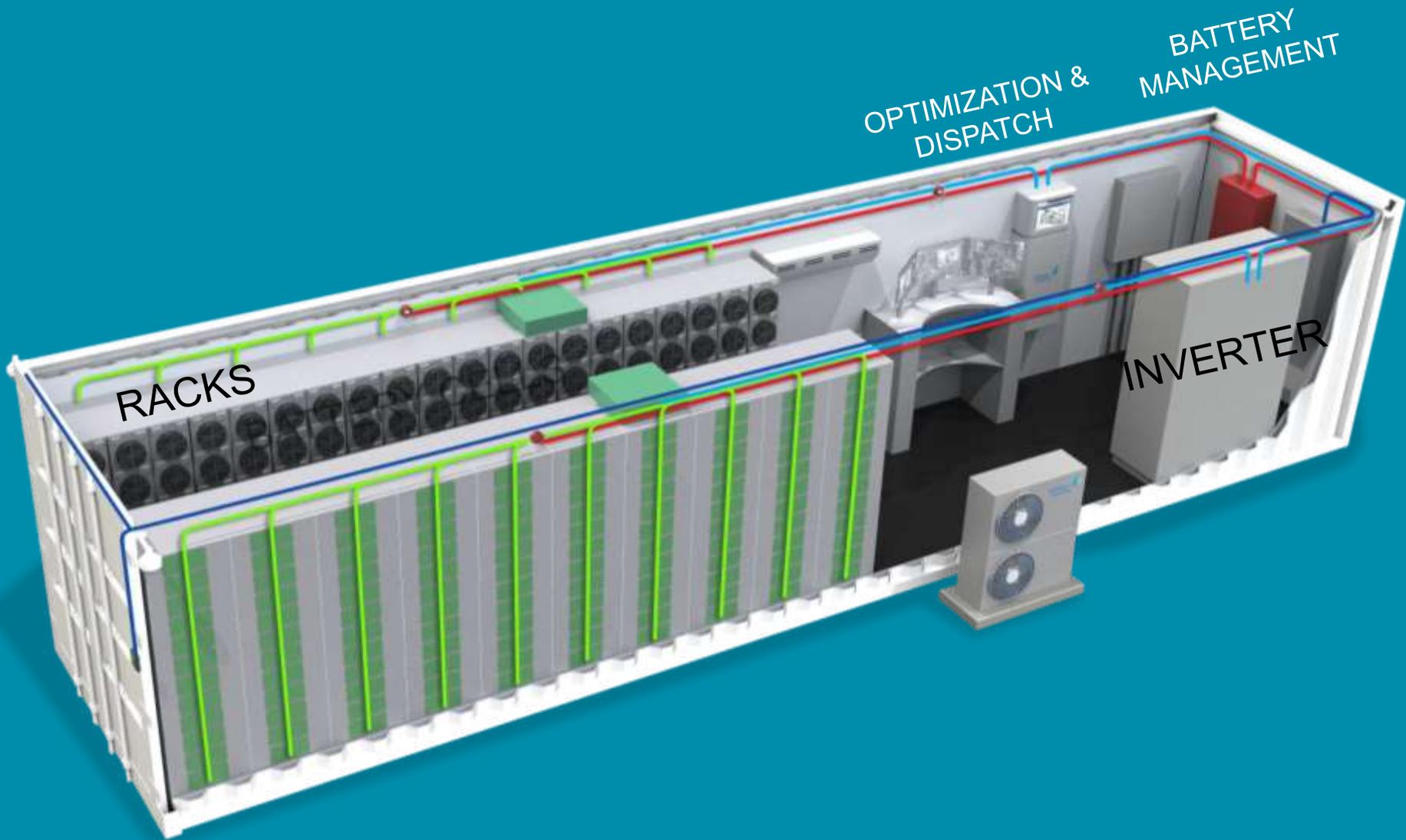


What Is A Battery System

Battery system has these major parts:

- Battery cells
- Racks for battery cells
- Battery Management System
- Inverter
- Battery System Optimization and Dispatch





How To Pay For Them

- Battery installations in buildings have a financial return that can justify the investment
- Some areas will see higher adoption rates when there is a financial incentive
- Building owners will generally invest in energy technology when there is sufficient financial benefit. Efficiency and Renewable Energy have a good track record in this regard.

Case Study: Large NJ Hospital

- Battery System
 - Solar PV system
 - On site emergency generator
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- System participates in PJM Frequency Regulation program. This is what monetizes the system
 - Solar/Battery System/Generator work in tandem to provide emergency power to critical loads when grid is down
 - The hybrid system dramatically increases the length of time that emergency power can be provided to facility



Battery System

Generator

Solar PV System

Conclusion

Battery System on the building side of the meter can:

- Improve electricity security and reliability by reducing system peaks and providing backup facility power
- Save money by reducing electricity costs for building owners by managing peak demand charges and enabling participation in grid programs
- Building owners will buy them and will adopt batteries at much higher rates with incremental financial incentives are offered

Johnson Controls stands ready to partner with you to advance distributed energy storage in your state

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Thank you

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