

POWERING THE FUTURE



FROM BATTERIES to BUILDINGS
to BOTTOM-LINE BENEFITS
Distributed Energy Storage | Solar PV

Doug Williams

June 20, 2016



WORLD-CLASS BATTERY
EXPERTISE



IN-DEPTH BUILDING
KNOWLEDGE

STORAGE + SOLAR OFFERINGS



L1000 In-Building Solution

Modular in 43 and 65 kWh increments



L2000 Containerized Solution

Modular in 510 kWh increments

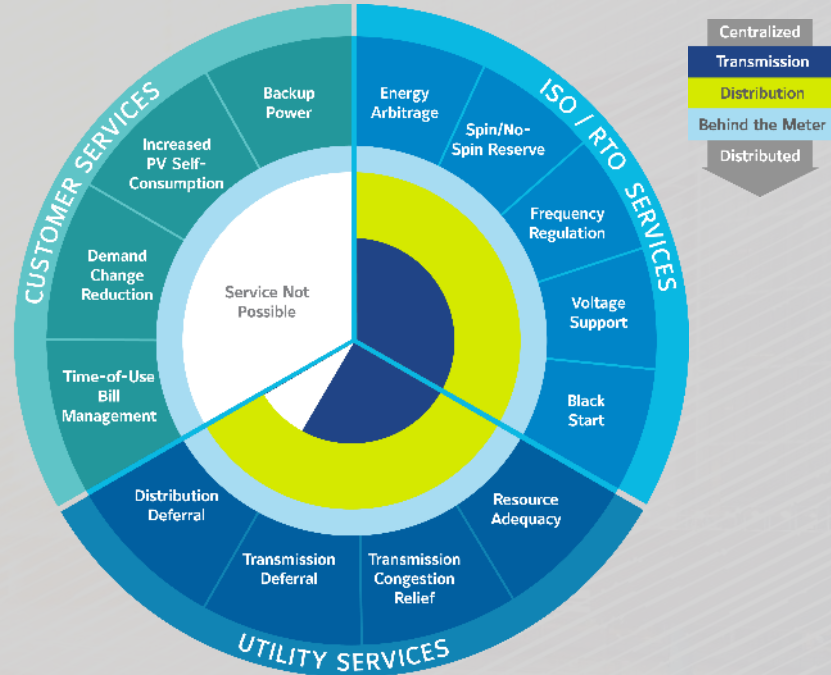


Solar PV Design / Construction

ENERGY STORAGE CAN PROVIDE MULTIPLE OPERATIONAL BENEFITS ALONG WITH COST SAVINGS AND REVENUE OPPORTUNITIES

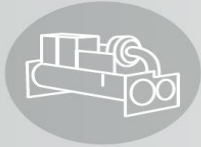
Potential value opportunities:

- + Demand Charge Management
- + Load Shift
- + Capacity Demand Response
- + Frequency Regulation
- + Renewable Energy Support
- + Back Up Power
- + Power Quality Improvement
 - + Power Factor Correction
 - + Voltage Support



Batteries can provide up to 13 services to three stakeholder groups

JOHNSON CONTROLS TECHNOLOGY AND OFFERINGS PROVIDES ADDITIONAL VALUE WHEN INTEGRATING STORAGE + SOLAR + BUILDINGS



1980–2000: EQUIPMENT-BASED EFFICIENCY

Improving equipment efficiencies piece by piece, with emphasis on the chiller, to use less energy.



2000–2015: ENERGY-BASED OPTIMIZATION

Making heating, cooling and air handling systems more efficient, reducing energy use another 5–15%.



2015–2020: COST-BASED OPTIMIZATION

Managing how and when energy is used, to spend less money. Model predictive control builds on rigorous, ongoing projection and analysis of weather, energy pricing, load requirements, etc., and draws on stored energy to optimally reshape load, minimizing utility costs—more than double the value of energy-based optimization.



2015–2025: REVENUE GENERATION

Shaping and shifting load profiles via model predictive control in shorter timeframes, to cut costs and also generate revenue through electric energy markets. Combining central plant and battery assets opens the door to a dramatic increase in value.



2015–2030: RESILIENCY & RELIABILITY

Ensuring continuous, high-quality supply of electricity through microgrid solutions. Optimal control products flatten load profiles and dispatches onsite power generation economically. Microgrid solutions help achieve desired resiliency and grid independence.

