



CONVERGENT

Leveraging Energy Storage for Resiliency & Efficiency in Ontario

PRESENTED BY:
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Senior Vice President, Strategic Projects
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Agenda



Who We Are



Energy Storage Value Creation



Financial Modeling



Risk Mitigation & Project Contracting

Who We Are

Convergent is the leading independent developer of Energy Storage solutions in North America.



Powered by Results



1st

The first to build and operate energy storage as a "non-wires alternative" for utility infrastructure



120 MW/240MWh

We're the largest independent operator of energy storage solutions in North America

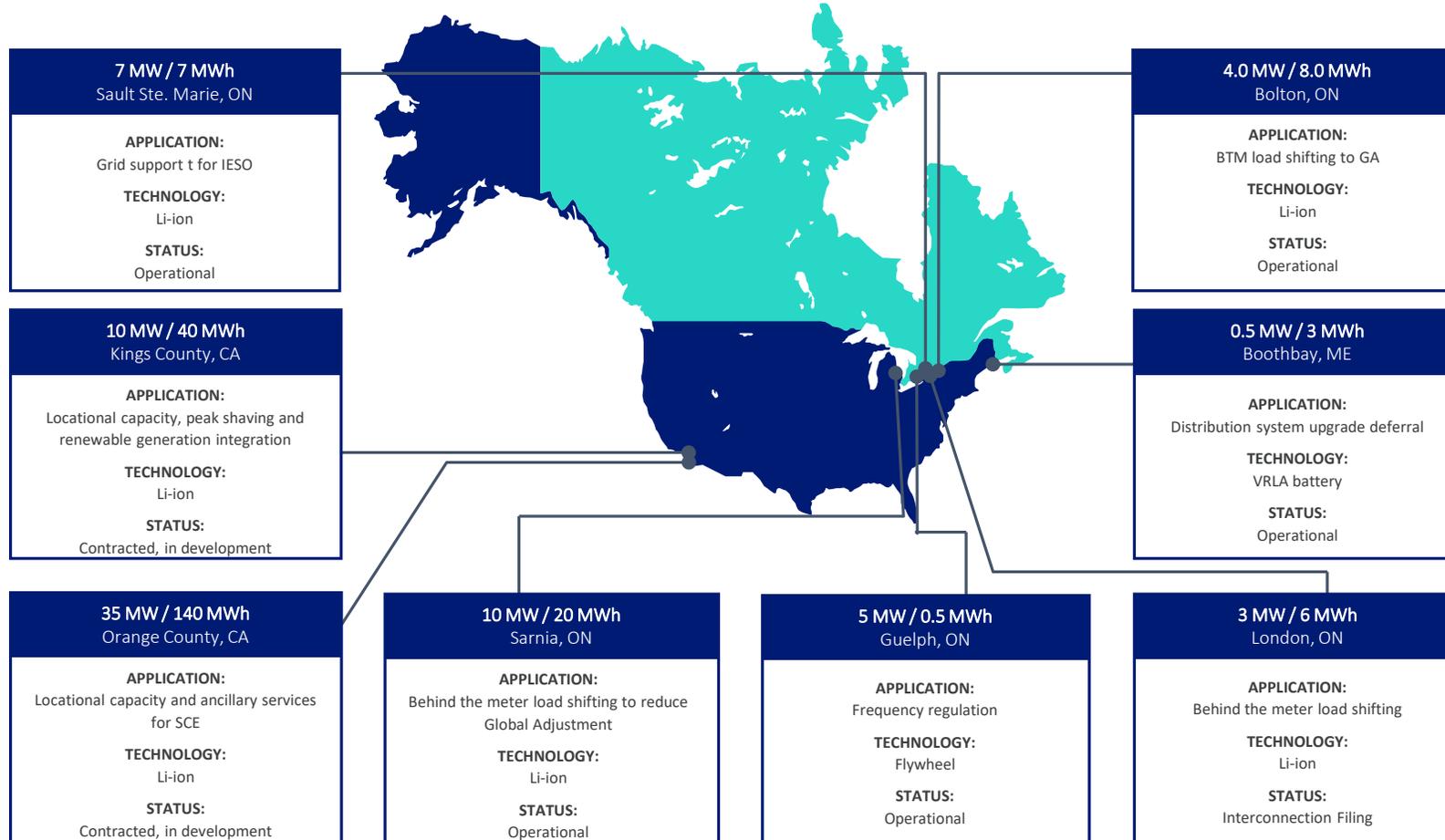


25%

Our proprietary algorithm is 25% more accurate at peak prediction than public market forecasts

Select Project Portfolio

With over 120 MW / 240 MWh of projects, Convergent is the largest independent operator of energy storage projects in North America.



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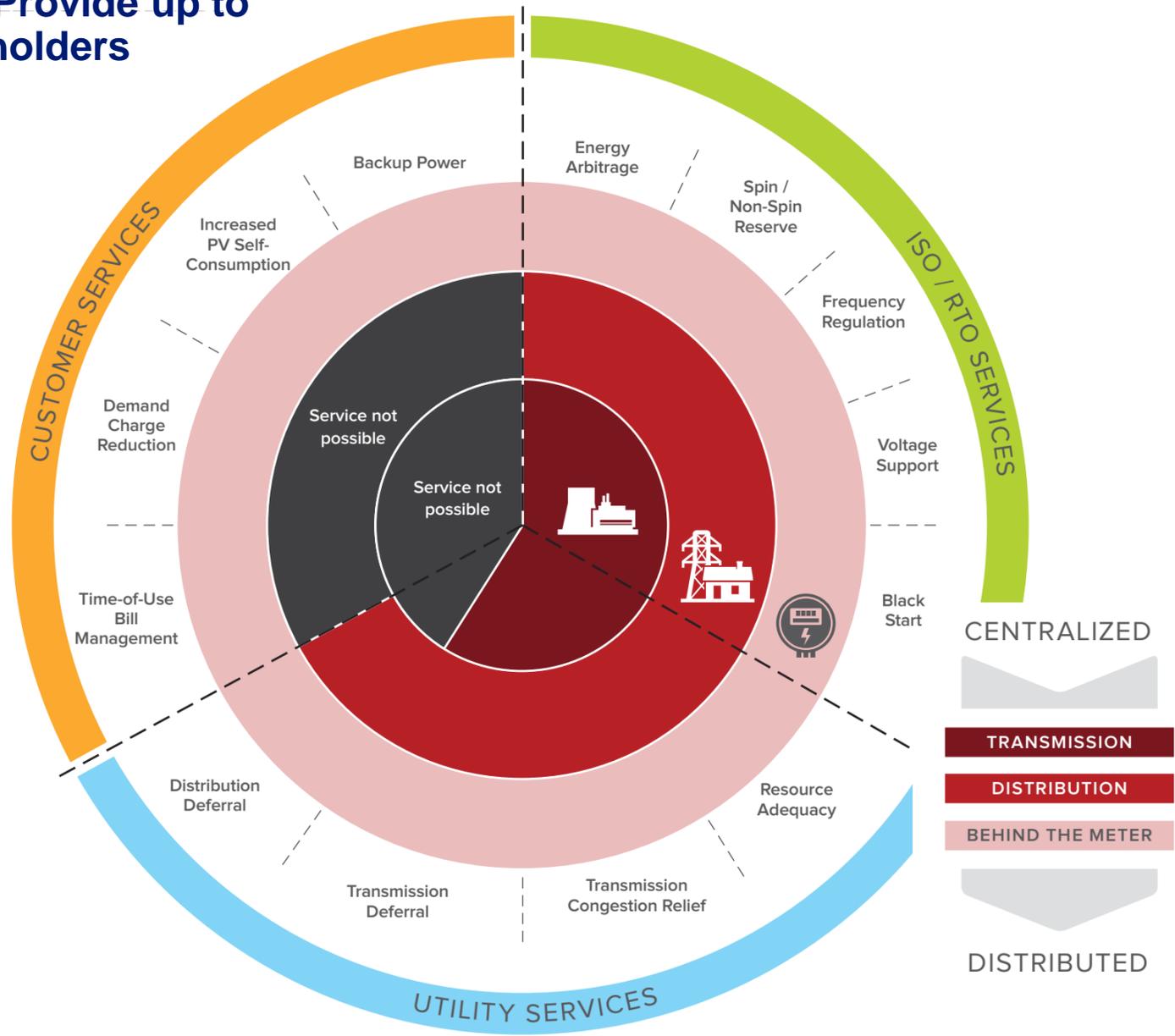
Risk Mitigation & Project Contracting

Value Creation

Energy Storage generates value for the grid today!

\$ REVENUE		SAVINGS \$\$
Energy Arbitrage	Avoid Transmission Capacity Charges	Increase System Flexibility
Spin Reserve	Capacity Value	Improve Resiliency
Voltage Support	Global Adjustment Reduction	Defer Infrastructure Upgrades
Frequency Regulation		
Black Start		

Energy Storage Can Provide up to 13 Services to Stakeholders



SOURCE: THE ECONOMICS OF BATTERY ENERGY STORAGE | 4

SOURCE: Fitzgerald, Garrett, James Mandel, Jesse Morris, and Hervé Touati. The Economics of Battery Energy Storage: How multi-use, customer-sited batteries deliver the most services and value to customers and the grid. Rocky Mountain Institute, September 2015. <<http://www.rmi.org/electricity_battery_value>>

Utility Portfolio Analysis Example

Reason	Traditional Solution	Cost*	Storage Solution	Storage CAPEX*
Load Growth & Reliability	Extend a 115 KV transmission line in a new corridor and install a new substation for a new mall & stadium complex	\$20M+	10 MW, 40 MWhs on 23 kV circuit next to the stadium	\$16M
Load Growth	Install a new 69/13.8 KV substation to replace the 69/4 KV substation; upgrade 4 kV circuit	\$6.3M+	2 MW, 8 MWhs downstream from the substation	\$3.8M
Global Adjustment Charges Reduction	10MW Load Curtailment– Impacting production or install gas-fired genset with upfront CAPEX commitment and impact on Green House Gas Emissions	\$10M+	10 MW, 20 MWh at the point of interconnection	\$7.5M

**All figures are approximate*

Up to 50% less CAPEX with Energy Storage compared to traditional solutions

Location Matters

For Value Creation

FLEXIBILITY, COST & RELIEF



INCREASES FLEXIBILITY

- locational flexibility directly within load pockets

REDUCES COST

- Avoids costly T&D infrastructure upgrades / reduces ratepayer costs

PROVIDES CASCADING RELIEF

- Distribution assets benefit feeders, substations and transmission lines

Technology Matters

Technology is selected based on the application

ENERGY STORAGE VARIABLES



- Energy
- Power
- Roundtrip Efficiency
- Density (footprint)
- Cycle Life
- Calendar Life
- Depth of Discharge
- O&M
- Hazardous or flammable

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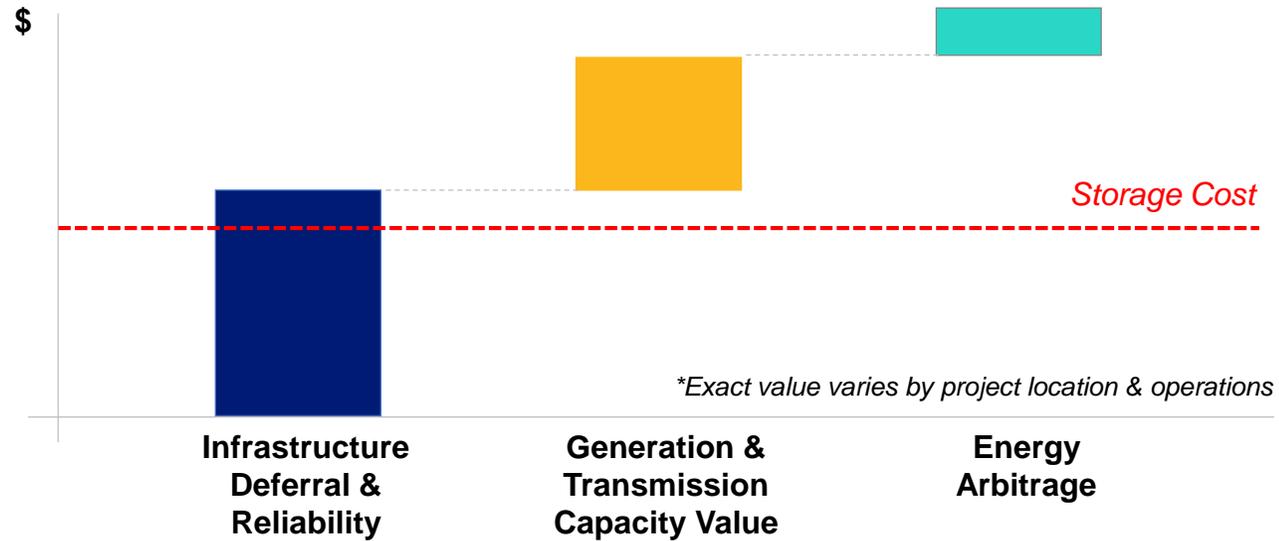
Financial Modeling



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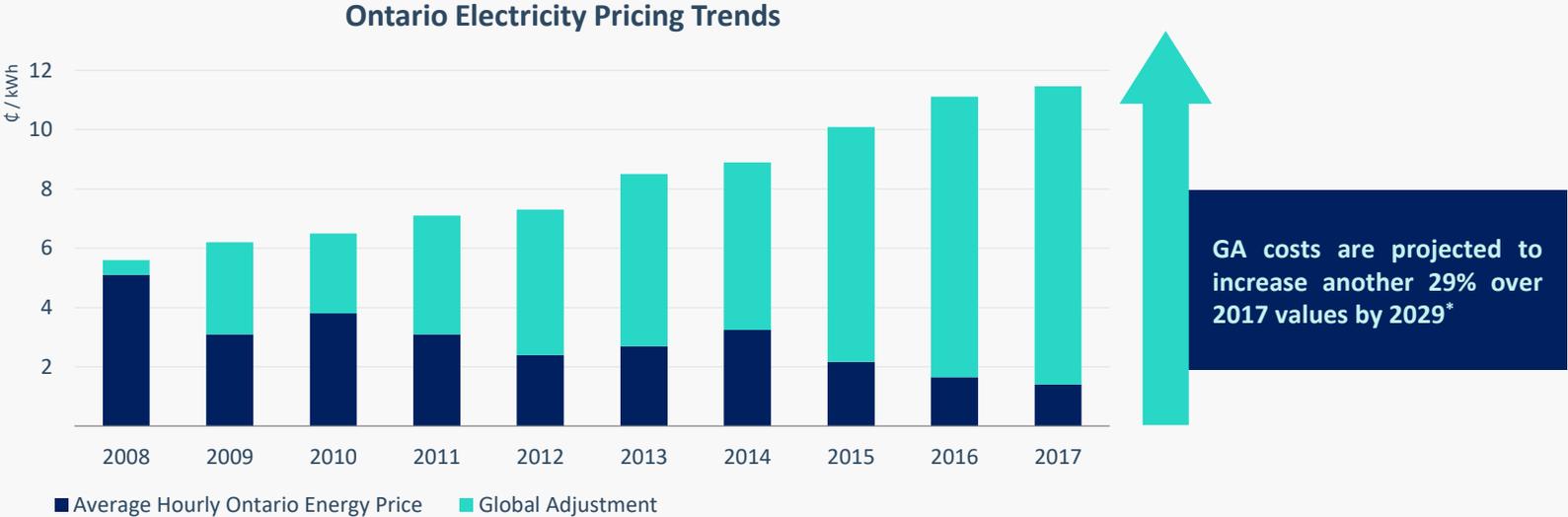
Front-of-the-Meter Sample Economics of Value Creation with Energy Storage

**T&D Infrastructure value* alone justifies energy storage today
Market revenues/savings further strengthen the business case**



Global Adjustment Costs

Ontario pays the highest energy costs in North America, where Class A users are charged based on their facility’s contribution to the 5 highest grid peaks. This surcharge falls under the byline “Global Adjustment”, and the fee is increasing rapidly



Source: IESO.ca
 *Based on projections from the Association of Major Power Consumers of Ontario, Sept 2017.

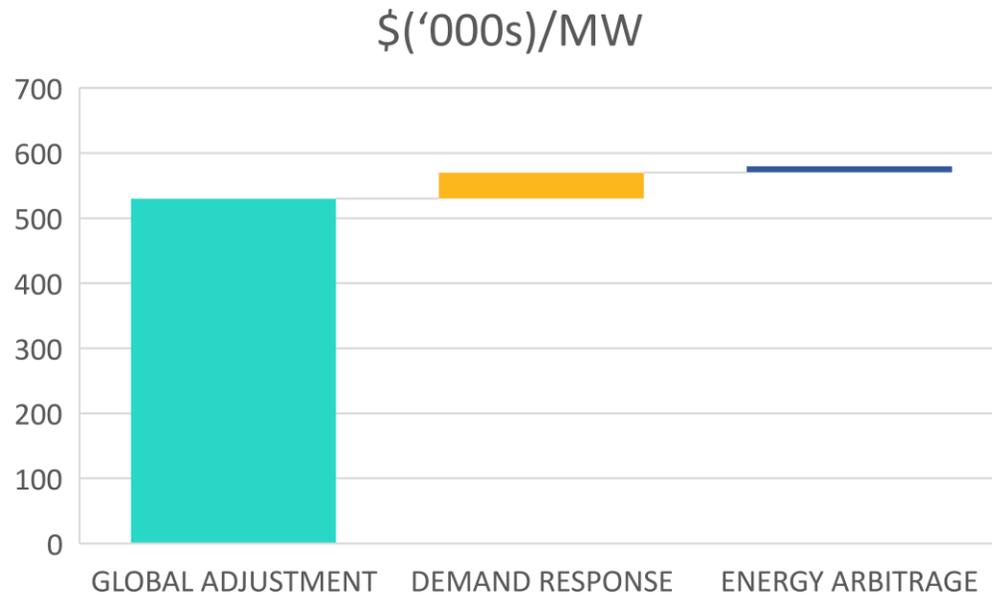
**Convergent Peak IQ[®] Energy Storage System
 minimizes energy usage during these 5 peaks,
 saving large industrial users' 50%-70% on their annual electricity bill.**

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Stacking Multiple Value Streams behind-the-meter

We use a battery asset to manage peak usage and ensure short-duration electrical reliability

Available Value Streams Today



10MW Value Streams (at 5 Peaks):

- GA: \$5.75M
- DR: \$210k
- EA: \$100k

+\$6M
POTENTIAL YEARLY
SAVINGS

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REDUCING GLOBAL ADJUSTMENT

discharge during peak hour(s)

PARTICIPATING IN DEMAND RESPONSE

peak reductions with **no impact**
on operations

ARBITRAGE PEAK/OFF-PEAK ENERGY

“arbitrage” off (charge) and on (discharge)
peak prices

FUTURE OPPORTUNITIES

provide grid services to local LDC or
participate on **ieso capacity auction**

ENVIRONMENTAL BENEFITS

no emissions or hazardous waste; **reduce**
GHG emissions from on peak power
generation; green leadership

Ontario Projects

Providing grid services for the IESO

5 MW/0.5 MWh Flywheel



APPLICATION: Fast response frequency regulation

TECHNOLOGY: Mechanical flywheel with extremely long cycle life

LOCATION: Fast load-growth area of northern GTA, interconnected to the 115kV transmission system

7 MW/7 MWh



APPLICATION: Reactive support and voltage control

TECHNOLOGY: Lithium-ion battery

LOCATION: In a 120MW-load pocket on a radial 115kV transmission line where 60MW of PV solar was recently added



ROB HARTEN
Manager of Engineering
PUC Services
Municipal Utility of Sault Ste Marie

They traditionally have connected the load customers
and generators, but batteries was a new area.



NWA Boothbay, Maine Project

APPLICATION: Non-wires alternative for infrastructure upgrade deferral

TECHNOLOGY: Advanced Pb-Acid batteries

ECONOMIC VALUE:

- **Deferred an \$18M upgrade** to an existing 34.5kV line.
- **Circumvents a 7-10 year permitting and licensing process:** 10 months from contract signing to COD

Capacity	6 hours
Project Cost	~\$3 M
Performance Specs	Immediate dispatch availability in summer between 9:00am-9:00pm

0.5 MW/3 MWh



MAINE

Augusta

Portland

RE
cord
ter

TTS
Boston

nce

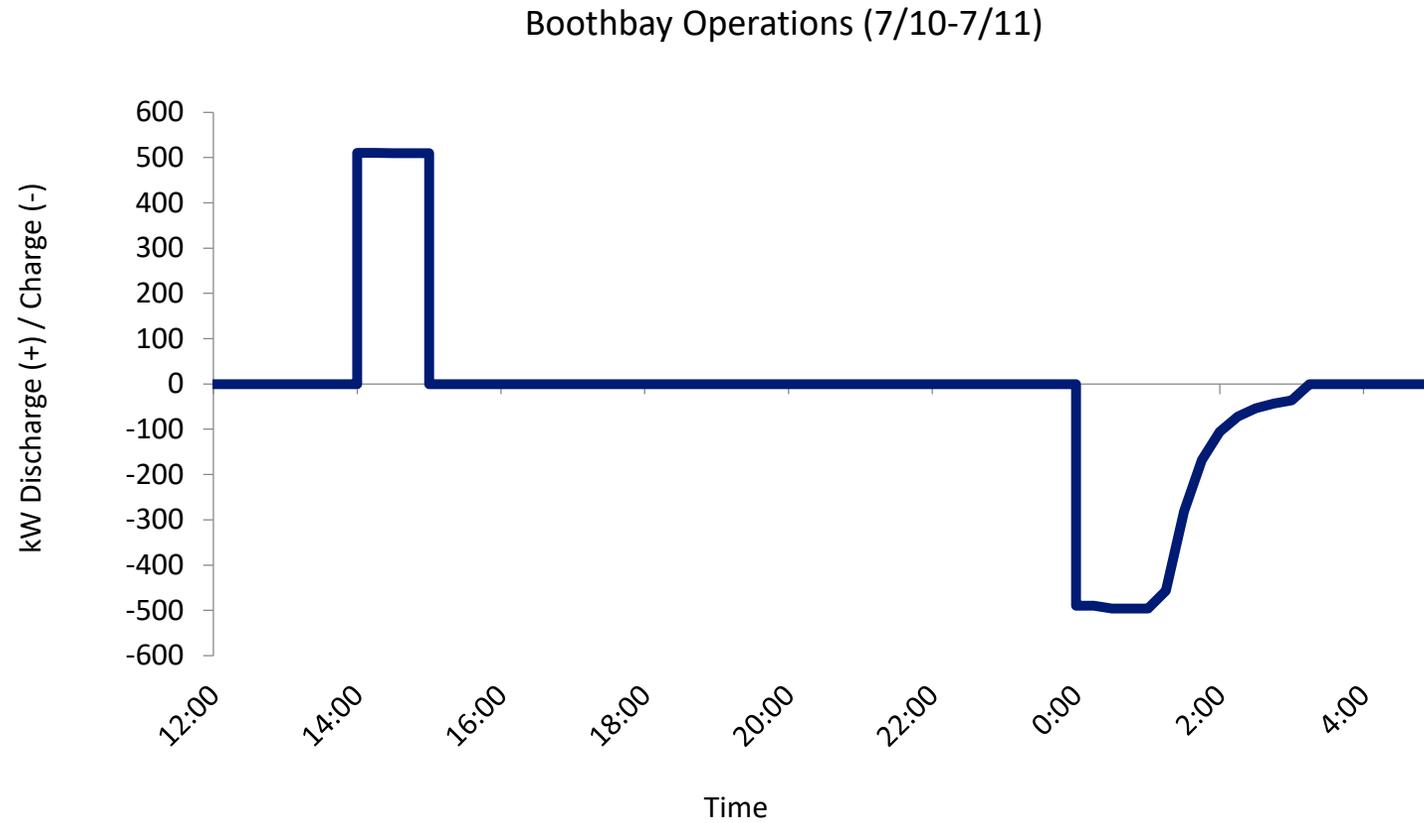
IDE



BOOTHBAY HARBOR, ME

Project Case Operations

Actual data from a dispatch day last July



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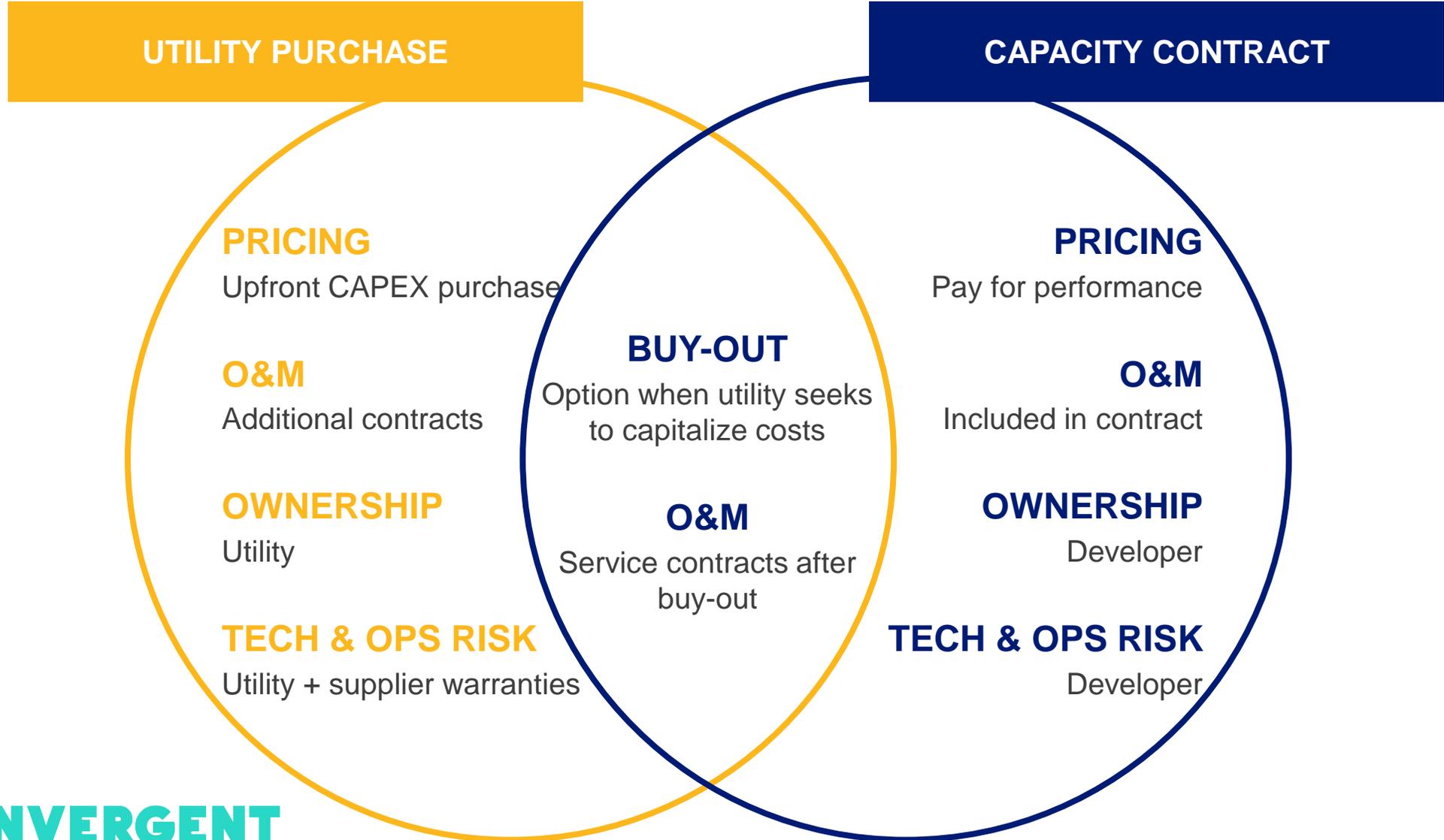
Financial Modeling



Risk Mitigation & Project Contracting

Commercial Options

Ownership and risk allocation vary depending on the commercial business model



Our System

Convergent deploys robust, industrial-grade energy storage solutions that offer best-in-class performance, reliability, and longevity

COMPACT, MODULAR SYSTEMS



LIFETIME

10+ years; 20+ with battery repower

AVAILABILITY

350+ full cycles per year; 99% uptime

SPACE EFFICIENT

Can configure standard blocks to meet a variety of space constraints

SAFE & ROBUST

Redundant safety systems and design with manufacturer guarantees

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Risk Mitigation & Contracting

Working with a project developer

Establishing THE BUSINESS CASE And Contract Execution



3 – 4 MONTHS

Building THE PROJECT



6 - 9 MONTHS



10 MW / 20 MWh BTM BESS in Sarnia, ON

Largest behind-the-meter facility in North America



Peak IQ© State of the Art Intelligence

Convergent's proprietary algorithms ensure we hit peaks and deliver value

IESO Peak Forecasts are routinely inaccurate.

In 2017, the IESO Peak Forecast missed 70% of the actual peak hours.

Basing our dispatch on IESO peak forecasts alone would mean missing most peaks.

+ PROPRIETARY SOLUTION

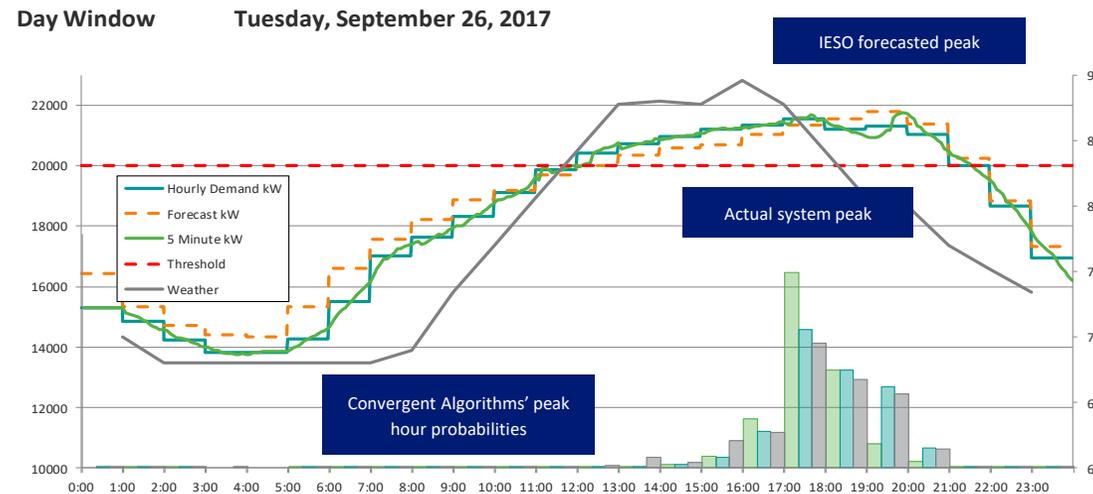
Convergent has developed in-house a suite of peak prediction algorithms significantly more accurate than the IESO's forecasts

+ DEMONSTRABLE SUCCESS

99% uptime

>26,000 operational hours

Successfully predicted every top 5 demand peak since its July 2017 release



Summary

ENERGY STORAGE GENERATES VALUE TODAY

No longer a pilot project

OPTIONS TO DE-RISK ENERGY STORAGE

Capacity contracts, pay-for-performance with third party ownership

WHAT IT MEANS FOR YOU

Large opportunity in Ontario through NWAs, GA and ieso capacity auction



CONVERGENT

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