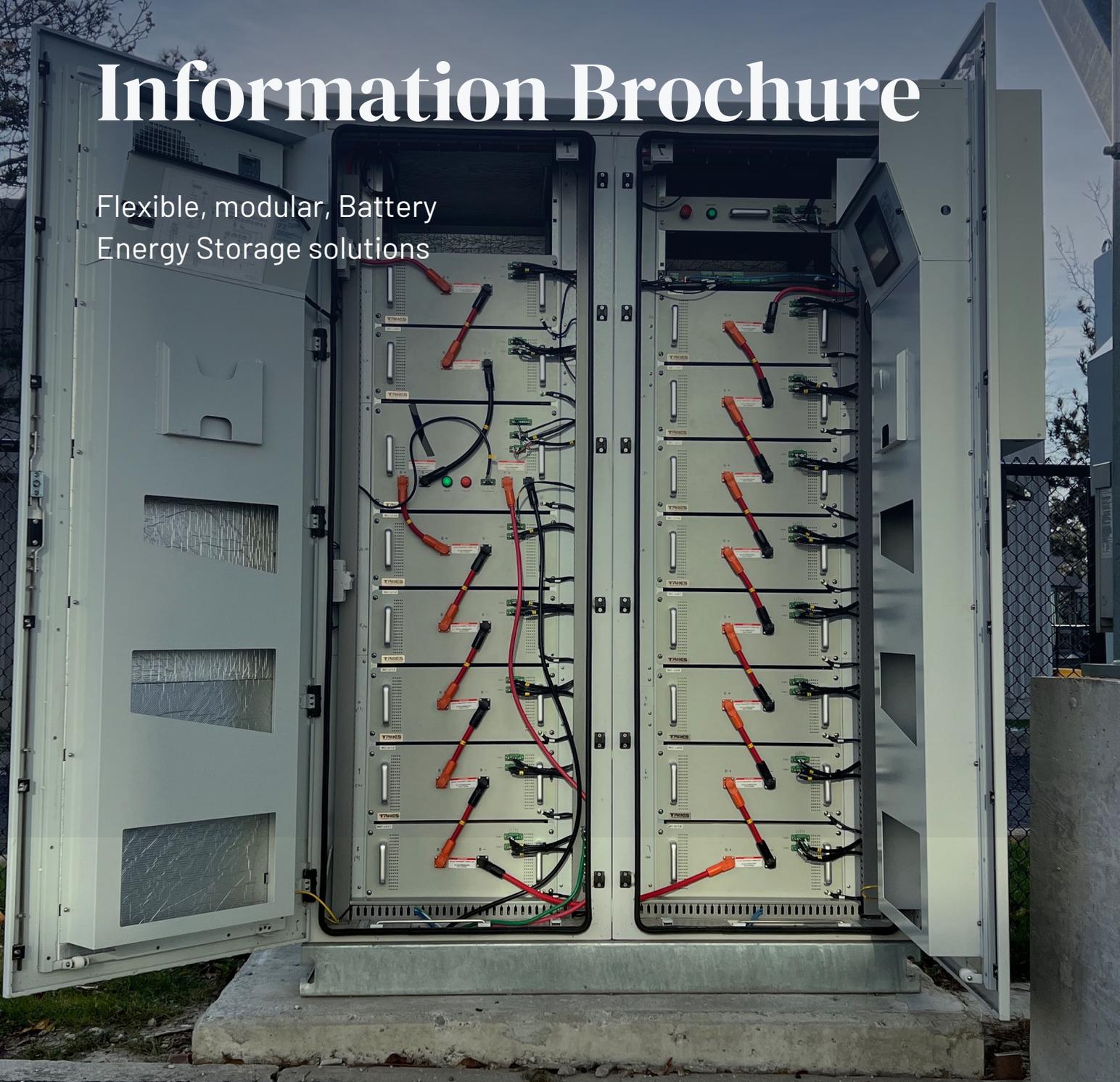




BATTERY BASED MICROGRID SOLUTIONS

Information Brochure

Flexible, modular, Battery
Energy Storage solutions



About TROES

TROES, established in 2018, is a Canadian advanced Battery Energy Storage Systems (BESS) provider. TROES specializes in developing, designing, manufacturing, and delivering smart, modular, cloud-managed energy storage systems as a complete turnkey solution.

Using proprietary technology, TROES sets itself apart from other energy storage providers by enabling mid-size projects with safe, cost-effective, and adaptable plug-and-play battery energy storage products and solutions.

Why TROES?

TROES helps electric power distributors and consumers solve pain points such as:

- High utility bills
- Power reliability issues
- Capacity shortage from existing grid infrastructure
- Unavailability of grid coverage

Applications

- Capacity Enhancement
- CHP Augmentation
- Critical Load Back-Up
- Demand Response
- Diesel Replacement/Augmentation
- Energy Arbitrage
- EV Charger Demand Support
- Lead Acid Replacement
- Peak Shaving/Shifting
- Power Quality Improvement
- Self-Supply
- Uninterruptable Power Supply



WHY TROES IS DIFFERENT

LFP-Based Chemistry

TROES' batteries are based on Lithium-Iron Phosphate chemistry. It's the preferred battery chemistry for stationary applications. LFP provides better thermal and structural stability and longer life compared to other competing battery chemistries.

Key Active Material	Lithium-Iron Phosphate	Lithium Nickel Manganese Cobalt Oxide	Lithium Manganese Oxide	Lithium Nickel Cobalt Aluminium	Lithium Titanate
Technology Short Name	LFP	NMC	LMO	NCA	LTO
Cathode	LiFePO ₄	LiNi _x Mn _y Co _{1-x-y} O ₂	LiMn ₂ O ₄ (spinel)	LiNiCoAlO ₂	variable
Anode	C(graphite)	C(graphite)	C(graphite)	C(graphite)	Li ₄ Ti ₅ O ₁₂
Safety					
Power Density					
Energy Density					
Cell Costs Advantage					
Lifetime					
BESS Performance					

Source: International Renewable Energy Agency (IRENA), 2017

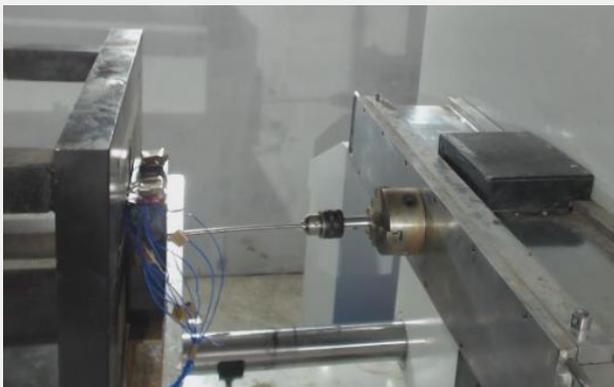
Cell Puncture Tests

TROES' batteries are based on Lithium-Iron Phosphate chemistry. It's the preferred battery chemistry for stationary applications. LFP provides better thermal and structural stability and longer life compared to other competing battery chemistries.

380°C HEAT SPREAD TEST

Cell failure test measures and judges the condition of the battery cell after failure caused by extreme conditions such as extrusion, puncturing, short-circuit or ultra- high temperature. This optional test is passed if the batteries can withstand 380°C heat.

Results: TROES' battery cells withstood 380°C without igniting or exploding the cells. TROES is one of the few energy storage manufacturers to conduct the experiment and pass the test on the first attempt.



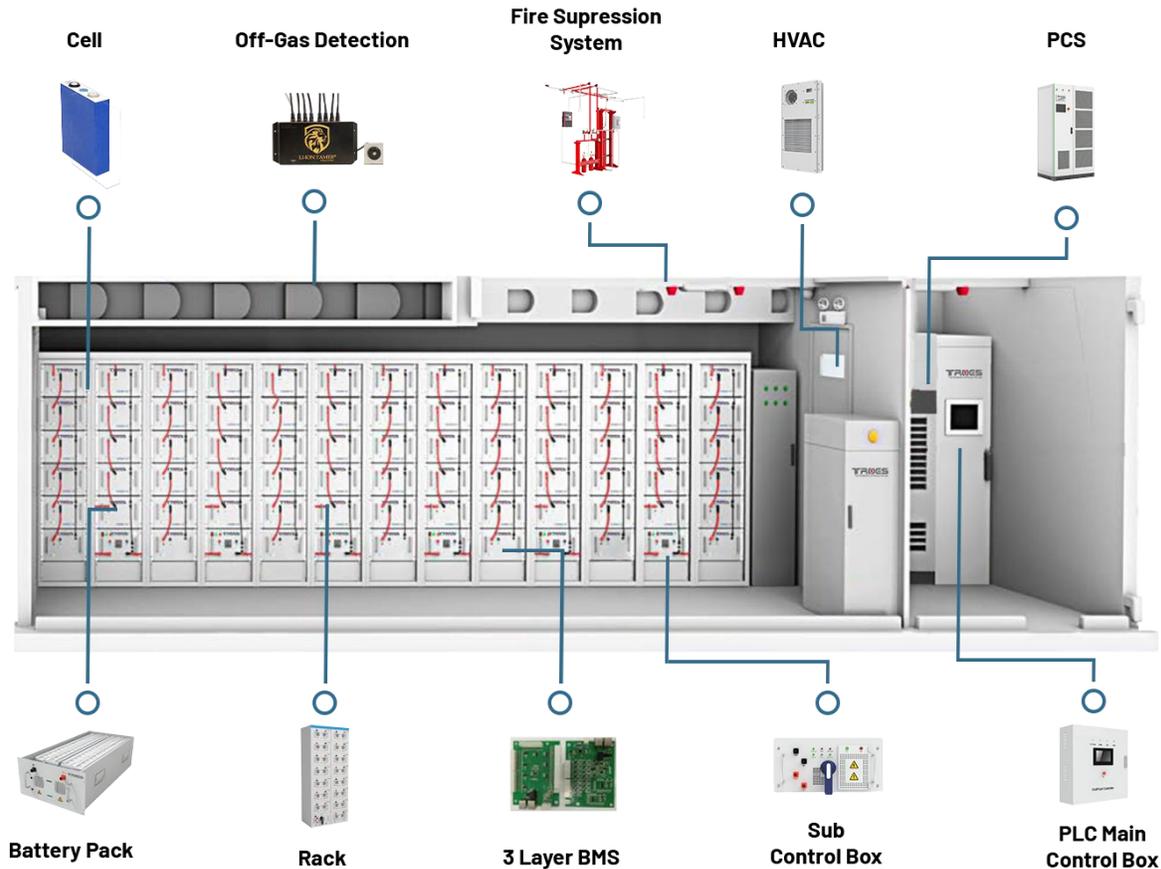
BATTERY CELL PUNCTURE TEST

This test measures and judges the condition of the battery cell by charging it to the limit at a constant current and then puncturing it with a steel nail for 6 hours. The test is successful if the battery cell does not explode or catch fire.

Results: TROES' battery cells did not explode or catch fire while maintaining normal current levels, resulting in a successful test.

3 LEVELS OF BMS PROTECTION

TROES' proprietary Battery Management System (BMS) works in a 3-level communication system with the battery cells, battery string, and our in-house microgrid controller to extend the batteries' potential without accelerating degradation or damaging the ESS.



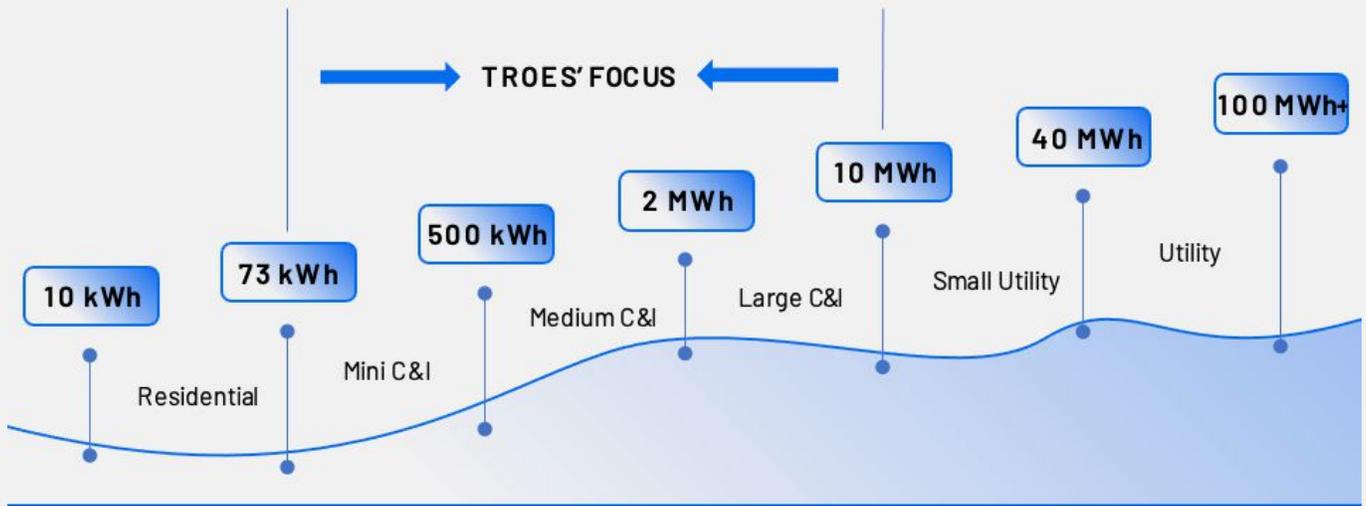
FIRE SUPPRESSION SYSTEM OPTIONS

All TROES BESS' are equipped with a fire suppression system that has a choice between two gas agents: FM200 or NOVEC 1230. They're both clean agents, which means they are safe for use in energy storage systems and don't leave behind a residue and use low toxic chemical agents to remove the presence of heat from a fire.

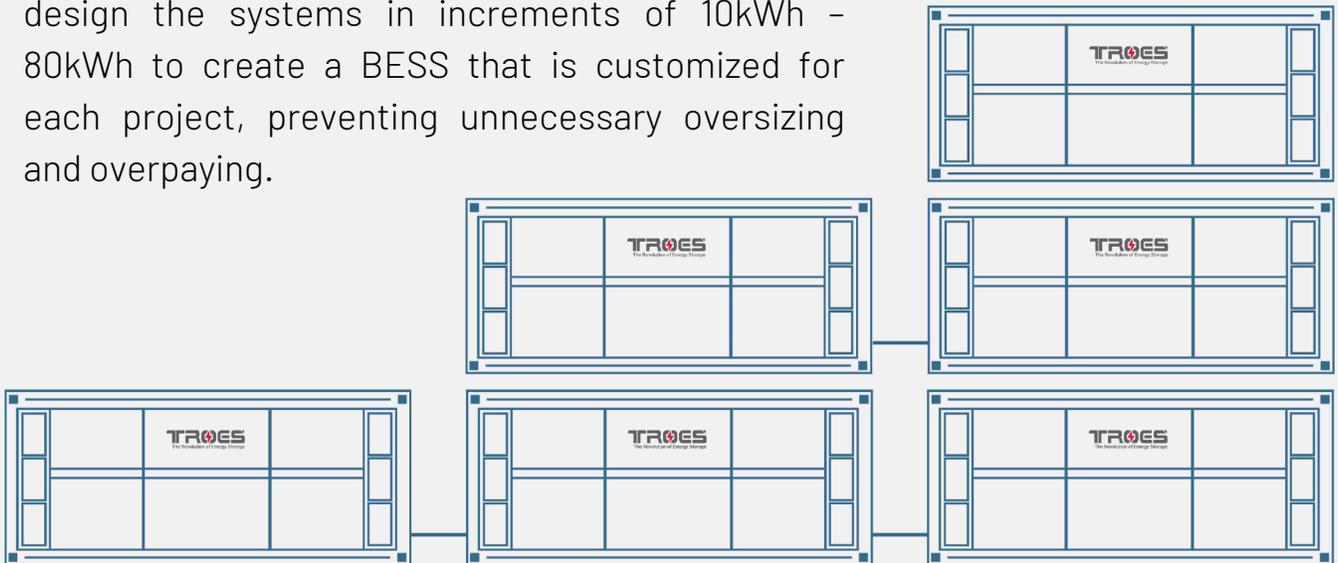
If a fire is detected, the pipeline communication control device opens the valve of the battery pack and the flame retardant liquid in the fire extinguisher is released. This method effectively prevents thermal runaway from spreading to other battery packs.



WHY TROES IS DIFFERENT



TROES' scalable module can provide a wide range of systems. Our flexible design reduces cost significantly in the 73kWh - 5MWh projects. We design the systems in increments of 10kWh - 80kWh to create a BESS that is customized for each project, preventing unnecessary oversizing and overpaying.



OPTIMIZE SPACE

Incorporate everything into one system to reduce physical footprint.

OPTIMIZE ENERGY

Additional energy storage systems can be added to achieve desired capacity.

TROES VS COMPETITOR OFFERINGS

	Offered by Others	TROES Solution
Grid Connection	Always connected to the grid. Unable to switch to an islanded system.	BESS can be grid tied, off grid or able to switch from grid connected to an islanded system.
Supporting Hours	Traditional charge/discharge rate of 0.25C or 0.5C (2-4 hours)	BESS can charge/discharge from 30 minutes to 10+ hours.
Enclosure Type	Single configuration "one size fits all" solution.	Indoor & outdoor cabinet, and container design of 10-foot, 20-foot, or 40-foot solution.
AC/DC Coupling	Single configuration for renewable micro-grid system.	DC-Coupled, AC-Coupled and hybrid PCS solutions.
Flexible Design	Limited to one default size container for 10MWh+ utility sized projects	Flexible indoor & outdoor, cabinet & container for 73kWh+ small-medium size projects

EXTENDED OPERATIONAL LIFE

TROES' batteries are based on Lithium-Iron Phosphate chemistry. It's the preferred battery chemistry for stationary applications. LFP provides better thermal and structural stability and longer life compared to other competing battery chemistries.



- Retention of system's usable capacity even after 10 or 20 years
- Optional augmentation of the system as part of the maintenance plan
- Taking advantage of new technology developments and decreasing battery costs
- Use of our life-cycle health monitoring & management system and proprietary battery technology

FLEXIBLE BESS DESIGN

TROES offers a plug-and-play feature set for different project requirements

Enclosure	Usable System Capacity(kWh)	Max Inverter Power (kW)																	
		30	50	60	90	100	125	150	180	200	250	300	375	400	500	600	750	800	1000
10ft Container/Cabinet	50																		
	60	2hr																	
	80																		
	90				1hr														
	100	3hr	2hr	1hr		1hr													
	120																		
	130	4hr		2hr															
	140																		
	150																		
	160		3hr						1hr										
	180	5hr			2hr														
	190									1hr									
	200					2hr													
	210	6hr	4hr	3hr											1hr				
	220																		
	240	8hr			3hr														
250		5hr	4hr						1hr										
300	6hr		5hr		3hr			2hr						1hr					
320																			
360			6hr	4hr				2hr											
20ft Container	370						3hr							1hr					
	400	8hr																	
	450		5hr																
	480		8hr											1hr					
	500			5hr	4hr										1hr				
	540			6hr															
	550																		
	600				6hr														
	625					5hr													
	720			8hr															
	750																		
	800				8hr														
	850																		
	900																		
	1000					8hr													
	1080																		
1125																			
1200																			
1250																			
1440																			
1500																			
40ft Container	1600							8hr											
	1800																		
	1875																		
	2000																		
	2200																		
	2250																		
	2400																		
	2500																		
	2600																		
	2800																		
	3000																		
	3200																		
	3600																		
	4000																		
	4800																		

*TROES develops and manufactures more BESS designs, beyond the 1MW/4.8MWh+ range, supporting power needs of over 8 hours. Indicative designs matrix for the 30kW/60kWh-1MW/4.8MWh spectrum.

Integrated Software Services

TROES' MiGrid™ is the life-cycle health monitoring & management system software tool, which creates a complete turnkey solution for our customers. MiGrid™ uses artificial intelligence and advanced analytics to remotely monitor the system, display real-time status updates, and provide battery fault detection.



COMPREHENSIVE CONTROLS

Real-time status display from all systems.



CLOUD-BASED OPERATION

Data is logged to a secure cloud platform in Canada



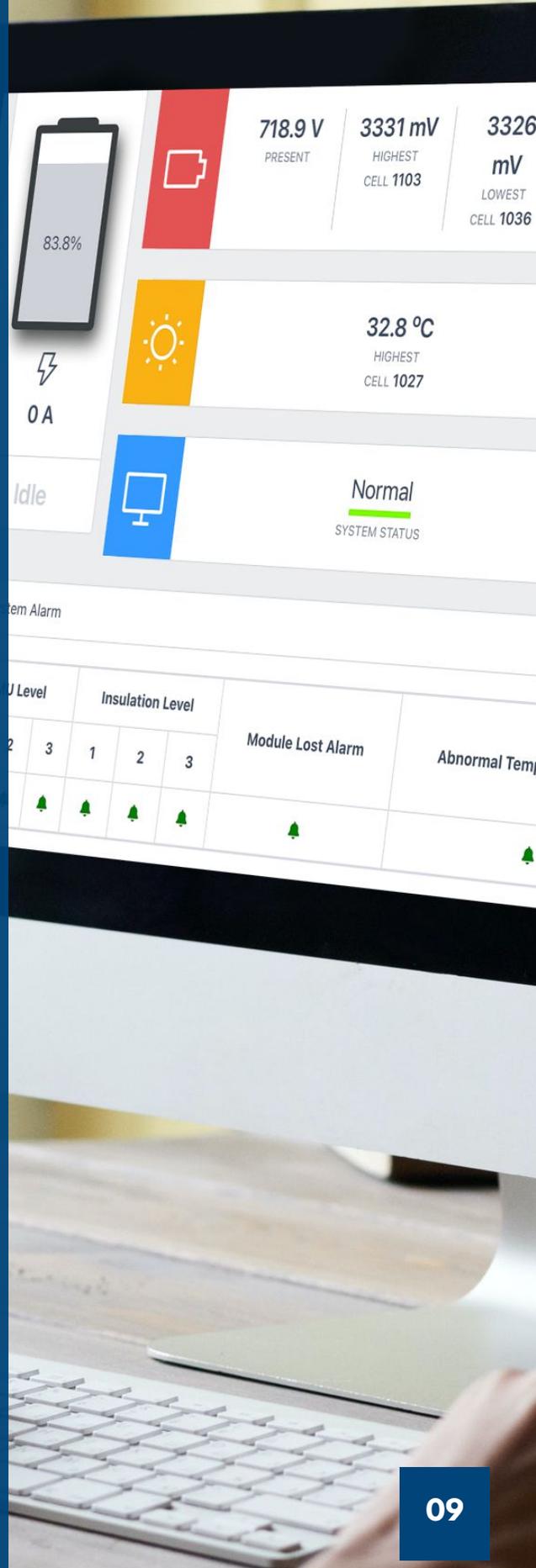
REMOTE DIAGNOSTICS

Remote battery fault detection and management



BATTERY MANAGEMENT

Optimize data for battery management system updates



INNOVATIVE TECHNOLOGY HIGHLIGHTS

MiControl™ Platform

MiControl™ is TROES' control platform responsible for the entire system scope of a BESS. MiControl™ collects all safety-related information in the battery cluster, PCS, HVAC, power distribution and fire protection. MiControl™ communicates with the BESS' EMS and SCADA equipment to run certain early warnings, alarms, protection, and cut-off strategies for all equipment.

Dual-Equilibrium™

With the usage of lithium battery packs, it is difficult to maintain consistent performance for all individual cells. Different cell balancing techniques are implemented to increase the battery voltage when high performance is required or reduce battery voltage in favor of longer battery life. TROES' Dual-Equilibrium™ proprietary technology combines the advantages of both passive and active equalization in LFP batteries and avoids the shortcomings of both.

MiControl™ and Dual-Equilibrium™ technology is continuously under development and will be available in the future.

Off-Gas Detection

TROES offers an optional off-gas detection technology with single cell off-gas event detection*. Working in collaboration with our MiGrid™ Remote Monitoring System, the off-gas detection technology provides alerts at the earliest sign of failure, enabling the option to prevent thermal runaway. Most battery energy storage systems available in the market have smoke detectors but when the smoke is detected, it might be too late.



*Off-gas technology is continuously under development and will be available in the future.

TROES Fulfillment Process



Manufacturing

TROES' battery test procedures adhere to UL certifications in North America, CE certifications in Europe, IEC and IEEE certifications internationally. Our battery packs and cells pass all tests & certifications before designing the system.



Assembly

TROES' assembly team begins connecting the cells with proprietary battery packs, followed by the battery management system, then racking the entire system into a UL & NEMA certified cabinet or container.



Factory Acceptance Testing

Extensive testing process is performed to ensure every major part of the system is working as intended from the system levels to the sensors, fans, and alarms. TROES follows and maintains the UL 9540A certification for thermal runaway fire propagation.



Shipping

TROES follows international certification UN 38.3 adhering to all shipping standards. All documentation is certified, signed and up to date while all strict packaging protocols are maintained to ensure the system arrives safely at its designated location.



Commissioning

Once the system has arrived and has been installed, TROES performs a 2-day long commissioning test. Once the field evaluation is successful, the entire system receives UL, IEC & NEMA certifications.

Flexible Financing Options

Warranty - Guaranty

All TROES products include a standard 2-year warranty.



Using AI and advanced data analytics, TROES provides optional on-site augmentation to predict the optimal time to add additional batteries into the system keeping it running effectively.

All warranties include technical support hot line, remote troubleshooting, consumables and scheduled preventative maintenance.

Extended warranty available for up to total of 10 years!



Battery energy storage makes financial sense for power consumers but investing up front can be unrealistic and expensive. Our goal is to solve pain points of conventional grids by offering multiple financing solutions that are accessible and affordable.



Energy Storage as a Service (ESaaS)



Asset Financing



Capital Purchase



Leasing



Government Sponsored Loan

Enclosure Catalogue

TROES' BESS use the most reliable and mature Lithium Iron Phosphate technology (LiFePO₄). The modular "off-the-shelf" design of these systems can accommodate specific dimensions and capacities from 73kWh to 10MWh+. Our IoT-based and AI-powered battery energy storage systems are geared towards helping mid-market Commercial, Industrial, and Institutional (CII) customers store electricity and transfer it over time.

Indoor Cabinet



Outdoor Cabinet



10 Ft. Container



20 Ft. Container



40 Ft. Containe



Custom Size



PRODUCT SPEC SHEET SAMPLE

-

OUTDOOR CABINET



Picture shown is for illustration purposes only.
Actual product may vary due to product or design enhancement.

Overview

TROES, established in 2018, is a Canadian advanced Battery Energy Storage Systems (BESS) provider. TROES specializes in developing, designing, manufacturing, and delivering smart, modular, cloud-managed energy storage systems using proprietary technology.

TROES sets itself apart from other energy storage providers by enabling mid-size projects with a safer, smarter, more adaptable and more economic turn-key solution.

Features and Benefits

- **Modular Off-the-Shelf Approach:** Scalable from 40kWh-10MWh+, with over 600 power output designs
- **IoT & Cloud-Based Operation:** Remote operation and prevention system reduces troubleshooting
- **Dynamic Rate Support:** Charge/Discharge rate from 30 minutes to 10+ hours
- **Patented Intellectual Property:** Bidirectional AC/DC PCS with on, off, or on & off grid
- connection system within a flexible enclosure
- **Extended Operational Life:** Retention of system's usable capacity after 10+ years with ability to augment the system
- **Leading Sustainability:** Offerings include a fire suppression system solution emits low/zero emissions

Model: TO-100-245

Electrical Specifications¹

Battery Technology	Lithium-ion / LFP
Max C-Rate (charge/discharge)	0.5C / 0.5C
DC Current Rating	200A*2
Battery Efficiency	100%
Installed Capacity	245.8 kWh
Usable Capacity	221.8 kWh
Rated AC Power	100 kW
DC Voltage	614.4V
DC Voltage Operation Range	535.2V – 691.2V
Auxiliary AC Voltage	480V, 3 Phase
Nominal AC Frequency	50/60Hz (configurable)

Mechanical Specifications²

Enclosure	NEMA 3R equivalent (Outdoor Cabinet)
Dimensions³ (W x D x H)	1000 x 750 x 2050 mm
Number of Enclosures	1
Operating Temperature	-20°C to 45°C
System Weight	7200 kg
HVAC	Yes
Advanced Features	Ultra-low temperature; Low-cabinet design; Off-gas detector etc.

Communications

Integrated Microgrid Control Function	Optional
Network	TCP/MODBUS/RS485
Safety & Grid Interface Certifications	UL1741, UL1973, UN38.3

Protection

- Thermal Runaway Protection
- Rack Level Lockable Disconnect
- Lightning Protection
- Over-charge/Over-discharge Protection
- Over-temperature Protection
- External Accessible E-stop
- External Accessible Fire Control Panel
- Islanding Capability

1. In the interests of continual product improvement, specifications are subject to change without notice. Contact us for the latest specifications.

2. Actual grid input requirement will depend on factors such as (but not limited to):
 (i) actual equipment electrical requirements. (ii) utilization/duty cycle. (iii) daily duration of availability of input power supply. (iv) state-of-health and age of the BESS. (v) duration of daily construction site operations.

3. An additional 0.9m clearance on all sides of the battery energy storage system should be provided for maintenance access.

PROJECT PORTFOLIO



New Brunswick, CA

100kW/528kWh
Peak Shaving



Illinois, USA

100kW/250kWh
Microgrid, Solar PV



Nova Scotia, CA

500kW/1.12MWh
Virtual Power Plant



Ontario, CA

30kW/100kWh
EV Charging





Edinburgh, UK

250kW/542kWh
Virtual Power Plant



New Brunswick, CA

30kW/124kWh
Peak Shaving



Ontario, CA

100kW/250kWh
Peak Shaving



Antigua & Barbuda

90kW/650kWh
Power Resiliency





Guangdong, CH

250kW/250kWh
Peak Shaving



Ontario, CA

150kW/502kWh
Peak Shaving



Ontario, CA

100kW/368kWh
Generator Optimization



Ontario, CA

60kW/77kWh
Mobile Power Solution



TROES

The Revolution of Energy Storage



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