



 **tae** Power Solutions

Bring Intelligence to Power

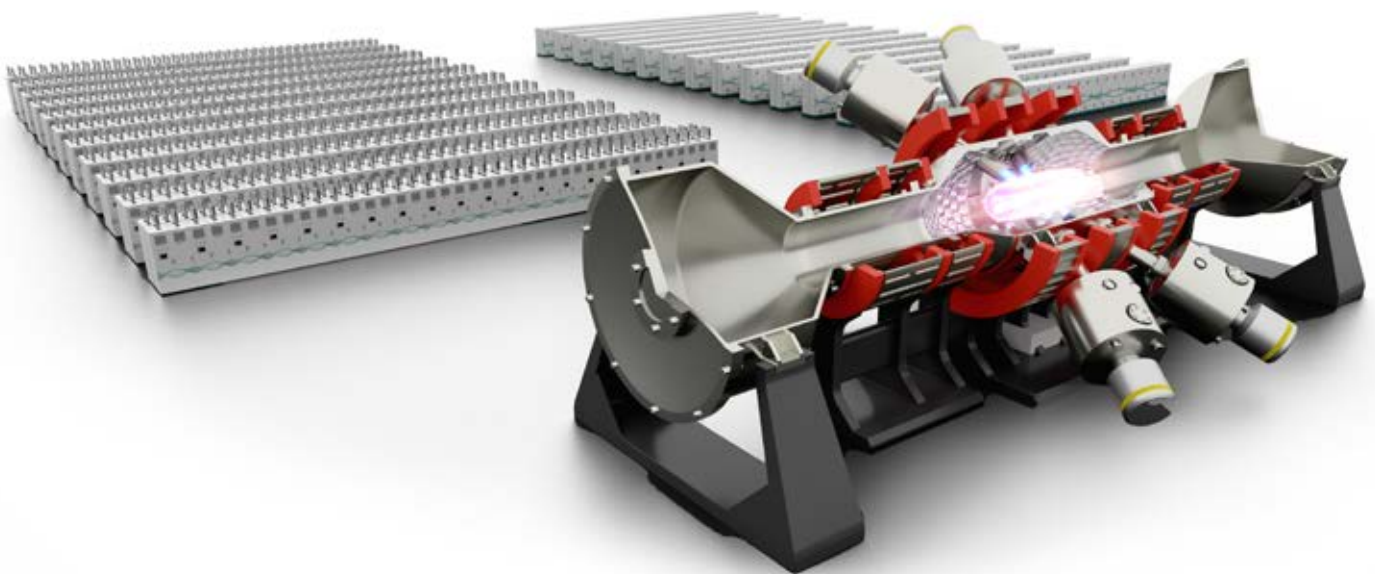
Company Intro

TAE Technologies was founded in 1998 with the goal of delivering limitless carbon-free energy to the grid using non-radioactive hydrogen-boron fusion. The last five years alone has been a period of exponential progress, enabled by advancements in machine learning, additive manufacturing, and especially power management.

However, extreme temperatures are required for the fusion reaction thus necessitating a novel approach to power management. To solve this, TAE Technologies developed a suite of breakthrough control algorithms that define the “Power Management Core”. The Power Management Core coupled with state of the art hardware delivers a modular, scalable, reliable power management system. TAE fusion reactor takes 2 MW of utility power and outputs 750 MW of pulse power. It has achieved over 1 million shots fired with 99% availability since its operation began in 2016.

The Power Management Core enables ultra-precise control of high voltage and current across over >400 devices with 10,000+ parameters being monitored. Data is fed into a machine learning algorithm and tuned for future shots to create an optimal environment for a self-sustaining fusion reaction.

This innovative modular control system allows for precise and accurate control of distributed power conversion throughout the system. This, in turn, creates sustainable fusion plasma while minimizing downtime and simplifying operation and maintenance. Recognizing the broader potential, TAE Technologies is developing applications based on the “Power Management Core” in Stationary Energy Storage and e-Mobility. This led to the spin-off of TAE Power Solutions in January 2023 to commercialize these products to solve the electrification challenges.



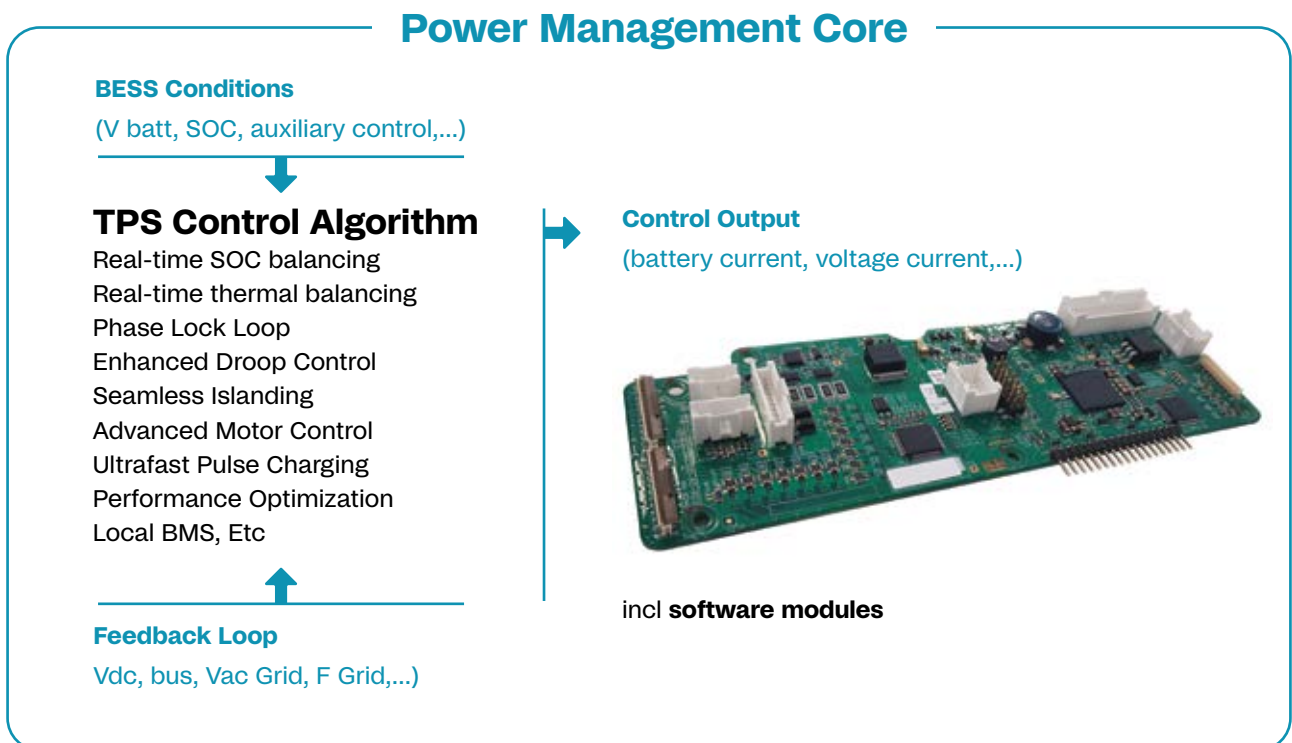
Capabilities

At TAE Power Solutions, our mission is to lead the world in the development of power management technologies. We leverage our nuclear fusion DNA to create solutions that move the world toward sustainable energy by accelerating the best energy storage, EV powertrain, and charging products to market. We are headquartered in Irvine, California, with additional facilities in the UK, Slovenia, and Czech Republic. Our facility at Dudley, UK, is equipped to perform battery testing, assembly, and quality control. With nearly 300 talented employees worldwide, we are ready to engage globally with innovative customers and partners.

Our core IP rests in the Power Management Core, which facilitates precise control of switching patterns. This capability enables the creation of various waveforms, thereby

unlocking novel advancements in power management. Working with our partners and customers, we can combine our modular and scalable technology to enable precise and dynamic control of the battery to the grid.

Our advanced power management solutions are engineered to ensure that you get the most out of every charge and discharge cycle by optimizing energy usage and minimizing waste. Understanding the diverse needs of our clients, we provide adaptable, modular power management solutions tailored to your unique needs, ensuring cost-effectiveness and simplified future upgrades. To complement the hardware, our proprietary software offers real-time insights and control, enabling informed decisions to optimize your power management strategy.



Power Management Core

Power Management Embedded Core

Purpose-built hardware and embedded platform.



+

Any Battery, Any System



Embedded Software Control

Advanced motor control, health- and performance optimization, fault tolerance, optimized BMS, ultrafast pulse charging.

+

Future-Proof

Unique designs and algorithms support mixing and evolving cell chemistries. Module-level control increases serviceability.

Connected Platform

IoT-enabled system- and site-wide control and connectivity products.








+

Cloud-Based Management & Control Algorithms

Remote monitoring & analytics for ML-based predictive control and maintenance. Data feedback into embedded algorithm improvement.

Economic Energy Analysis - BESS

Application	Capabilities	
 Power Quality	<ul style="list-style-type: none"> Renewable smoothing Frequency Regulation Voltage Regulation Inertia Services 	<ul style="list-style-type: none"> Power Factor Harmonic Mitigation
 Power Reliability	<ul style="list-style-type: none"> Contingency reserve Black Start Ramping reserve Seasonal Storage 	<ul style="list-style-type: none"> Microgrid Peak Capacity Backup Power
 Utilization	<ul style="list-style-type: none"> Load following Renewable firming Congestion Relief Transmission Deferral 	<ul style="list-style-type: none"> Distribution Deferral Demand Charge Red. Self-consumption
 Arbitrage	<ul style="list-style-type: none"> Wholesales Arbitrage EV Arbitrage Retail Arbitrage TOU Billing 	<ul style="list-style-type: none"> Renewable Arbitrage Grid Services VPP
 Policies	<ul style="list-style-type: none"> Investment Tax Credit MACRS Tax SGIP 	

Power Management Core

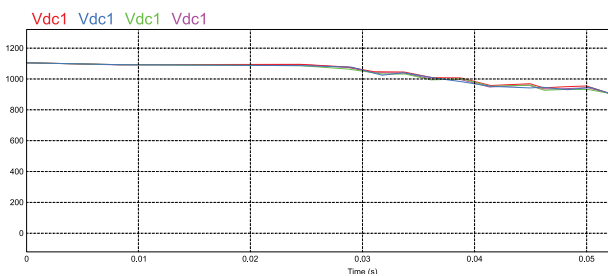
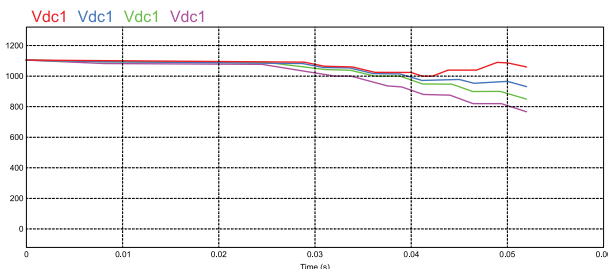
Power Management Core

Just two of the breakthrough control algorithms within the Power Management Core are explored below. Some other significant algorithms that deliver notable benefits include phase lock loop, seamless islanding, harmonic mitigation, and interphase balancing.

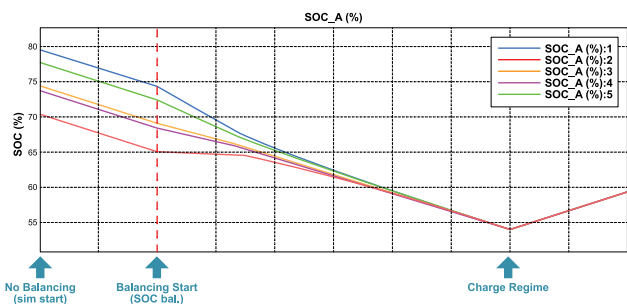
Real-time SOC Balancing Algorithm

- Calculates and distributes, in real-time, the power demand between DC energy and equalizing the DC voltage
- Maximize the energy efficiency of DC energy

Fusion



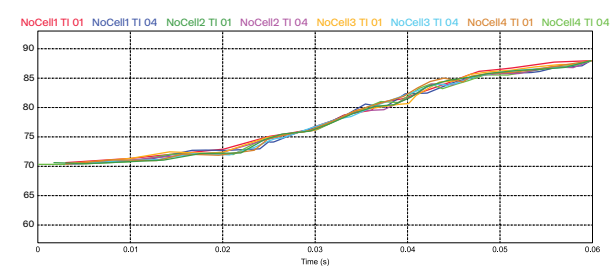
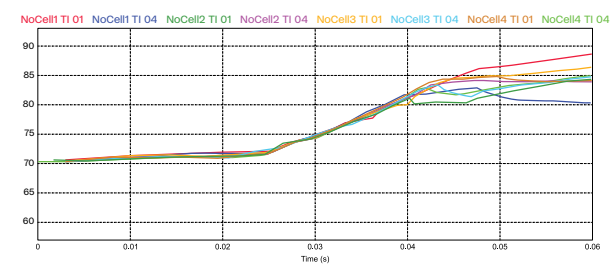
BESS



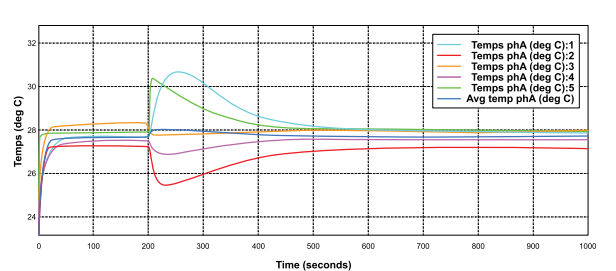
Real-time Thermal Balancing Algorithm

- Temperature estimation on real-time power loss calculation that equalizes power between DC energy.
- Reduce the thermal stress on components, increasing the lifetime and reliability of the system.

Fusion

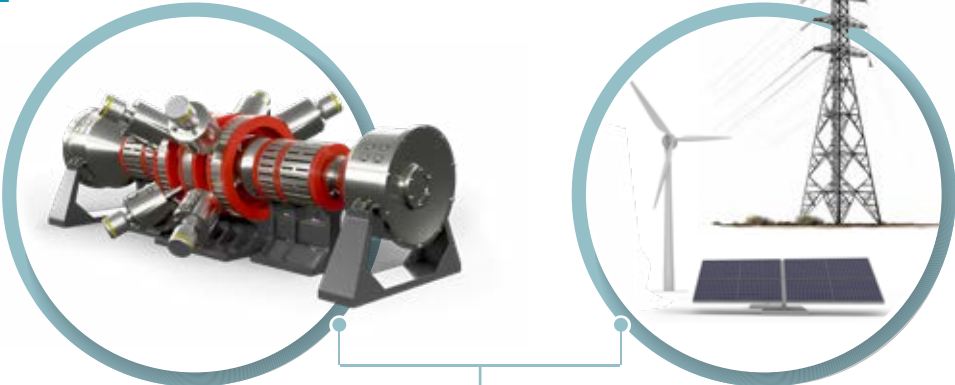


BESS



TPS Ecosystem

RENEWABLE ENERGY



SOFTWARE & CONTROL



BESS



DCFC



Energy Storage Systems

Bring intelligence to power.



Maximizing the return on your storage investment involves fully leveraging your existing resources. Our unique modular approach to battery management yields a more precise charge and discharge of power to deliver superior peak output while reducing the levelized cost of storage. It

increases the reliability and availability of the system. Additionally, it improves the system's reliability and availability by enabling the bypass of any malfunctioning string, ensuring operations persist seamlessly until the fault clears or replacement is made.

Benefits of our system:



100% TAE Design

Designed, Installed and Maintained by TAE staff



Superior Performance

Ultrafast Dynamic Response



Modularity

Maximum Flexibility for different applications



High Reliability

Module bypassing in case of fault. Built-in Redundancy



Scalability

Ultrafast Dynamic Response



Maintainability

Reduced MTTR. Common Parts Design Criteria



Our innovative technology is designed to be both modular and scalable, offering unparalleled precision and dynamic control when integrating batteries with the grid. This sophisticated approach allows for significant enhancements in productivity across every charge and discharge cycle, leading to improved system performance and overall efficiency. Furthermore, our solutions are crafted to be cost-effective, combining modularity, flexibility, and scalability; the

tightly integrated systems ensure economic efficiency while improving quality. Additionally, customer value and transparency is prioritized in system operations via high-fidelity system monitoring and intelligent system control. This comprehensive approach ensures that our customers can optimize their energy storage and distribution capabilities, making the most of their investment while maintaining clear oversight of system operations.

 **Product range:**

M-Series BESS



D-Series BESS

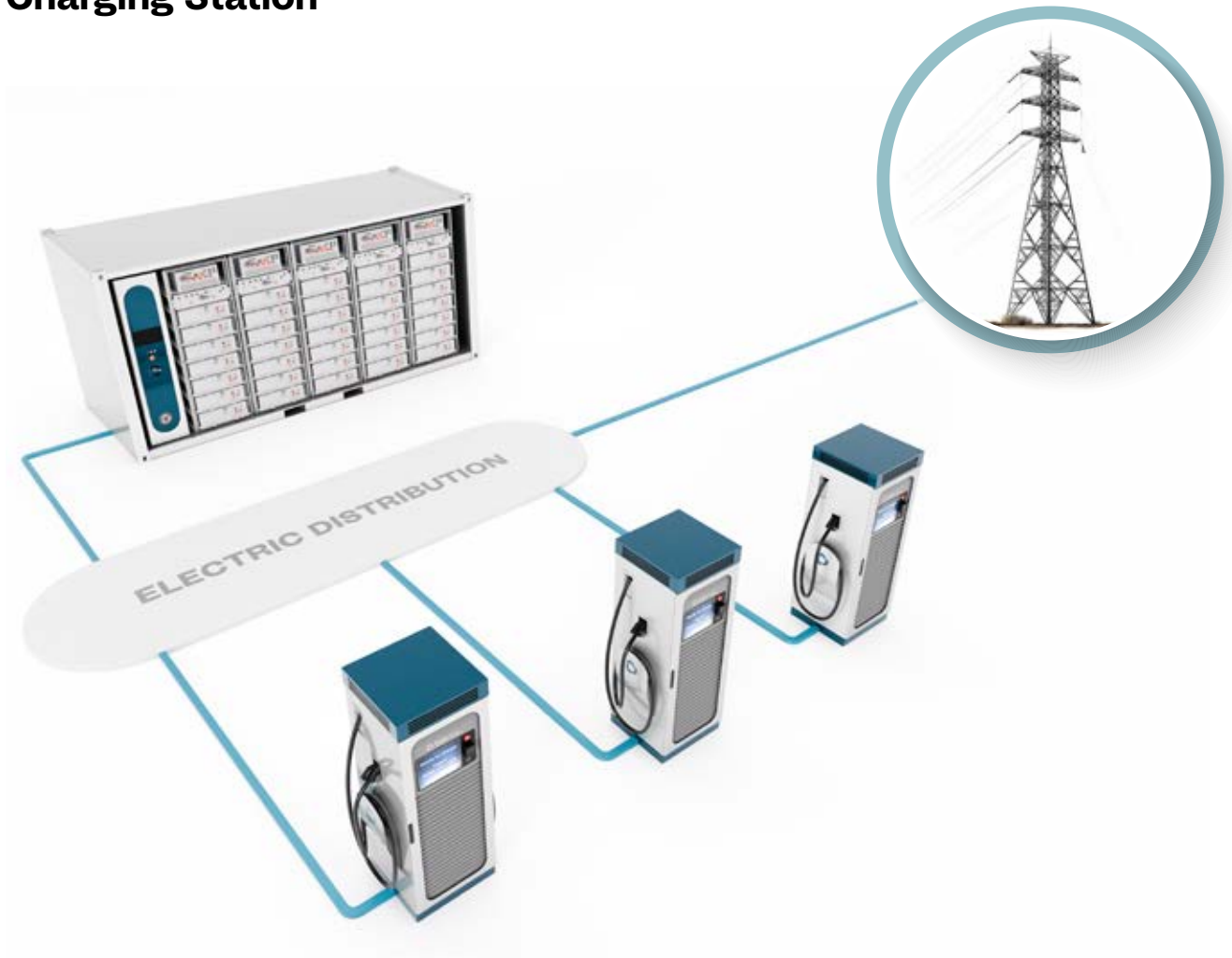


C-Series BESS



DCFC + BESS

Charging Station



Battery-buffered DCFC stations enable affordable and efficient fast charging bypassing expensive and time-consuming utility upgrades.

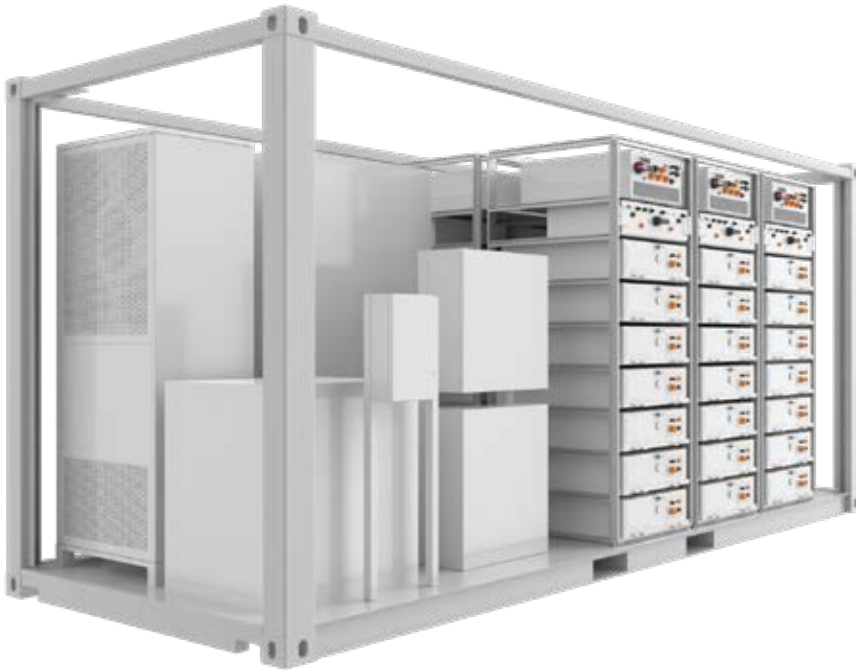
	kWh Battery Pack	EVSE Charge Power (kW)				
		22	50	100	180	360
Passenger Car	100 kWh	202 min	89 min	45 min	26 min	13 min
Commercial Vehicles	175 kWh	353 min	155 min	78 min	44 min	22 min

TPS can offer EV charge times under 30mins

TPS chargers >180kW

Criteria	BESS	Utility
Timeline to Deployment	Deploy a BESS to meet the DCFC Station's power needs and leverage distributed energy resources (i.e PV, wind, and etc.)	May take several years to pull a new distribution line to meet the power requirement for the DCFC Station.
Cost to Implement	Integrating Behind-the-Meter (BTM) BESS with DCFC can significantly reduce total costs.	Based on the existing infrastructure, costs can vary from expensive to prohibitive.
Customer Satisfaction	The BESS can be sized accordingly to meet both power and energy demand of the DCFC to reduce the amount time at the charging station	Utility maybe only be able to provide a certain amount of power where curtailment may take place often.
Distributed Energy Resources	Able to leverage DER (i.e. PV, wind, fuel cell, etc.) for more favorable rate in \$/kW and \$/kWh as a non-wire alternative.	-
Revenue	The BESS can be programmed to take advantage of "value-stacking" to offer more revenue benefits.	-
Outage	The BESS can ensure electric vehicles are charged even during utility outages.	-

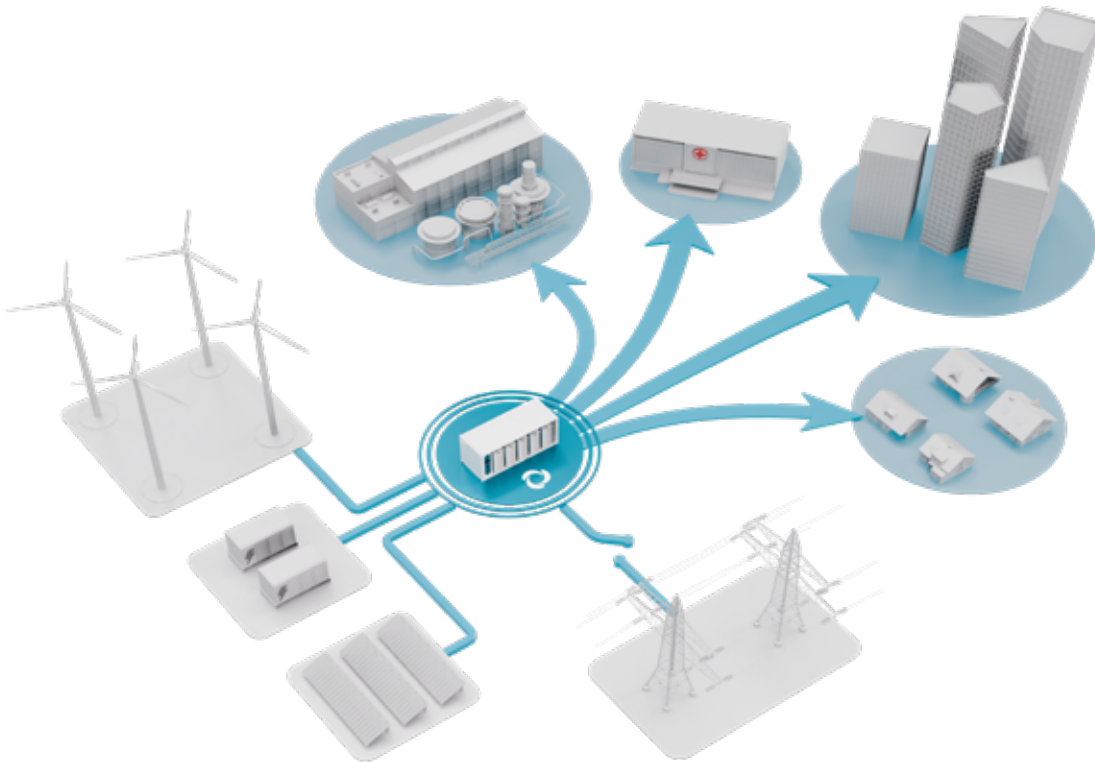
 **TPS Product Offering:**
D-Series



 **TPS Product Offering:**
DCFC



Microgrid / Resiliency

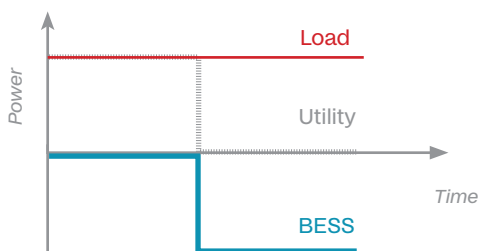


The benefits of a Battery-Enabled Microgrid

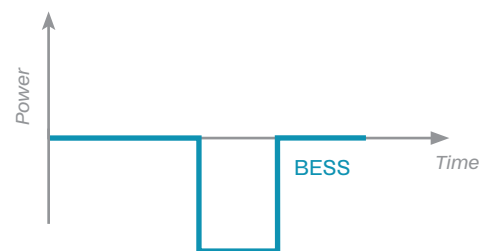
1. Enables higher renewable energy integration
2. Enhances Resilience and Availability
3. Value Stacking for Increased Revenues
4. Improve Power Quality
5. Renewable Smoothing / Buffering

Value Stacking

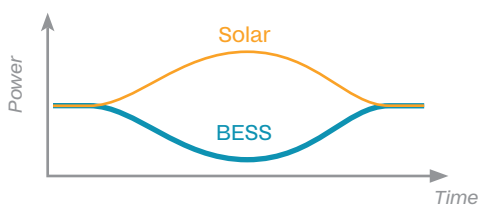
1) Demand Management



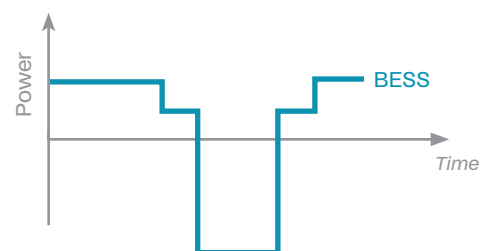
2) Grid Services (VPP)



3) Increase BTM renewable penetration

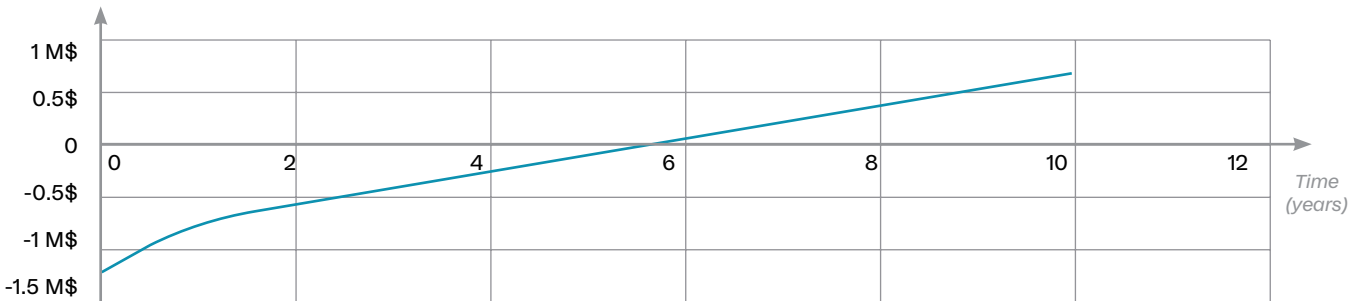


4) Tariff management.



The table and chart below outline a sample cash flow summary for TPS BESS deployed in a Behind-The-Meter installation.

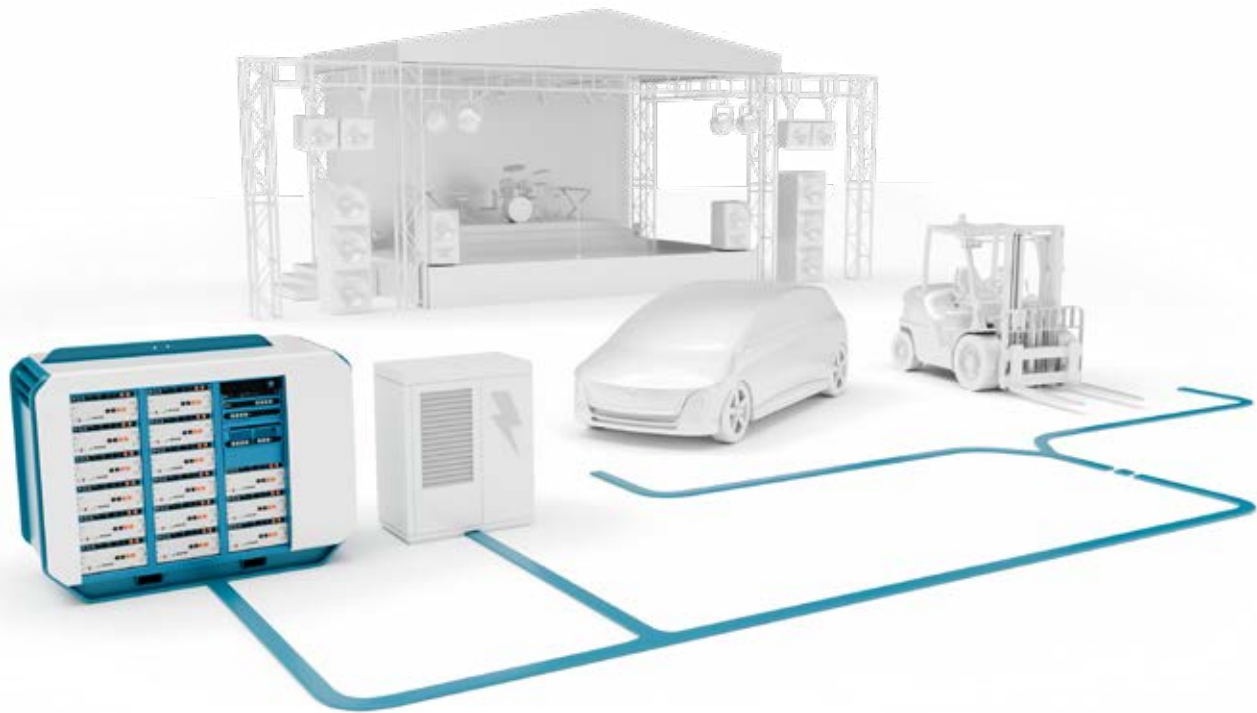
Yrs	Costs	Resiliency	Electric Bill Saving	Federal Tax (IRA)	State Tax Depreciation	Cumulative Cash Flow
0	\$1,264,200.00	\$-	\$-	\$-	\$-	(1,264,200.00)
1		\$75,000.00	\$47,850.00	\$341,738.50	\$11,396.00	\$(788,215.50)
2		\$76,500.00	\$48,807.00	\$34,825.00	\$11,395.00	\$(616,688.50)
3		\$78,030.00	\$49,783.14	\$19,158.50	\$11,396.00	\$(458,320.86)
4		\$79,590.60	\$50,778.80	\$9,757.00	\$11,398.00	\$(306,796.46)
5		\$81,182.41	\$51,794.38	\$9,762.50	\$11,401.00	\$(152,656.17)
6		\$82,806.06	\$52,830.27	\$2,732.00	\$11,405.00	\$(2,882.84)
7		\$84,462.18	\$53,886.87		\$11,405.00	\$146,871.21
8		\$86,151.43	\$54,964.61		\$11,405.00	\$299,392.25
9		\$87,874.45	\$56,063.90		\$11,405.00	\$454,735.60
10		\$89,631.94	\$57,185.18		\$11,405.00	\$612,957.72



 **TPS Product Offering:**
D-Series



Portable BESS



The benefits using Portable BESS

1. Reducing fuel consumptions
2. Reduce OPEX
3. Improved Sustainability
4. Reduce emission and noise pollutions

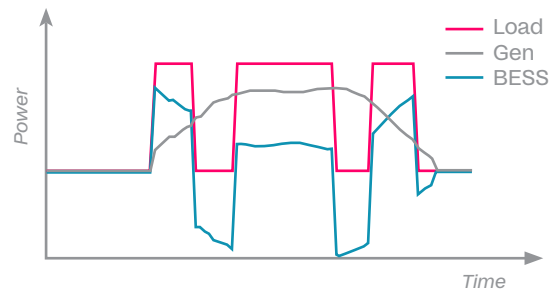
TPS differentiations

1. Increase power and energy density
2. Parallel multiple portable BESSs
3. Seamless transition with genset
4. Increased availability and fault tolerance
5. Easy maintenance and reparability

Case Study:

Comparison between an off-grid system running only genset vs a genset + portable BESS

	Genset Only	Genset + BESS	Savings
Fuel Utilization	114	79	35
CO2 (metric ton/year)	424	280	144
Annual Saving	\$161,239	\$111,523	\$49,716



Less than 3-5 year payback depending on incentives and load profile.



144 metric CO₂ is equivalent to:

- GHG Emission: Removing 32.1 gasoline-power passenger vehicles per year or Reducing 370,173 mile driven
- Carbon Sequestered: 2,388 tree seeding grown for 10 years or 172 acres of US forest in one year




TPS Product Offering:
M-Series







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