

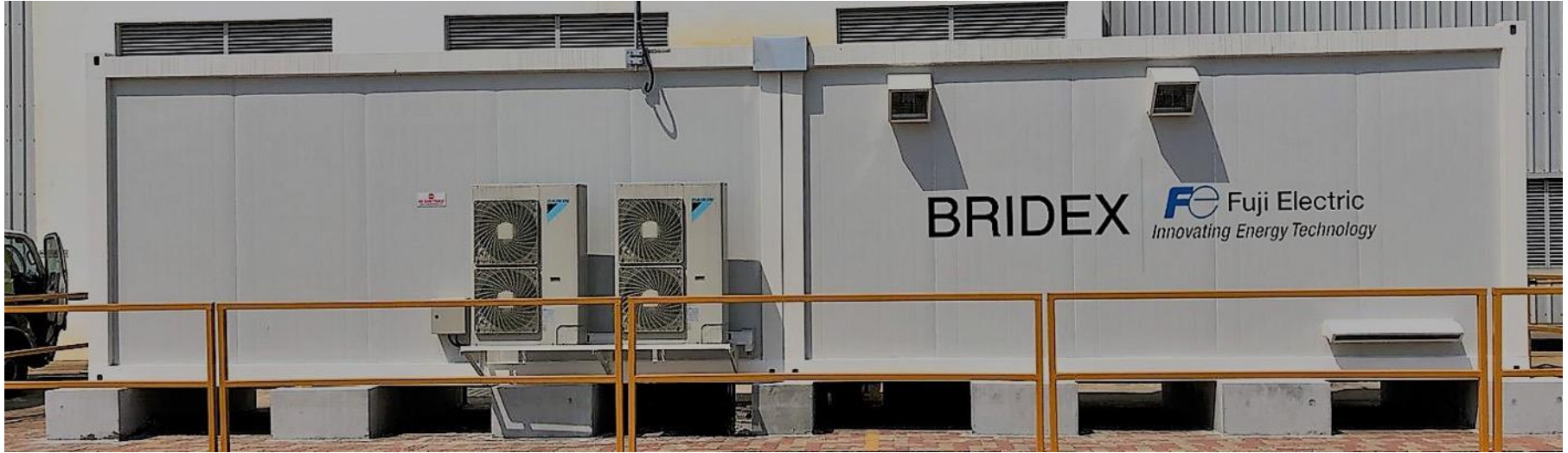
Sodium-Ion Battery

Game Changer For Data Centers & Critical Power

Application Industries



BRIDEX |  Fuji SMBE



Founded in 1978, [Fuji Bridex](#) is a leading Industrial Solution & Services Provider in the Electrical, Power Quality and Energy Storage System market. Trusted by many customers in the Data Center, Power Utilities and Industrial market, we consistently develop our people and innovate our solutions to meet our client's needs. Today acting as an [Electrical System Integrator \(ESI\)](#) Contractor are essential for ensuring that different electrical systems work together efficiently and safely. The process involves analysis and planning, design and documentation, implementation and testing, and commissioning and maintenance. By following these steps, an electrical systems integration project can be completed successfully, resulting in a cohesive and reliable system.



Vision – Be one of the leading ESI companies in Southeast Asia’s industrial electrical market.

Mission – Dedicated to providing optimal solutions that will exceed customer’s specifications and requirements with below objectives:


- i.*** Ensure the best ESI competitiveness with Human Resource/Technology/Quality that meet international standards.
- ii.*** Continuously focus to improve HSE standards and minimize our ecological footprint.
- iii.*** Apply innovative solutions to deliver Fit-For-Purpose products and services.
- iv.*** Offer integrated services from conceptual design to final commissioning and start-up.

Power Quality Mitigation

- Up to 46kV Sag Mitigation Systems
- Statcom / VVO
- HT / MV Transformers



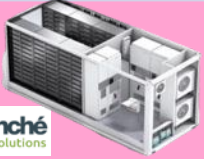
Green Energy

- Saltwater Battery  Natron Energy
- Natron Sodium-Ion Battery



Modular Infrastructure

- Battery Energy Storage Solution
- Containerized/Custom Solution
- Power Skid



Thermal Management

- Fire Prevention & Monitoring
- Moisture monitoring & drying





Jack Pouchet  

Vice President Sales and Marketing
Natron Energy

Jack Pouchet is the Vice President of Sales for Natron Energy. Jack works closely with major OEMs, large Telecom and data center owners and operators, BESS/ESS integrators, industrial power users driving towards decarbonization, and leading...

[Show more](#)



Brian Kennedy  

Director of Business Development & Marketing
Natron Energy

I am a results oriented sales and marketing leader who tirelessly works to achieve goals. Most of my background is in Industrial Power and Integrated Solutions for the Data Center and facilities industries.

Mission:

- To solve operations, reliability, and performance challenges for the world's largest electricity customers with advanced battery solutions

Products:

- High power, safe, sustainable batteries for in-rack and centralized power
- Based on new chemistry: sodium-ion energy storage in Prussian Blue electrodes

Company:

- Founded in 2012 as a Stanford University spin out
- 180+ employees
 - Headquarters in Santa Clara, California USA
 - Manufacturing plant Holland, Michigan USA

Stage:

- >2MW of batteries shipped to date
- First mass manufacturing online Spring 2024



Why Natron's Prussian Blue Sodium-Ion?

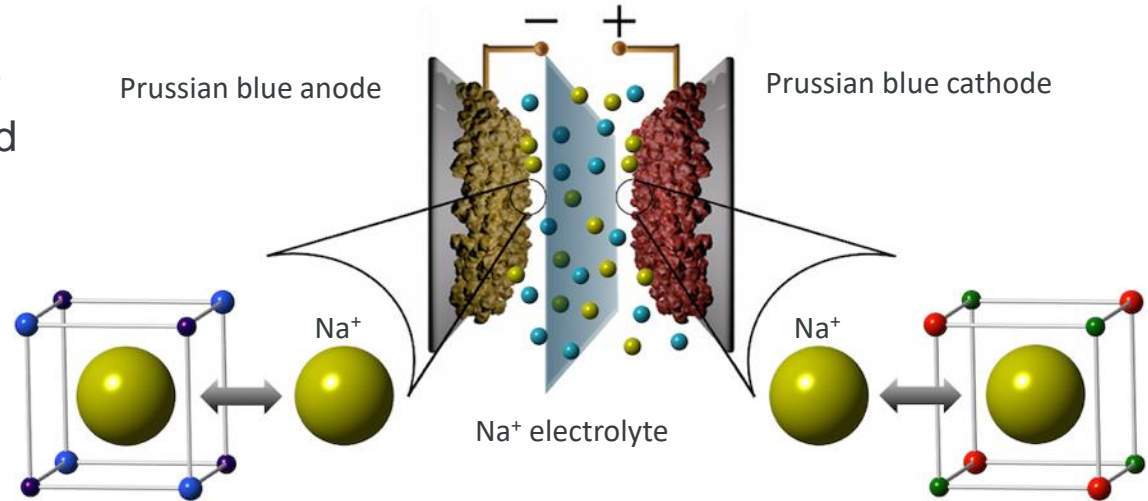
Natron's Prussian Blue Sodium-ion technology is perfectly aligned for quick energy and an extensive cycle life.

Natron's patented Prussian blue electrodes store and transfer sodium-ions faster, more often, and with lower internal resistance than any other commercial battery. With zero strain during charge / discharge, 10x faster cycling, and an over 50,000 cycle-life Natron's sodium-ion batteries represent the future of industrial mobility.

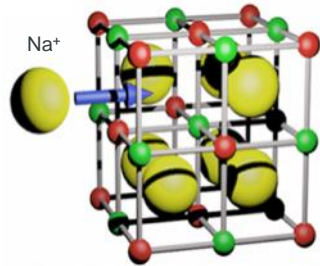


A Unique Sodium-Ion Battery Cell

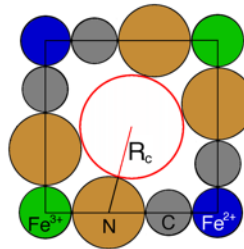
- Prussian blue pigment electrodes store sodium-ions
 - Unique atomic structure for faster charge/discharge and 10x longer cycle life
- Non-flammable
- No mineral constraints
- No hazards that limit safe end-of-life disposal
- Drop-in to industry-standard manufacturing lines



Prussian blues: storage sites are larger than sodium-ions.



Prussian Blue

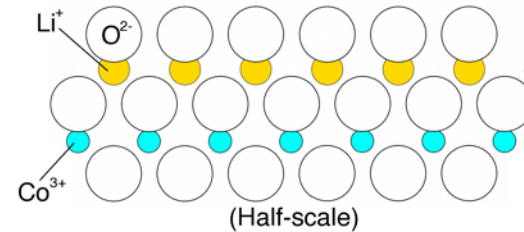


Prussian Blue

Channel radius: $R_c = 1.6 \text{ \AA}$

Larger than Na⁺ = 1.12 Å

Lithium Cobalt Oxide



LiCoO₂:

Channel radius: $R_c = 0.43 \text{ \AA}$

Smaller than Li⁺ = 0.6-0.7 Å

Na-ion ½ internal
resistance of any
Lithium chemistry

Mission Critical Power article – *Is Battery Technology on the Verge of a Blue Period?*
https://issuu.com/energymagazines/docs/mcp_june_2019_digital_issue/36

- Very low internal resistance
 - Same reason for our safety advantage
- 70% of rated energy is delivered during 2-minute discharge
- Extremely rapid recharge
 - 0-99% SOC in <15 minutes
 - Available immediately - no settling required



- No fire or explosion after puncture, pressure, heat, or electrical faults
- We are the only manufacturer ever to publish our unredacted UL test report

Nail penetration test

Natron

Li-ion



High speed projectile test

Natron

Li-ion



Safety video: <https://youtu.be/vvcvg7xGo1U>

As Seen on CNBC!

- CNBC profiled Natron Energy and one other sodium-ion battery manufacturer

Click anywhere on this slide to visit the CNBC link, or search the web for “CNBC sodium-ion”

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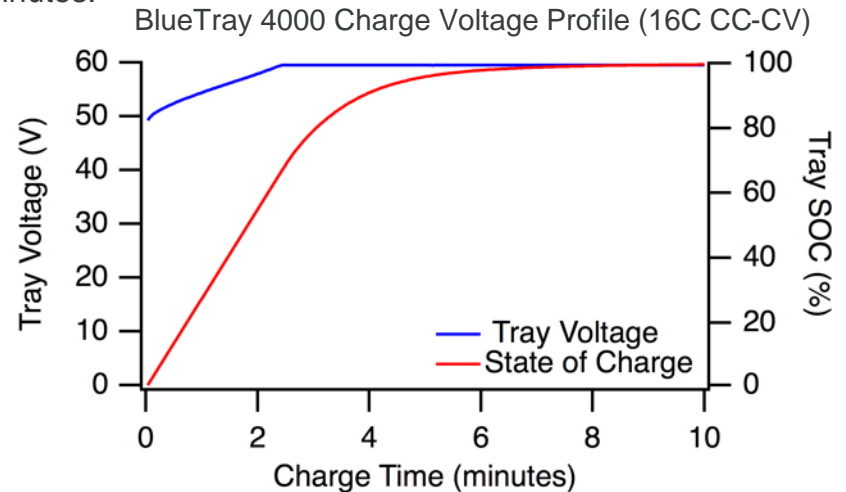
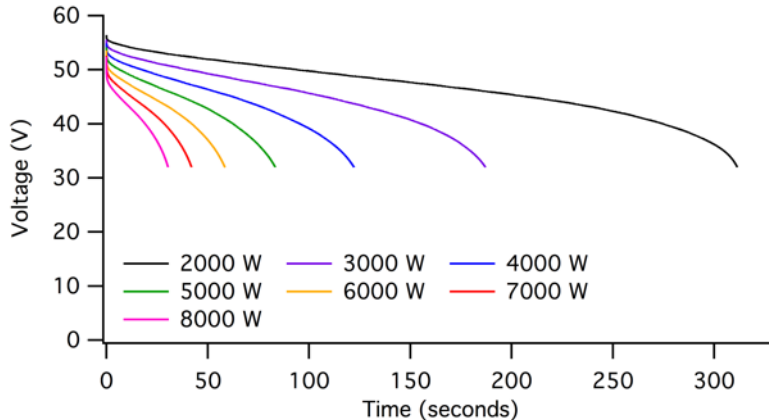


VIDEO 13:58

How sodium-ion technology will compete with lithium-ion batteries

Rapid Discharge/Charge Cycle

- Half the internal resistance per energy of lead acid
- Significantly greater percentage of total energy delivered during rapid discharge
- 70% of rated energy is delivered during 2-minute discharge at 4kW
- 33% of rated energy is delivered during 30 second discharge at 8kW
- Extremely rapid recharge: 0-99% SOC in 8 minutes and immediately available - no settling required
 - 0-70% SOC during 16C recharge lasting 2.5 minutes.
 - 70-99% SOC during constant voltage hold lasting 6 minutes.

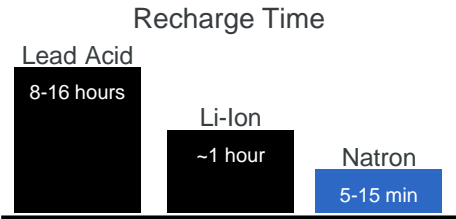
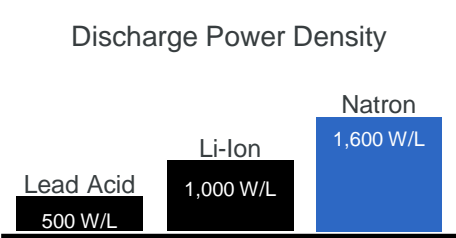


Extremely Wide Temperature Operating Range

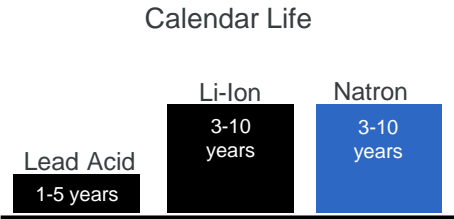
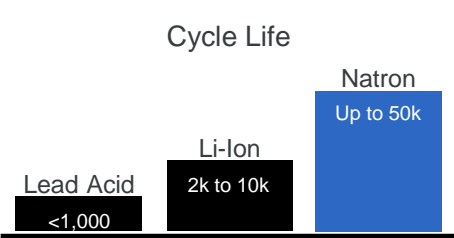
- Operating Range 0 to 45°C / 32 to 113°F
- Rated Transportation Range -20 to 45°C / -4 to 113°F
- Nominal Range 10 to 20°C / 50 to 68°F



High Power / Small Footprint



Reliable



Safety

Safety Attributes

Attributes	Lead Acid	Li-ion	Natron
Fire due to heat	●	●	●
Fire due to mechanical damage	●	●	●
Fire due to electrical faults	●	●	●
No Acid	●	●	●
No Heavy Metals	●	●	●

Natron eliminates the “blood” minerals

- No lithium, cobalt, nickel, copper

Natron eliminates lead, the source of a global public health crisis

- Uncontrolled emissions from lead smelting and recycling

Longer life and safer disposal

- Up to 3x longer operating life in a data center operating environment
- Disposal as universal waste at any general waste processing site

Cobalt mining, Congo



Lead acid recycling, Indonesia



BlueTray 4000 - A Rack Mounted Battery Tray

- UL 1973 Listed
- UL 9540A testing completed successfully (database <https://bit.ly/3iib9lv>)
- Double the 2-minute power of lead acid
- Over a dozen successful customer demonstrations
- Several leading telecom and data center end customers
- Collaborating on product integration with OEMs & end users

Natron BlueTray 4000



Performance Spec	Natron BlueTray 4000	Lead Acid
Mechanical	1U height, fits 19" rack 600mm depth	1U height, fits 19" rack 600mm depth
Electrical	50V nominal (58 – 32V)	48V nominal (54.5 – 38V)
Power, run time	6 kW, 1 min > 4 kW, 2 min	3 kW, 2 min
Service life	5-7 years expected 3 years warranty	2.5 years expected 1 year warranty
Cycle life	>10,000 cycles warrantied	<100 cycles
0-99% recharge time	<10 minutes	12-24 hours
Safety	Nonflammable – UL9540A No heavy metals	Lead, acid

Blue Pack – Launched 2023

- Modular 48V packs that can be serialized into a 480V Cabinet
- Pack
 - 48V, 25kW, 2 Minutes
 - Voltage rating swing: 58V to 32V
 - Max Current rating: 760A
 - Size: 37" L x 9" H x 9.5" W
 - Weight approx.: 165 lbs
- Cabinet
 - 10 Packs in Series → 250kW → A String
 - 2 Strings in Parallel → 500kW
- Hardware
 - Balance Unit → For Cell balancing, Communicating with other Packs
 - Protection Unit → Has Protection Board and Protection elements
 - Interface Unit → To interface with outside world and to communicate with String
- Communication
 - Communicate with outside world using MODBUS Ethernet 100 MBS
 - Internal Communication: CAN Bus 2.0B 1 MBS



- High Peak Power capacity eliminates need for N+1
- Higher power cabinets enable 2+ MVA UPS power blocks
 - Fewer strings
 - Higher per cabinet standard power
 - Significantly higher Peak Power capacity
- 250 kW per cabinet nominal at a 2-minute discharge
- 340 kW+ peak at <1 minute discharge rating
- Can be combined to make larger systems





Sodium-Ion Batteries

- UL1973 & 9540A approved
- 480VDC Version available in 2023
- 480VDC discharge 500kW in 2 mins & 250kW in 5 mins ~ LFP possible 250kW from 2 to 5 mins
- 16C Charge Rate ~ recharges in 15 mins
- 50,000 cycles with 100% DOD
- Single Phase UPS solution available

Current Progress

- Establishing position with SCDF Clause 10.3
- Discharged 12kW (403A) from 6 x Natron BT4000 (1.56kWh @1C) for >5 minutes
- Charging only 5 mins back to 100%
- 480VDC BluePack to arrive in Apr 2023
- Ongoing BlueRack design



- Point-of-Presence (POP) Rooms –
- 48V telecom systems within a 400/415/480V AC data center or commercial building (i.e. hospital)
 - IDF / MeetMe / Network Closets
 - Building / Campus AC UPS & generators
 - 2-minute ride-through sufficient
 - Fire & Life Safety: mission critical
- Unmatched ESG, smallest CO2 footprint
- No maintenance, long life
- Best TCO, lowest OPEX battery system



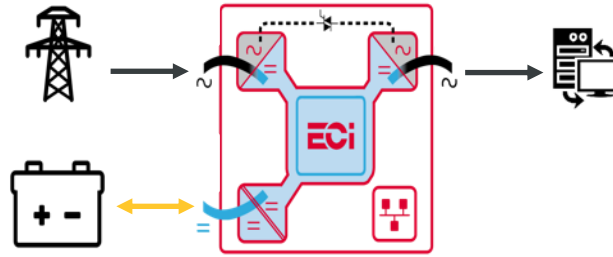
- Industrial – Rack Product
 - Batteries deployed as part of drilling rig microgrid power system
 - Diesel fuel savings business model,
 - \$50M opportunity with 100 sites in US, 150+ international
 - Experienced with batteries & supercapacitor systems
- kW to MW systems
 - Managing peak loads from minutes to hours
- No maintenance, long life
- Best TCO, lowest OPEX battery system



- Enabling Software Defined Power
- Localized energy storage, peak power capping / augmenting
- Extending life of current UPS / power infrastructure



4 – 20 kW power block



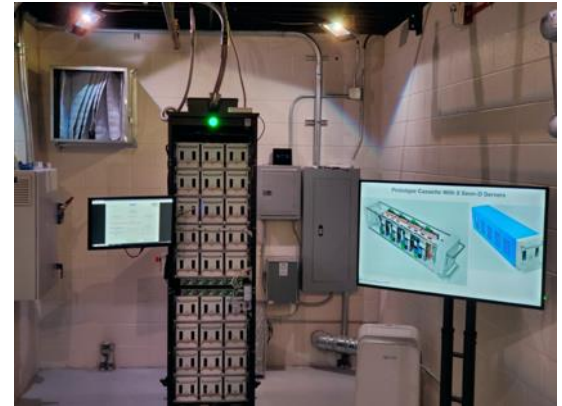
MW+ multi-mode Power / Energy system



10 – 80 kW power rack

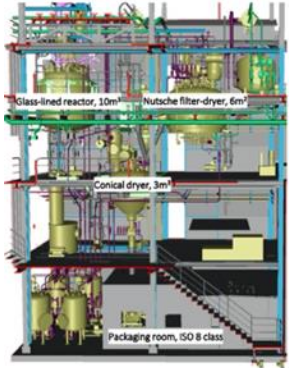
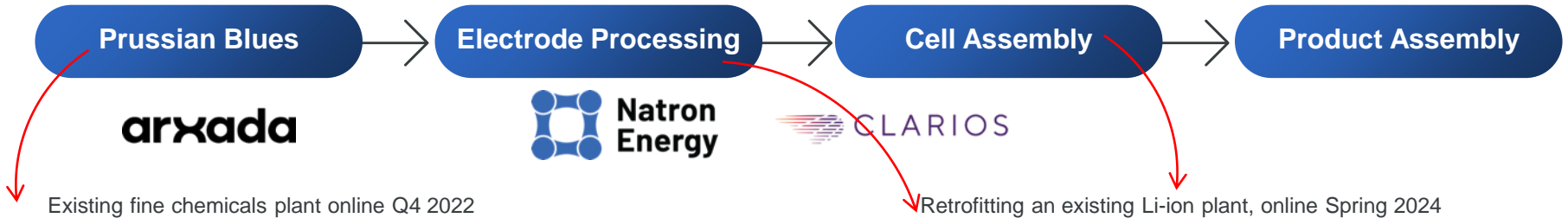
- 2019 Deployment – Phoenix H5 facility
- Forced Physics DCT high-density innovative cooling IT stack
- Backup power via Natron Energy 1U batteries

 H5 DATA CENTERS



Edgility – outdoor platform
No Cooling required!

- Santa Clara pilot line currently delivering 50-100 trays / month
- Partners secured and plant upgrades underway for 2023 high volume launch



Thank You.

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