UFLEX RENEWABLE ENERGY

SIRIUS ENERGY STORAGE

The world's first supercapacitor-based energy storage system

Commercial Applications

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KILOWATT LABS

UFLEX is the trading company of the ULTRAFLEX GROUP, founded in 1935 in Genoa.

ULTRAFLEX, founded in 1935, is the world leader in the production of guidance and control systems for pleasure boats (ULTRAFLEX and UFLEX USA), produces home automation systems for opening windows and large openings (UCS), push-pull cables and joysticks for the automotive sector and agricultural and steering wheels for boating and rally (UFLEX).

UFLEX's Energy Division was founded in 1996 to follow the off-grid installation market in Italy and abroad, providing solutions for the production of energy from renewable sources

www.uflexenergia.ultraflexgroup.com

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SIRIUS ENERGY STORAGE

DEVELOPMENT, ADVANTAGES, COMMERCIALIZATION

The **Sirius Energy Storage System** – the world's first supercapacitor-based energy storage system – provides a safe, efficient, and viable alternative to chemical batteries that outperforms chemical batteries in most applications.

SUPERCAP LIMITATIONS

- **UNSTABLE WHEN CONNECTED IN SERIES**
  - *therefore limited applications where supercaps can be deployed*
- **LINEAR VOLTAGE CURVE**
  - *therefore cannot be deployed where any kind of controlled or long duration discharge is required*
- **HIGH SELF-DISCHARGE WHEN IDLE**
- **LOW ENERGY DENSITY**
  - *commercially unacceptable form factor for most use cases*

Supercaps use are restricted to power applications of short duration and low power deployments

OVERCOMING THE LIMITATIONS

- **POWER ELECTRONICS**
  - Advances in power electronics allowed us to deploy innovative circuits to achieve algorithm-based:
    - ➢ Current balancing circuit that actively balances supercaps in series without compromising cell attributes
    - ➢ Charge control circuit that allows control of rate of discharge
    - ➢ Charge retention circuit that enables control of self-discharge

- **MATERIALS**
  - Advances in materials—such as graphene-based materials—allowed us to deploy high density supercaps

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SIRIUS STORAGE - PERFORMANCE HIGHLIGHTS

EFFICIENCY	High DC to DC round-trip efficiency[1]
	Nameplate capacity = usable capacity[2]
SAFETY AND DURABILITY	No risk of thermal runaway
	No heat generation during cycling
LONGEVITY	Long cycle[3] and calendar life
	No memory effect[4]
	Self-discharge, when in sleep mode, of 2% or less, per month
VERSATILITY	Wide ambient operating temperature range
	High C-rate capability without affecting cycle life or capacity
	Commercially acceptable form factor for low, medium or high voltage applications
	Modular and scalable. Economical manufacturing plant.

[1] at the supercap cell level
[2] under normal operating conditions, no derating necessary for DOD, C-rate, temperature, capacity loss due to cycling
[3] warranty for 10 years
[4] If left idle for an extended period and recharged, no effect on capacity or cycle life

ADVANTAGES OVER CHEMICAL STORAGE

LOWER CAPEX

- Reduced oversizing to compensate for DOD, C-rate, ambient temperature, round-trip efficiency
- Reduced safety infrastructure requirement
- Reduced disposal cost and environmental impact

OPEX ADVANTAGE

- Lower energy consumption during cycle life
- Lower energy consumption due to reduced parasitic loads (e.g. HVAC)
- Reduced diesel consumption & DG maintenance costs in diesel + storage deployments

MARKET SEGMENTS

The Company delivered its first commercial order in January 2018
Since then, the Company has seen a steady growth in demand

LOCATION	APPLICATIONS
South Africa	Sirius for solar, cell tower, streetlights
Australia	Sirius for solar
Pakistan	Sirius for UPS
Canada	Sirius for solar
Italy	Sirius for solar, genset, marine
Sudan	Containerized Solution - Centauri + Sirius for microgrid
Kenya	Centauri + Sirius for microgrid

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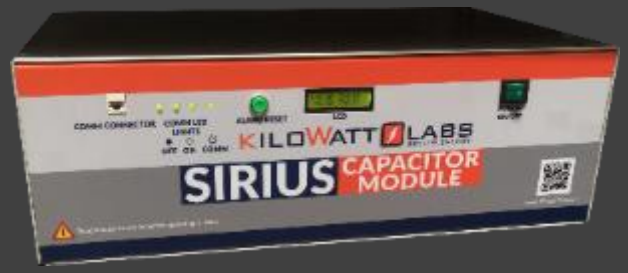
SIRIUS ENERGY STORAGE

APPLICATIONS

7.1kWh48VDC MODULE



3.55kWh48VDC MODULE

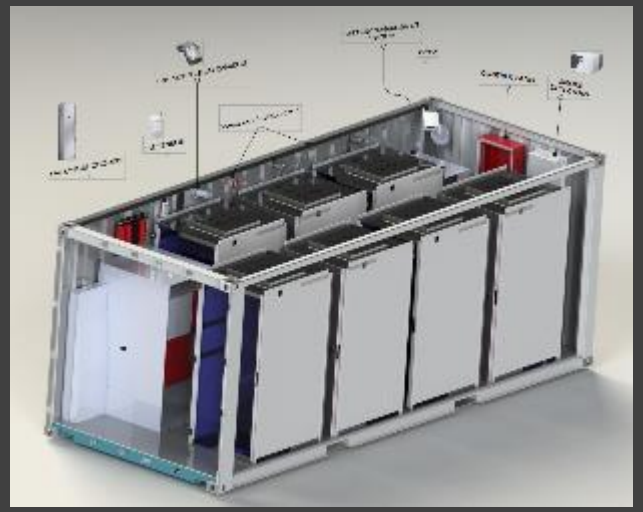
3 X 7.1KWH48VDC MODULE IN SOLAR + STORAGE

- PRODUCT
  - 48VDC Series - Modules
- DEPLOYED IN
  - Solar
  - Cell tower
  - Marine
  - Forklift
  - Club car

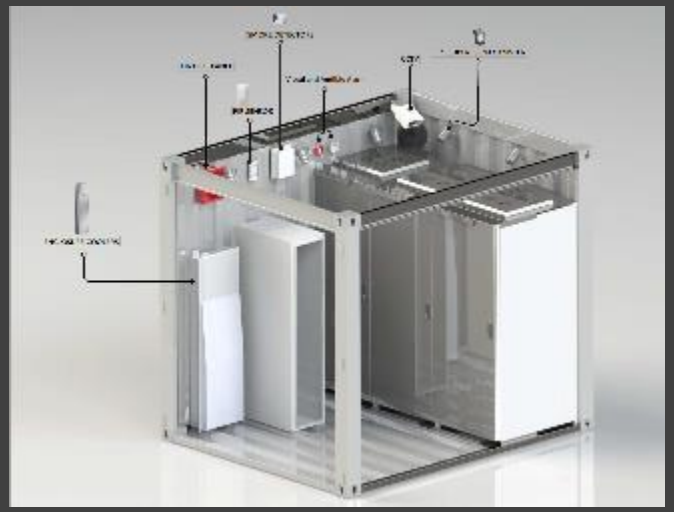
- PRODUCT
  - 12VDC - embedded pole storage module
- DEPLOYED IN
  - Street lights
  - Wifi / security poles

- PRODUCT
  - 192VDC
- DEPLOYED IN
  - UPS storage

UPS APPLICATIONS



20’ – APPROX. 500KWH



10’ – APPROX. 300KWH

- PRODUCT
  - Containerized storage - 360VDC+/60kWh+
- DEPLOYED IN
  - Microgrids (with Server)

SIRIUS STORAGE – PRODUCT PORTFOLIO

PRODUCT	APPLICATION	STATUS
Ready for Production		
465Wh12VDC module	Replace 12V Lead Acid	Ready for production
AA modules	Consumer	Ready for production
1MWh Containerized System	Grid Storage (US utility)	Deployment in August 2019
Under Development		
565V module	Crane regen	Testing in – Apr 2019
7.1kWh120VDC	Solar	Under development
3.55kWh24VDC	Solar	Under development

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CASE STUDIES

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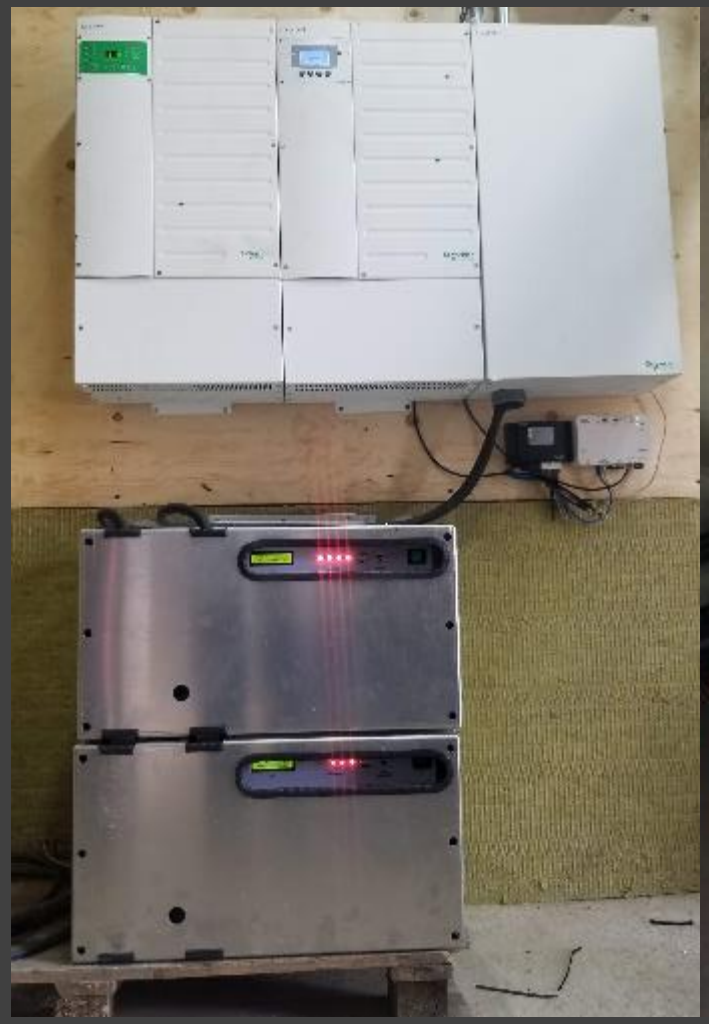

CANADA
RESIDENTIAL CUSTOMER

AUSTRALIA
RESIDENTIAL CUSTOMER

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Sirius Storage
14.2kWh

INSTALLATION

Pretoria Residence, Pretoria, South Africa
Sirius Energy Storage: 14.2kWh (4 x 3.55kWh)

LOCATION

Pretoria, South Africa

SYSTEM TYPE

Hybrid System

APPLICATION

Charging from PV and providing power to the house

INSTALLATION

Early 2017

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CASE STUDY

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Guinea Conakry,

Small medical center for the treatment of Ebola, built by an Italian NGO

LOCATION

Remote – no easy roads access to site

SYSTEM TYPE

Off-grid – in the next future will be installed a genset for backup

APPLICATION

Sirius Energy Storage: 7.1kWh (2 x 3.55kWh units)

Charging from PV and providing power to the medical center

INSTALLATION

Early 2019

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CASE STUDY

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Alto Adige - South Tyrol,

Small hut (Pieralongia 2297mt) in the Puez-Odle Natural Park.
It is a refreshment point on the paths towards the Firenze Refuge

SYSTEM TYPE

Off-grid system with energy generated with photovoltaic modules

APPLICATION

Sirius Energy Storage: 7.1kWh (2 x 3.55kWh units)

An additional SIRIUS 3.55 kWh will be installed this summer.

INSTALLATION

November 2018

CASE STUDY

ISOLA SANTA MARIA,

exclusive resort and gourmet restaurant in the Maddalena archipelago

LOCATION

wonderful island north of Sardinia, with no electrical connections

SYSTEM TYPE

Off-grid installation to support the loads of the restaurant and of the resort.

INSTALLATION

Early 2019

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CASE STUDY

HOUSEBOAT

Two new hybrid boats designed to offer maximum comfort with high quality and uncompromising solutions.

LOCATION

Recreational boat to rent for holidays in the lagoon of Venice and surrounding area

SYSTEM TYPE FOR ANY BOAT

4 SIRIUS 3.55 modules for marine genset optimization. Plan to add 2 additional modules in July19.

INSTALLATION

End 2018

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THANK YOU

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