The added-value of Long duration - Vanadium-Redox-Flow Batteries – for real time energy trading and 24/7 REs energy supply

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BUILDING ENERGY STORAGE INFRASTRUCTURE

Global Leader in Vanadium-Redox-Flow Batteries

Long Duration Energy Storage

Business at a glance

€2.5 Billions+

Addressable market by 2040

140+

Projects deployed globally

20+ years

Research and development

11.9 MW / 67.3 MWh

Installed / contracted base

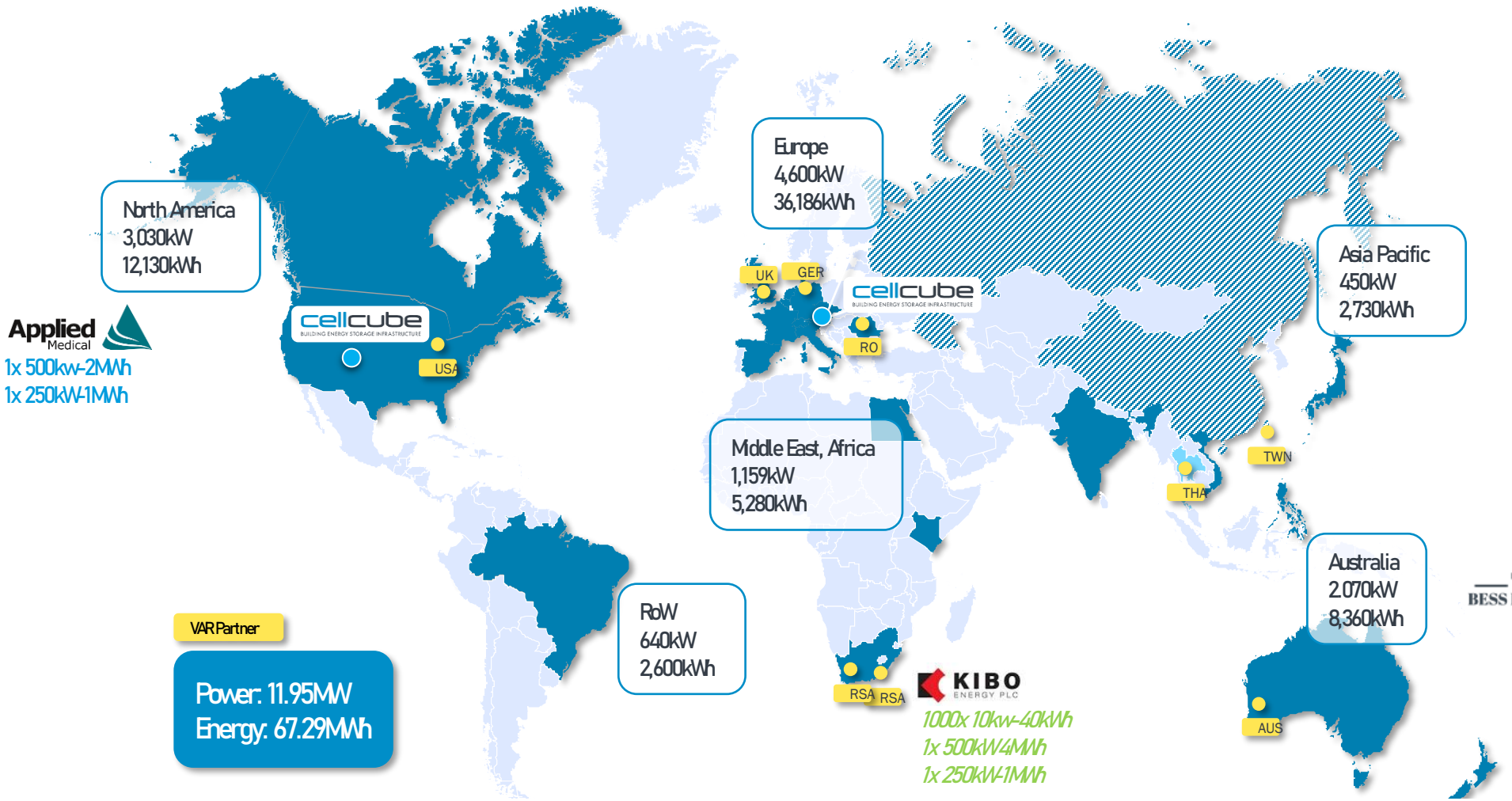
10+

Patents

100+

Employees

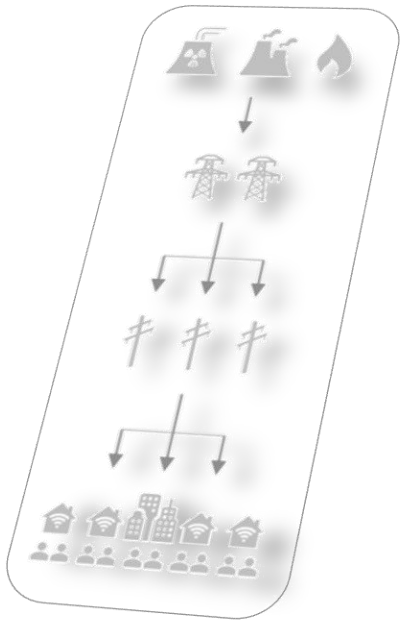
CellCube is the leading VRFB provider for LDES applications

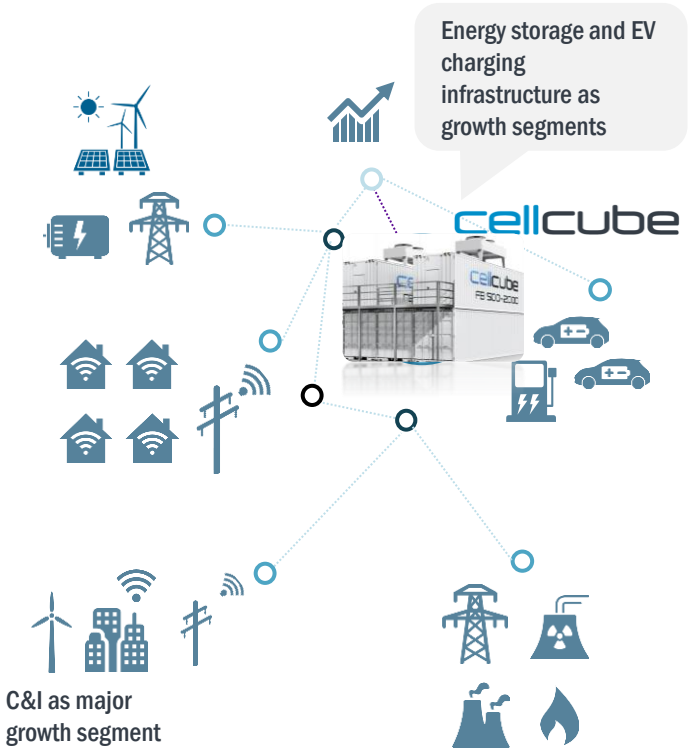


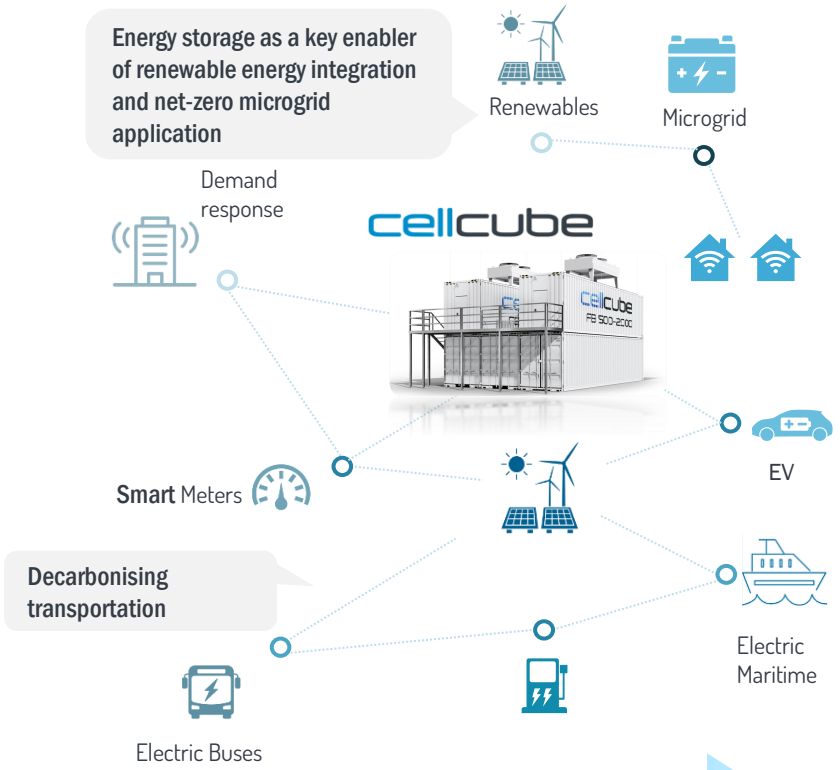
We have 140+ projects contracted and delivered in 20+ countries with an operational success record involving systems operating for over 10 years without interruption totaling 6m operating hours

The energy ecosystem is more and more decentralising, decarbonising and digitalizing – introducing microgrid ecosystem

Driven by low cost renewable generation energy storage is the key enabler of decentral green microgrids



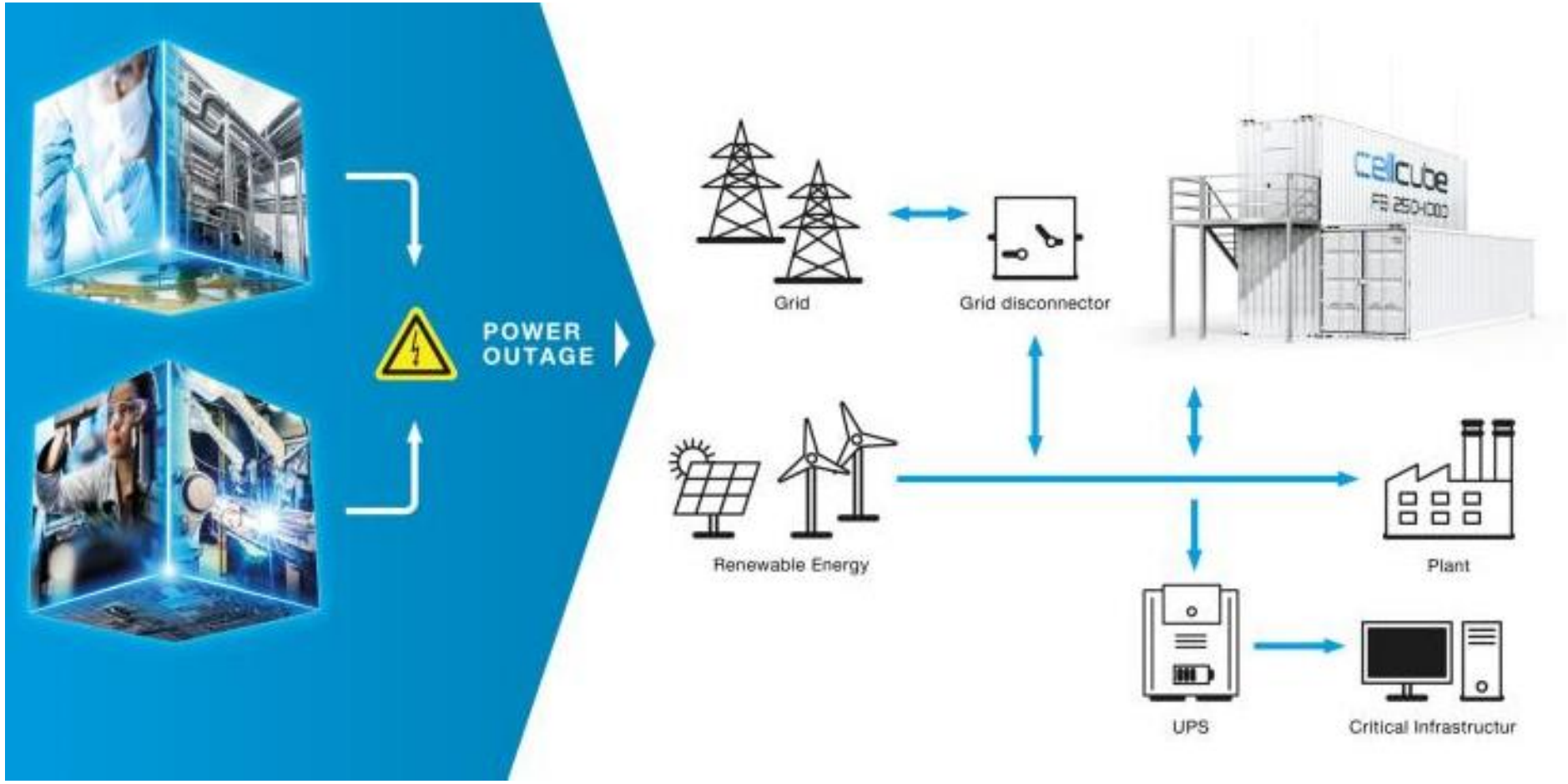




Historical centralised grid → Today's decentralised grid → Future net-zero neural network

Strengthen the resilience of your operations with CellCube's reliable vanadium redox flow battery Microgrid Solutions

Building a resilient industrial microgrid using bankable VRFB technology



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CellCube offers VRFB systems as versatile and robust LDES to enable decarbonized, reliable and sustainable power supply

Green & critical infrastructure

- Maritime
- Data centres
- Water and telecommunications
- Hospital, emergency & military

Remote microgrids

- Rural electrification
- Mining
- Island-systems

Industrial microgrids

- Agriculture & food
- Processing industry
- Manufacturing industry
- Energy & utilities

Commercial microgrids

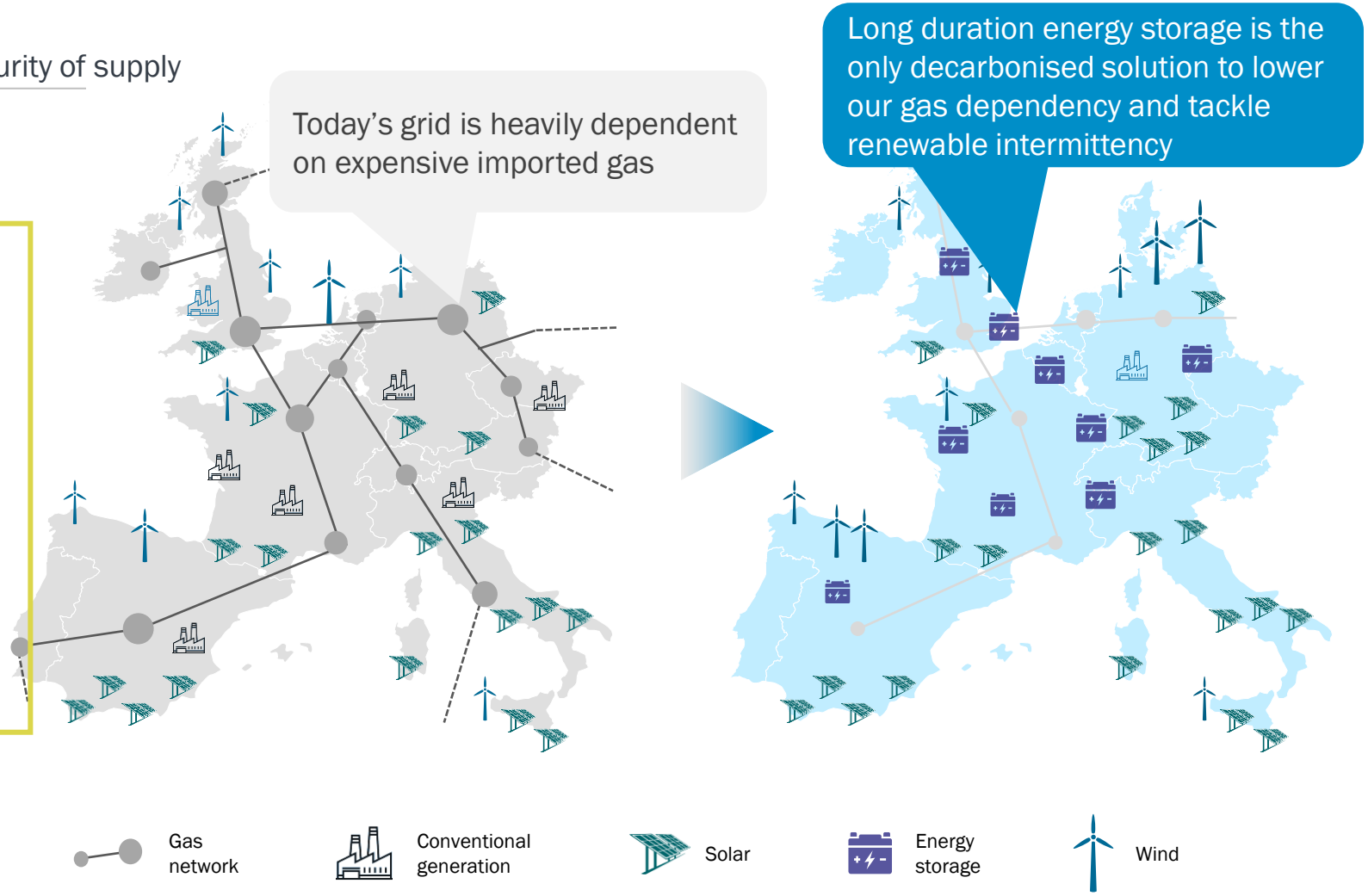
- Business parks
- Energy communities
- Logistics & e-mobility hubs

Regulators' energy security focus needs to consider incentivized microgrid applications rather relying on centralized models

The introduction of LDES would contribute to security of supply

- renewable penetration results in increased flexibility demand that is largely balanced with gas assets nowadays -> problem increased
- Despite high prices – wholesale day-ahead price on 17 Sept 2022 was below 10 EUR/MWh for 3 hours due to high Solar infeed
- LDES has the capability to extend low price of renewables for a 24/7 scenario and help keep lights on Net Zero scenario, keeping energy bills as low as possible and power sector emissions down
- Combined Solar-Wind-Storage Hybrid Plants have the potential to deliver 24/7 renewable energy baseload - no intermittency, reduced risk for Dunkelflaute

European regulation needs to switch from central to decentral grid operation concept mandating LDES to any renewable installation



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CellCube is the benchmark in VRFB long duration energy storage technology

MADE BY GLOBAL MARKET LEADER

50%+ market share with 130+ projects globally deployed

EASY TO SCALE

adding power and energy modules when needed

ISLANDABLE

Microgrid ready to connect

BANKABLE

A+ rated warranty insurance decades of validation

SAFE

Non-flammable, non-explosible, no leakage, build-in-safety

HIGH PERFORMANCE

Industrial grade heavy duty use long-lasting (Up to 30 years and 20,000+ cycles), multi-cycling per day, 100% usable depth of discharge, temperature conditions flexible

SUSTAINABLE & REUSABLE

No degradation, 25+ year life, re-usable, local assembly, repair friendly, no rare earths, contribution to a circular economy

SUBSECOND – 24h DURATION

Future proof - widest range of applications
Supply to meet demand from 100ms to 24hrs

200% POWER OVERRATING

without loss of delivered power

RELIABLE

10+ years in continuous operation

CellCube demonstrates VRFB as proven LDES technology in microgrid applications across the world

Grid Support for energy community

Market sector	Critical Infrastructure
Location	Simris, Sweden
CellCube Product	1 x CellCube FB 250-1000
Key Applications	Renewable baseload, Islanding
Rated power / capacity	0,25MW / 1MWh

Power Supply for Island

Market sector	Remote Microgrid
Location	Kitobo Island, Uganda
CellCube Product	4 x CellCube FB 15-130
Key Applications	Renewable energy supply, energy shifting, reduced use of diesel genset
Rated power / capacity	60kW / 520 kWh

EV charging station

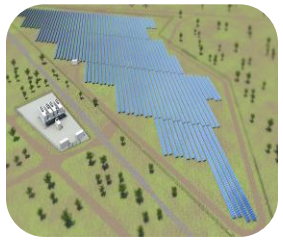
Market sector	Commerial Microgrid
Location	Ulyanovsk, Russia
CellCube Product	1 x CellCube FB 30-130
Key Applications	Green e-mobility charging station
Rated power / capacity	30 kW / 130kWh

Grid Company – Renewable Integration
>10 years in continuous operation (COD in 2010)

Market sector	Critical Infrastructure
Location	Lichtenegg, Austria
CellCube Product	1 x CellCube FB 10-100
Key Applications	renewable integration, DSM
Rated power / capacity	10 kW / 100kWh

Provider of electric power equipment

Market sector	Industrial Microgrid
Location	Bolingbrook, USA
CellCube Product	4 x CellCube FB 500-2000
Key Applications	Energy shifting, peak shaving, UPS, frequency reg.
Rated power / capacity	2MW / 8MWh



Decarbonizing Mining Plant

Market sector	Remote Microgrid
Location	Brits, South Africa
CellCube Product	2 x CellCube FB 500-2000
Key Applications	Energy shifting, renewable integration
Rated power / capacity	1MW / 4MWh

Resilient Microgrids in California

Market sector	Commercial Microgid
Location	Santa Margarita, California
CellCube Product	1x FB 500-2000 / 1x FB250-1000
Key Applications	microgrid establishment, bill optimization
Rated power / capacity	750 kW / 3 MWh

Grid Company on Island

Market sector	Critical Infrastructure
Location	Pellworm, Germany
CellCube Product	1 x CellCube FB 200-1600
Key Applications	congestion management, grid services
Rated power / capacity	200kW / 1,6MWh

Future stationary energy storage systems will be LDES technology covering services from sub second to multiple days

LDES applications

UPGRADE DEFERRAL

Deferring and avoiding grid upgrades

PEAK SHAVING

Providing max, power during short or longer peak loads

RENEWABLES TIME SHIFTING

24/7 renewable base load

GRID SERVICES

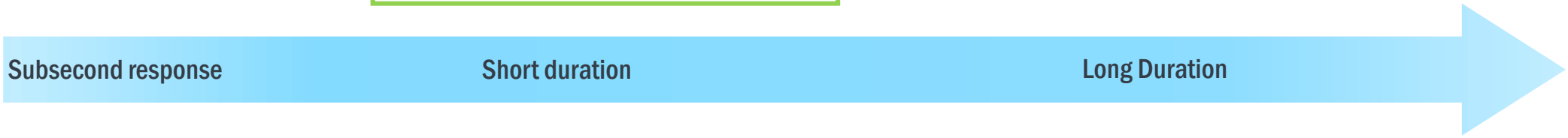
Providing power in < 10ms for PRL, SRL, DC, BM, etc

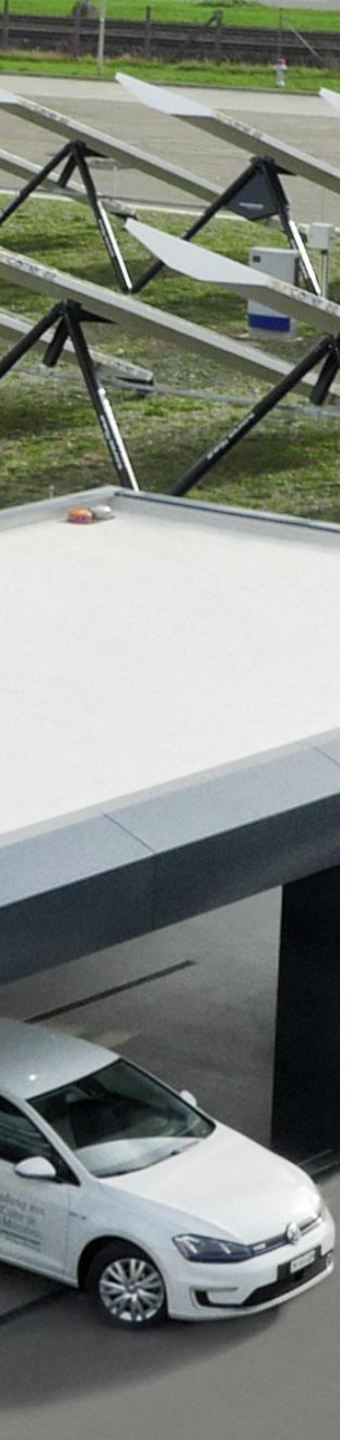
POWER TRADING

Providing power for arbitrage, intraday, day ahead, power pools, etc.

GREEN BACK-UP

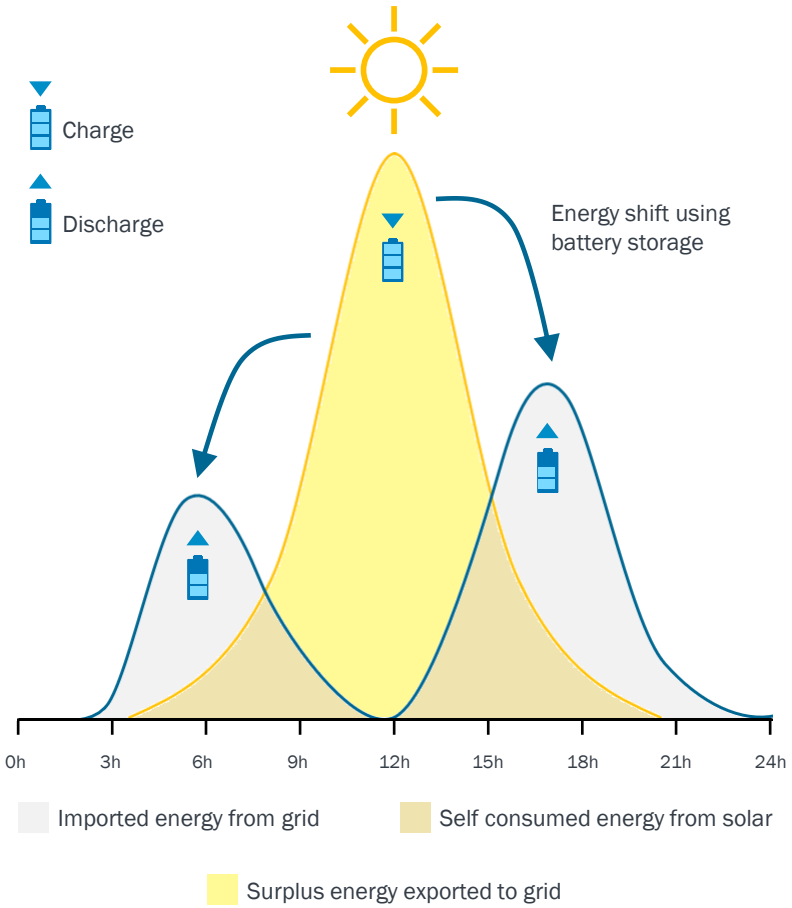
UPS for 16 hours of peak loads



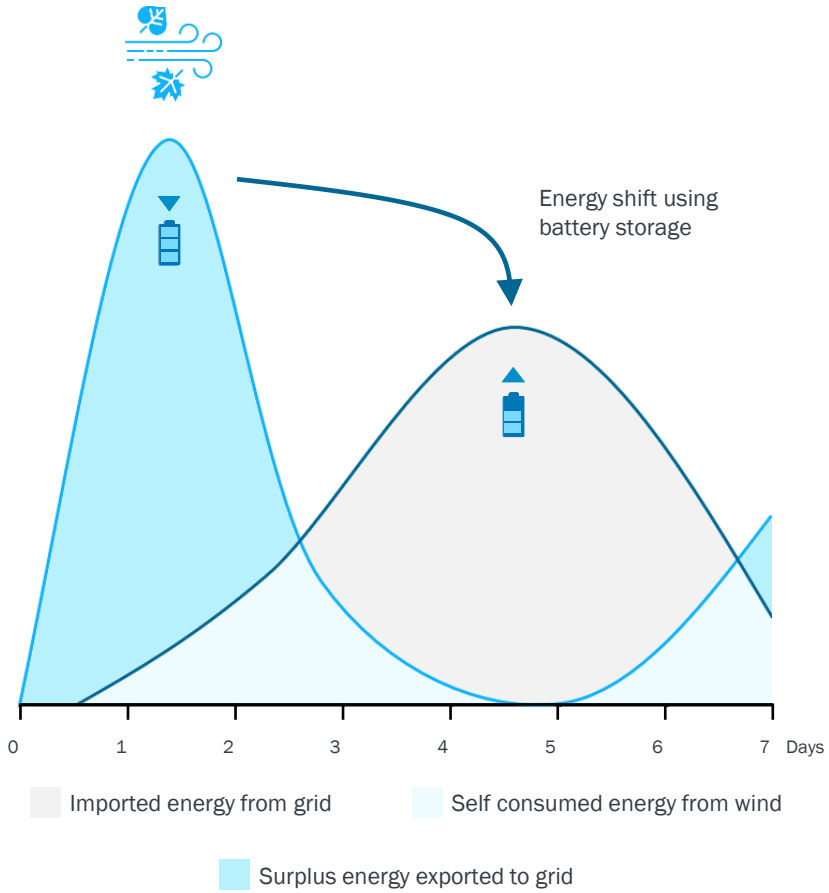


LDES enables grid stability and reliable power output – from seconds to days – 24/7 renewable baseload

Sunny day in a Northern Hemisphere summer



Short-spell of wind in a Norther Hemisphere winter



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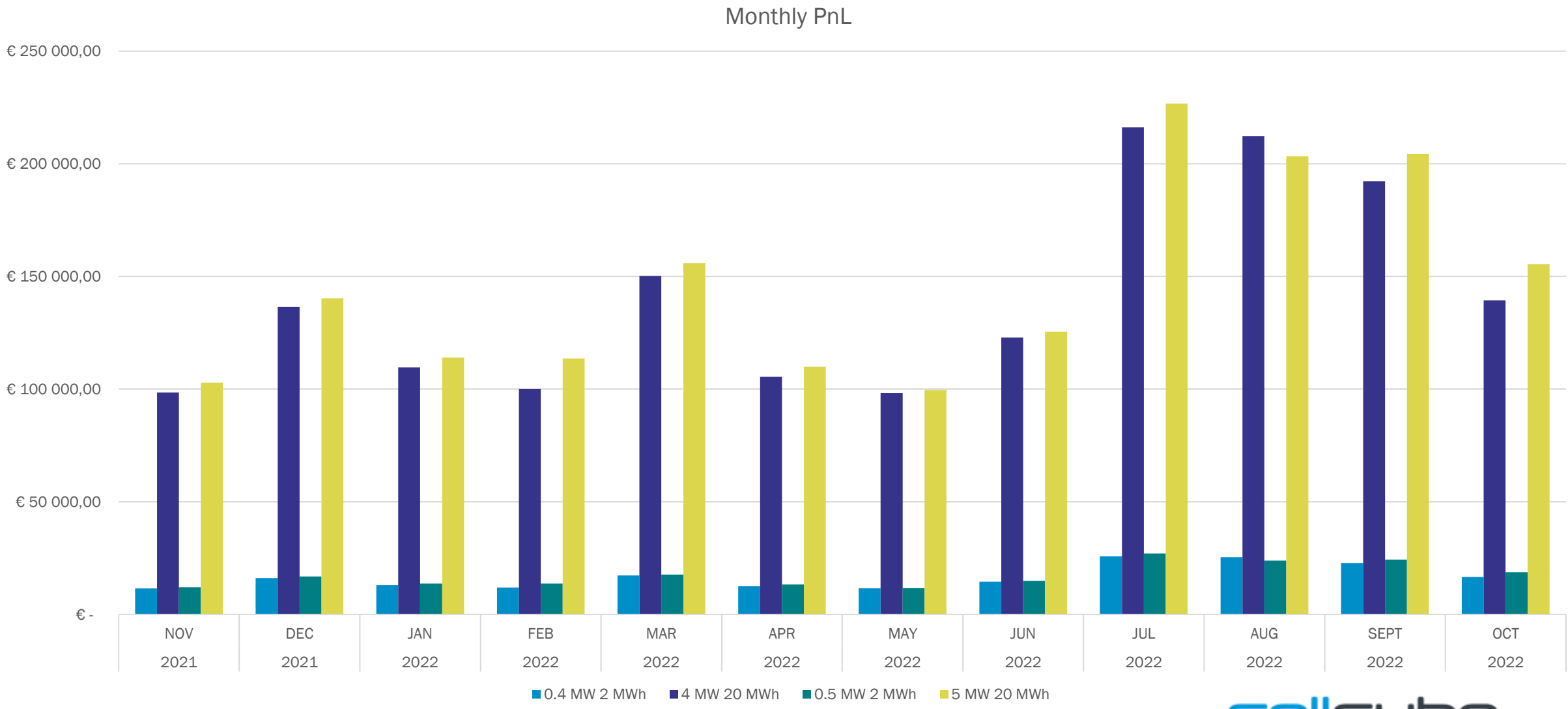
The value of VRFB flexibility for intraday trading and real time trading

CellCube PNL Evaluation November 2021 – October 2022 (done by Enspired)



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The Project technical and commercial Use-Cases

G&W Electric's microgrid will cover multiple use cases based on added-values of VRFB

- Islanding and grid forming
- Sub cycle green backup power for critical asset protection
- Provide high quality, reliable and resilient power during seasonal peak demands and power outages
- VRFB operation at up to 150% of nominal power i.e. 3MW for app. 2 hours and at 100% for up to 4 hours
- Integration of rooftop solar

PEAK SHAVING

- Energy independent when prices are high, enabling peak load shaving for energy savings

GREEN BACK-UP

- Facility continuous operation during grid failures or power outages

POWER TRADING

- Flexibilizing supply and demand, active participation in PJM and ComEd's demand response program

RENEWABLES TIME SHIFTING

- Reducing CO2, become carbon neutral or negative net carbon producer

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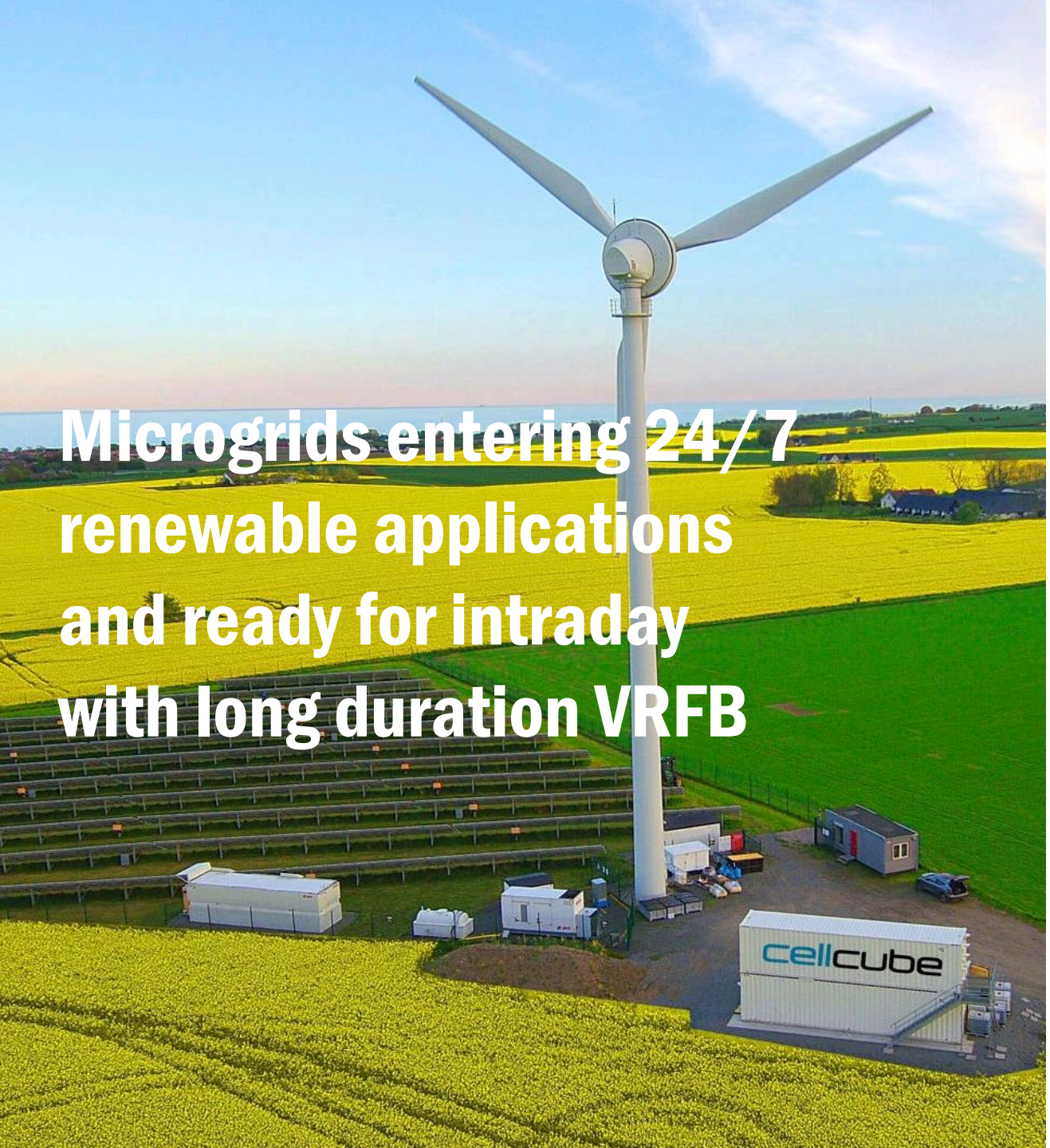

Microgrids entering 24/7 renewable applications and ready for intraday with long duration VRFB

LDES – VRFB to cover ms – 24 h days enabling 24/7 renewables with unlimited number of cycles

LDES is available now to allow high performance intraday trading

LDES is highly versatile and modular to be place at any location

AI / Trading Softwares enabling smart intraday trade operation

Microgrid-Communities will trade their flexibilities on the market

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Thank you for your attention!

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