Powering the evolution of a renewable society, by redefining energy infrastructure

Jonas Wallmander
CEO
There is a gap in the global renewable transition

Long Duration Energy Storage is required to make power from renewables become available at all hours of the day.
Investments in renewables must be met by investments in storage

Investments in renewable energy have increased dramatically over the years. Less than 1 percent of investments in energy transition goes to storage.

With increased storage we can ensure access to renewables at all times of the day.
Long-duration energy storage is key for the transition to renewables

Our long-duration energy storage solution, makes power from renewable sources becomes available at all hours of the day.

Powering the evolution of renewable societies.
Storage capacity still lagging behind

To reduce the 1.5 to 2.3 Gt of CO$_2$ that is produced annually from fossil fuels, to meet grid energy imbalances, we need to install 85-140 TWh of long-duration energy storage by 2040 worldwide. This would cover 10% of the global electricity consumed.

To reach NetZero we need to boost investments with 1 TWh of capacity deployed globally by 2025. Only around 7% of this storage capacity exists today.
Storage technologies

Exhibit 3
Overview of LDES categories

There are 4 kinds of novel LDES

All LDES allow energy to be stored when there is a generation surplus and released when there is a shortage.

**Thermal**

Thermal energy storage systems use thermal energy to store and release electricity and heat.

- Sensible heat
- Latent heat
- Thermochemical heat

**Electrochemical**

Electrochemical LDES refers to batteries of different chemistries that store energy.

- Aqueous flow batteries
- Metal anode batteries
- Hybrid flow batteries

**Mechanical**

Mechanical LDES store potential or kinetic energy in systems for future use.

- Novel PSH
- Gravity based
- CAES
- LAES
- Liquid CO₂

**Chemical**

Chemical energy storage systems store electricity through the creation of chemical bonds.

- Power-to-gas-to-power
Combining electricity and heat

A unique position

- COMBINED ELECTRICITY AND HEAT
  - LI-ON BATTERIES
  - LIQUID AIR ENERGY STORAGE
  - SODIUM SULPHUR
  - FLOW BATTERIES
  - THERMAL BATTERIES

- ELECTRICITY SERVICES ONLY
  - AZELIO – ELECTRICITY AND HEAT SERVICES

- HEAT SERVICES ONLY

IDEAL SIZE MW OF INSTALLATION

0.2 MW
100 MW

PLAYERS IN THE MARKET
Azelio provides the missing piece of a renewable future

Azelio TES.POD – Thermal Energy Storage. Power On Demand

Storing renewable energy in recycled aluminium, supplying electricity and usable heat on demand

STORAGE CAPACITY
Clean energy supply 24 hours a day

COST COMPETITIVE
More affordable than fossils and batteries

SUSTAINABLE & MODULAR
No degradation, no emission and competitive from 0.1 to 100 MW
Completing the 24-hour cycle
Example of installation
TES.POD® outperforms diesel and batteries

Less than half the cost of diesel-generated electricity and significantly cleaner

**LEVELISED COST OF ELECTRICITY (LCOE) 2021 (EUR/MWh)**

- TES.POD®
- Diesel generator

**ENVIRONMENTAL IMPACT (CO2e)**

- Azelio vs. lithium battery: 29% cleaner
- Azelio vs. diesel genset: 96% cleaner

From internal calculations that are based on data from Lazard Levelized Cost of Storage 4.0 and performance simulations in National Renewable Energy Laboratory’s (NREL) tool SAM 18.11.31

13h supply with a system lifetime of 30 years.

Azelio’s TES.POD vs. lithium-ion batteries and diesel generators. Delivering electric power for 13 hours every day, for 25 years. Life Cycle Analysis by RISE Institute, 2020.
Changing the game with TES.POD®

This is how it works

**CHARGED**
Charged with electricity from renewable sources such as solar PV.

**STORED**
Energy is stored as heat in a recycled aluminium alloy, with phase change at 600°Celsius.

**DISPATCHED**
Stored heat is dispatched to a Stirling engine on demand, generating electricity and usable heat (55-65°Celsius).

**AVAILABLE ON DEMAND**
Clean power available on demand at all hours of the day. Emission free and at a significantly lower cost than Li-ion batteries and fossil alternatives.

- Holds 16 granted patents
Reference Project off-grid case

85 TES.POD units
Capacity Ratio 11
30 kW baseload from gensets for off-grid operation
Verification projects
Taking place in the main global arena of renewable energy

At the technical center in Åmål
The heart of the technology where the global installations are monitored

Noor solar power complex in Morocco
World-leading solar park and arena for breakthrough technologies

In Abu Dhabi with Masdar and Khalifa University
Evaluation of the technology for inclusion in Masdar’s product portfolio

Technology verification by third party
Report issued. Longer data series to be added to verification package
We are making a difference in the world today

First contracts and installation deployed.

With intensified electricification globally and increased use of renewables, the value and need of Azelio’s TES.POD grows.
Installation Masdar Abu Dhabi
Our target sectors

COMMUNITIES
The versatility of TES.POD makes it an ideal solution for residential communities and public services with no access to electricity, or access only to isolated or unreliable grids.

COMMERCIAL FACILITIES
WE provide commercial and industrial users with a new, economically viable renewable baseload source. With this, facilities can access clean, as well as stable power and heat on demand.

PRODUCTION & EXTRACTION INDUSTRIES
The TES.POD is perfectly suited to the high energy demands from production and extraction industries in remote and extreme environments.

AGRICULTURE
Reliable and inexpensive energy from renewable sources is crucial for sustainable food and industrial crop production. The TES.POD provides the global energy solution for the agriculture sector.

WATER
Access to a clean and reliable water supply is vital for well-functioning societies. Wastewater treatment and desalination is improved with regular and stable clean energy supply.
Azelio facilities
Wee Bee Ltd. is a mixed farming company with annual energy consumption of around 1.9 GWh. With an energy demand for day and night operations, reliable and cost-effective energy supply is of great importance. With a current grid connection that is unreliable, expensive and fossil-based, Azelio’s long duration energy storage TES.POD® will reduce energy related CO2 emissions by 323 tonnes and securing energy supply around the clock with solar PV together with Azelio’s TES.POD®.
Business model

Technology provider for both EaaS and direct sales

EPC (Engineering, Procurement, Construction), EPCM (Engineering, Procurement, Construction Management), LTSA (Long Term Service Agreement), IPP (Independent Power Producer), PEM (Power engines manufacturers), PED (Power electronics Designers), ESI (Energy Systems Integrators)

CUSTOMER/PARTNER

PROJECT DEVELOPER

EPC/ EPCM

IPPS

PEMS, PEDS

ESIS

EAAS / DIRECT SALES

END USER OF SYSTEM

TECHNOLOGY

TRAINING & SUPPORT

LOCAL O&M SERVICE COMPANY

O&M SERVICE (LTSA)

EPC (Engineering, Procurement, Construction), EPCM (Engineering, Procurement, Construction Management), LTSA (Long Term Service Agreement), IPP (Independent Power Producer), PEM (Power engines manufacturers), PED (Power electronics Designers), ESI (Energy Systems Integrators)
The way metals and minerals are extracted is changing. Increased energy consumption costs and growing environmental concerns are putting pressure on the mining industry.

The TES.POD is perfectly suited to the high energy consumption and demand for uptime from a sector known for its remote and extreme environments.

**Example CASE – MINING**

Powering the evolution of mining

The way metals and minerals are extracted is changing. Increased energy consumption costs and growing environmental concerns are putting pressure on the mining industry.

The TES.POD is perfectly suited to the high energy consumption and demand for uptime from a sector known for its remote and extreme environments.

**Grid+Diesel vs. Azelio TES.POD**

**COST REDUCTION**

1,68 MUSD

PER YEAR. COMPARED TO GRID + DIESEL

**75% CLEANER**

THAN THE ALTERNATIVE OF DIESEL + GRID POWER. 1,566 TON CO2 AVOIDED.

**EQUIVALENT OF PLANTING**

58,000 TREES

EXAMPLE: AN AZELIO TES.POD CLUSTER OF 40 UNITS IN COMBINATION WITH SOLAR PV. CONSIDERED 4,730 MWH ANNUAL ENERGY BASELOAD DEMAND. LOCAL CONDITIONS: GHI: 2071 KWH/M2/YEAR.
Agriculture is the world’s largest industry. It has deep connections to the world economy, human societies, and biodiversity – making it one of the most important frontiers for an efficient energy transformation.

Reliable and affordable energy from renewable sources is crucial for sustainable food and industrial crop production in the future.

Example CASE – AGRICULTURE

Powering the evolution of agriculture

Agriculture is the world’s largest industry. It has deep connections to the world economy, human societies, and biodiversity – making it one of the most important frontiers for an efficient energy transformation.

Reliable and affordable energy from renewable sources is crucial for sustainable food and industrial crop production in the future.

Grid+Wood fuel vs. Azelio TES.POD

COST REDUCTION

930,000 USD

PER YEAR, COMPARED GRID COST, INCLUDING SUPPLY OF HEAT.

81%

CLEANER

THAN SUPPLY FROM THE GRID AND WOOD FUEL.

3,203 TON CO2 AVOIDED.

EQUIVALENT OF PLANTING

87,000 TREES

AN AZELIO TES.POD CLUSTER OF 40 UNITS IN COMBINATION WITH SOLAR PV. CONSIDERED 4,468 MWH ANNUAL ENERGY BASELOAD DEMAND. LOCAL CONDITIONS: GHI: 2001 KWH/M2/YEAR.
Powering the evolution of communities

Our everyday activities require almost continuous access to electricity. When it’s lacking it may inhibit development and growth.

The TES.POD’s versatility makes it an ideal solution for residential communities and public services with no access to electricity or those on the fringe of grid locations.

Grid+Diesel vs. Azelio TES.POD

Cost Reduction

345,000 USD
PER YEAR. COMPARED TO GRID + DIESEL

84% Cleaner

249 TON CO2 AVOIDED COMPARED TO DIESEL.

Example: An Azelio TES.POD cluster of 20 units in combination with solar PV. Considered 2,486 MWh annual energy base load demand. Local conditions: GHI: 1874 KWh/m2/year.

Equivalent of Planting

11,422 TREES

Example CASE – COMMUNITIES
The challenge is now

- We have installed our solution on global arenas
- Our system performance has been validated by DNV
- We have established an all European supply chain
- We have initiated production of our system
- We have initiated our first commercial projects

We are here now

Powering the evolution of a renewable society
Thank you

CEO Jonas Wallander

jonas.wallander@azelio.com