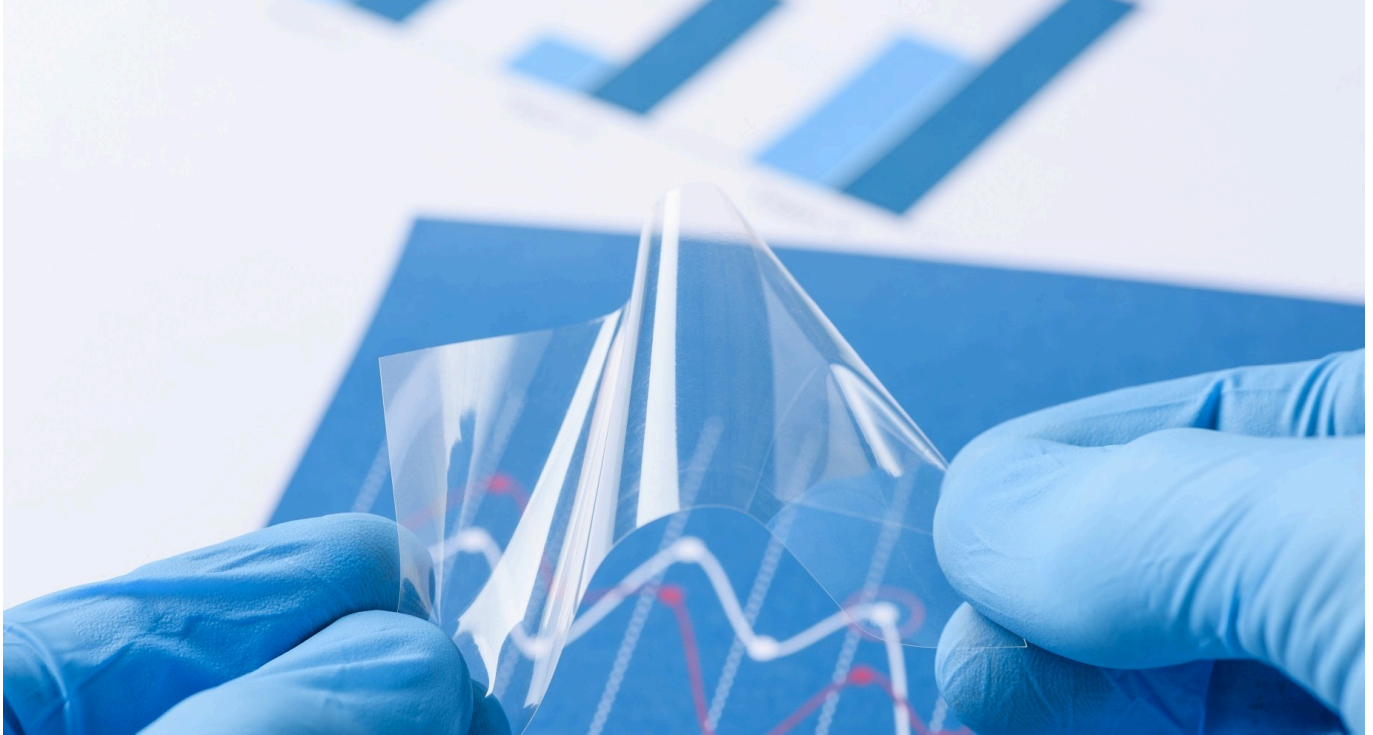


**TECH OFFER**

## Flexible Printed Battery as a Sustainable Power Source



### KEY INFORMATION

TECHNOLOGY CATEGORY:  
Energy - Battery & SuperCapacitor

TECHNOLOGY READINESS LEVEL (TRL): **TRL8**  
COUNTRY: **FINLAND**  
ID NUMBER: **TO174876**

### OVERVIEW

With a projected market size of close to US\$300M in 2025, printed thin film batteries are emerging as ideal candidates to power the next-generation wearables, medical and electronic devices.

Unlike conventional batteries, printed thin-film batteries offers form-factor freedom, flexibility, providing power at sub-millimeter thickness and potentially cost effective to manufacture. Typically, zinc-manganese has been the chemistry of choice for printed batteries thanks to its low cost, high safety and ease of processing. Printed battery is manufactured by depositing conductive ink as a thin-film of paste onto a flexible polymer substrate (e.g., PET or heat-resistant polyimide films) by screen printing technique.

Developed by an SME, the proprietary printed battery technology consists of layers of zinc anode, manganese dioxide cathode, electrolyte, separator, current collectors and sealing materials. The final battery is about 0.7 mm thick. While the energy capacities and size/shape could be customised depending on the use cases, the printed battery is best suited for applications at a power consumption of less than 50 mW.

The technology owner may provide an initial assessment of the feasibility in using printed battery as a power source. If feasible, the technology owner may support in further brainstorming to optimise the power requirement and battery capacity for potential use cases. With a full grasp of the technical requirements, co-development activities including prototyping, battery integration with the final product (where applicable) will follow. For selected final products, the technology owner may serve as the original equipment manufacturer or original design manufacturer for the technology seeker.

## TECHNOLOGY FEATURES & SPECIFICATIONS

The standard non-rechargeable printed battery developed by the technology owner has the following technical specifications:

- Nominal voltage: 1.5 V to 3.0 V
- Initial capacities: 15 mAh @ 1 mA to 60 mAh @ 1 mA
- Initial internal resistance: ~20  $\Omega$  to ~90  $\Omega$
- Maximum peak current: 25 mA for 5 ms
- Shelf life: minimum 2 years

The outer dimensions, thickness and shape of battery as well as terminal size and location can be tailored according to the use cases:

- Customisation (area): 2 to 100 cm<sup>2</sup>
- Customisation (capacity): up to 400 mAh
- Bending radius: the printed battery can be attached to a curved surface with a minimum radius of 35 mm.

## POTENTIAL APPLICATIONS

The thin film paper battery may be designed and customised to supply power to the following products and applications:

- Wireless sensor labels for temperature monitoring or asset tracking
- Wireless skin patches for monitoring vital signs
- Cosmetics patches and masks for skin care
- Smart wound healing dressings
- Intelligent packaging lighting, display and tracking
- New products that benefit from the thin and flexible form factor

## MARKET TRENDS & OPPORTUNITIES

US\$296M in 2025 and CAGR 24.7% from 2020-2025 (MarketsandMarkets, 2020)

## UNIQUE VALUE PROPOSITION

Customisable, flexible printed batteries for multiple applications.