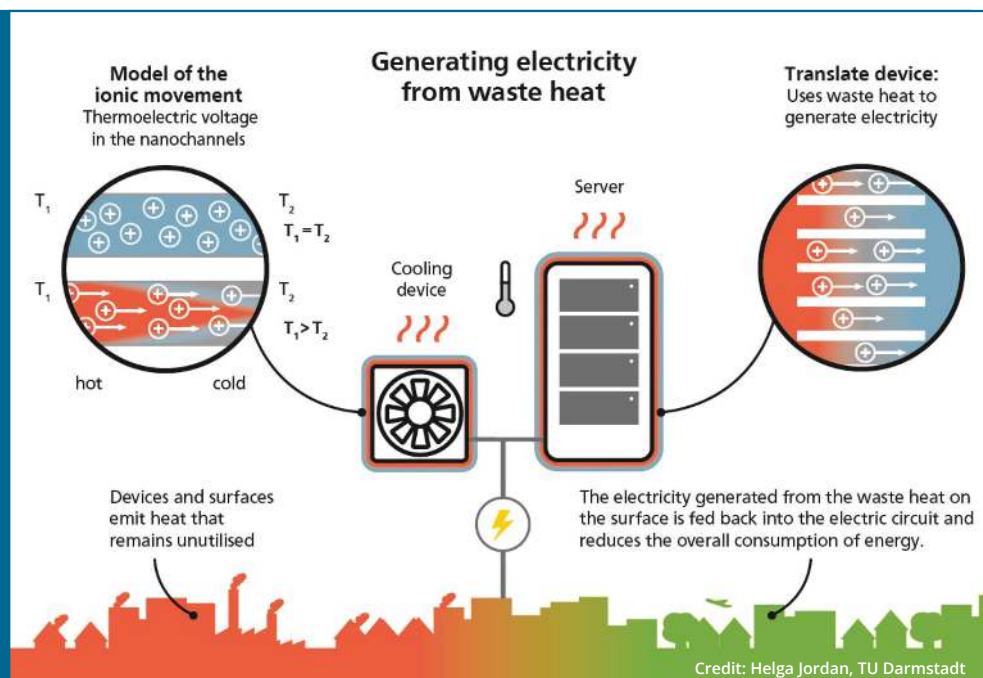


Recycling Waste Heat

factsheet

TRANSLATE is an early-stage, low-TRL nanofluidic energy harvesting technology that converts low-temperature waste heat (<100°C) into clean electricity. It provides a novel pathway to sustainable energy conversion, particularly for low-grade and ambient heat sources.



Key Features:

- **Technology:** Utilises nanofluidic membranes where ion flux in nanochannels transforms thermal gradients into electrical energy.
- **Efficiency:** Potential for high energy conversion efficiency at low temperatures compared to conventional approaches.
- **Environmental Impact:** Emission-free operation using Earth-abundant, environmentally benign materials and aqueous NaCl electrolyte for energy conversion.

Potential Use Cases:

- **Wearable technology:** Potential for powering medical devices, fitness trackers, and smart clothing.
- **Consumer electronics:** Enabling self-charging or energy-autonomous devices.
- **Wireless sensor networks:** Providing energy for distributed IoT devices.
- **Smart mobility:** Prospective integration into energy-efficient transport systems.
- **Environmental monitoring:** Powering remote and low-maintenance sensing platforms, including hazardous and other remote monitoring applications.

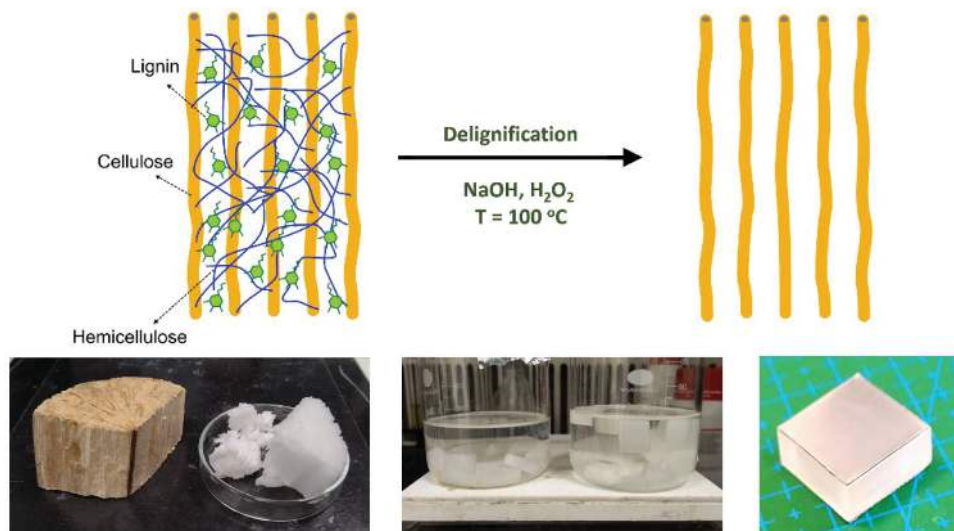
Technical Specifications:

- **Materials Used:** Earth-abundant, biocompatible nanofluidic membranes with aqueous NaCl electrolyte.
- **Power Output:** Designed for ultra-low power systems; suitable for intermittently powered applications, such as environmental sensors or passive IoT devices.
- **Operating Temperature:** <100°C (validated in controlled lab settings).
- **Scalability:** Suitable for small-scale applications.

Performance Metrics

As the TRANSLATE technology remains in early-stage development, detailed performance metrics such as energy conversion efficiency, device lifetime, and system integration characteristics are still under investigation. Current efforts are focused on establishing experimental benchmarks and identifying key parameters for future optimisation.

Visual representation of the process of delignification of wood.



Benefits:

Economic & Environmental Impact:

- **Cost Savings:**
Potential to reduce dependence on batteries and external power sources.
- **Clean Energy:**
Zero emissions from the energy conversion process.
- **Sustainable Design:**
Based on recyclable, Earth-abundant materials.

Technological Innovation:

- **Novel Energy Conversion:**
Novel approach to nanofluidic energy conversion.
- **Compact Solution:**
Experimental platform with potential for compact, lightweight energy solutions.
- **Targeted Applications:**
Optimised for distributed use cases, such as sensors, wearables, consumer electronics and smart mobility.

Future Prospects:

- **Energy Storage Integration:**
Future compatibility with next-gen supercapacitors or batteries is under consideration.
- **Ongoing R&D:**
Focused on improving ion transport, membrane stability, and energy density.
- **Market Potential:**
Targeted at specialised markets, including IoT, wearables, and environmental sensors.

Get Involved

We welcome collaboration opportunities across industry, academia, and policy sectors.

Project Lead: Prof. Justin D. Holmes, Professor of Nanochemistry,
School of Chemistry, University College Cork

You can find out more on our website: translate-energy.eu

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