Saule Technologies

Perovskite future of photovoltaics

SAULE TECHNOLOGIES

our story

When the simplest solutions turn out to be the best

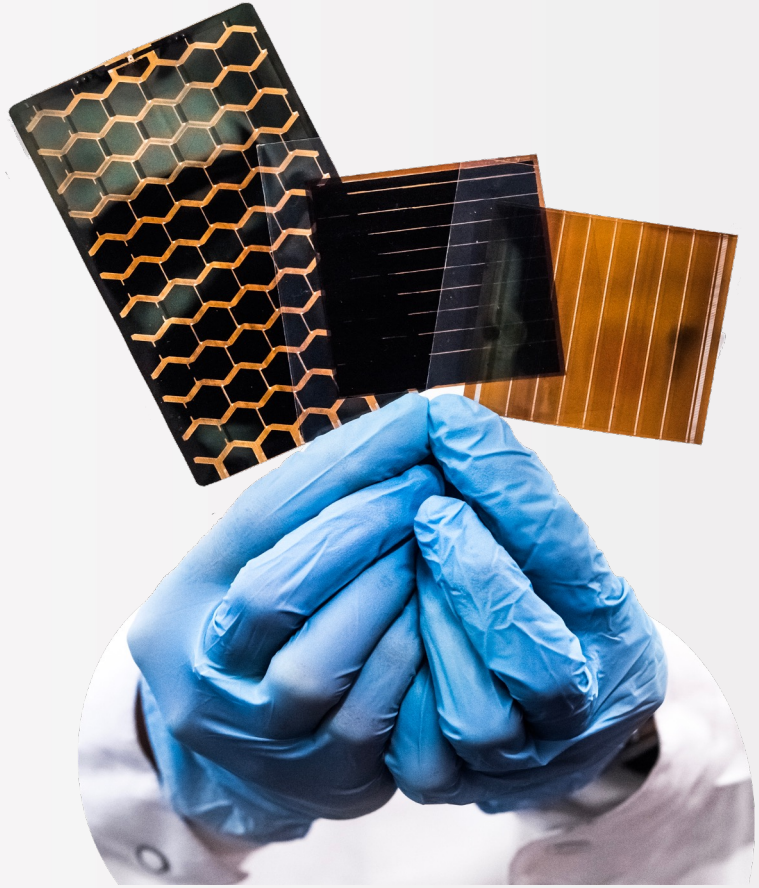
Saule Technologies develops and commercializes next generation inkjet-printed, ultrathin, and flexible solar modules based on new groups of perovskite crystals.

Our big mission is to **reimagine solar power generation** and make it accessible to everyone and everywhere.

The company was **founded in 2014** by Olga Malinkiewicz, a Polish physicist & inventor of the unique production method of perovskite solar modules.

Today, Saule Technologies is a team of **over 100 scientists**, engineers and administrative staff from over 15 countries. They work in the R&D center with a **pilot production line** and one of the **best equipped optoelectronic laboratories** in Europe. In 2021 Saule opened **first in the world** pervoskite PV factory.

Developed by Saule solar cells printed on flexible foils are **lightweight, ultra-thin** and can be made in different colours or translucent. Due to their properties, perovskites will significantly exceed the range of possible applications of traditional silicon technology.



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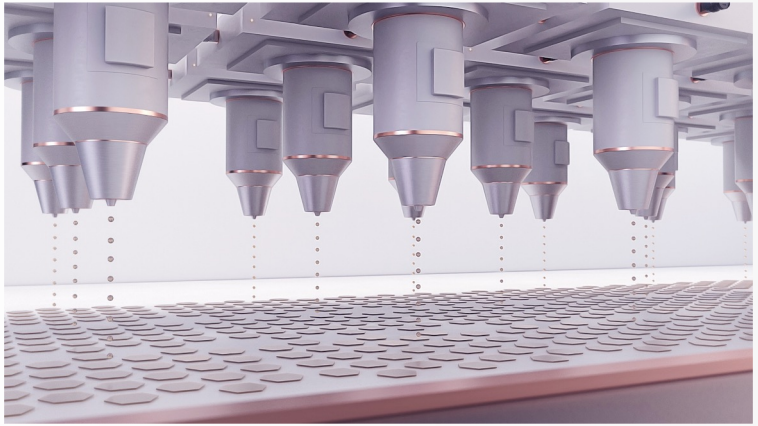
Our technology

The combination of our innovative production method and unique perovskite features provides exceptional advantages over traditional silicon-based systems.



Versatility

Flexibility & small weight
Low-light performance
Custom shapes

Simplicity

Manufacturing based on printing
Eco-friendly processing
Easy scaling

Low cost

Economical ingredients
High performance
Straightforward infrastructure

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Proven Unique Perovskite Technology

First production line already in operation since 2021 – utilizing the same inks, print heads and processes as in our R&D labs

- Unfolding and cutting a foil by a robot
- Defining a shape of the cells by a laser
- Inkjet-printing of cells in a low temperature
- Drying / Activation of a surface
- Stacking up the modules by a robot in a box
- Laminating

Unique properties of perovskite solar panels

Versatile - Ink-jet printing offers free form perovskite solar modules, high adaptability to design

Flexible - foils as substrates are resistant to damage caused by bending and folding

Ultrathin - the thickness of a solar cell is around 500 nm.

light weight Current weight of the module by Saule is approx. - 730 g/m2

Low light performance - can be used both outdoors and and inside rooms with limited sunlight

Semitransparency - almost the complete range is obtainable

Tunable color - the finished product can be engineered to a wide range of available colors with relative the ability to generate various colors, shapes and prints

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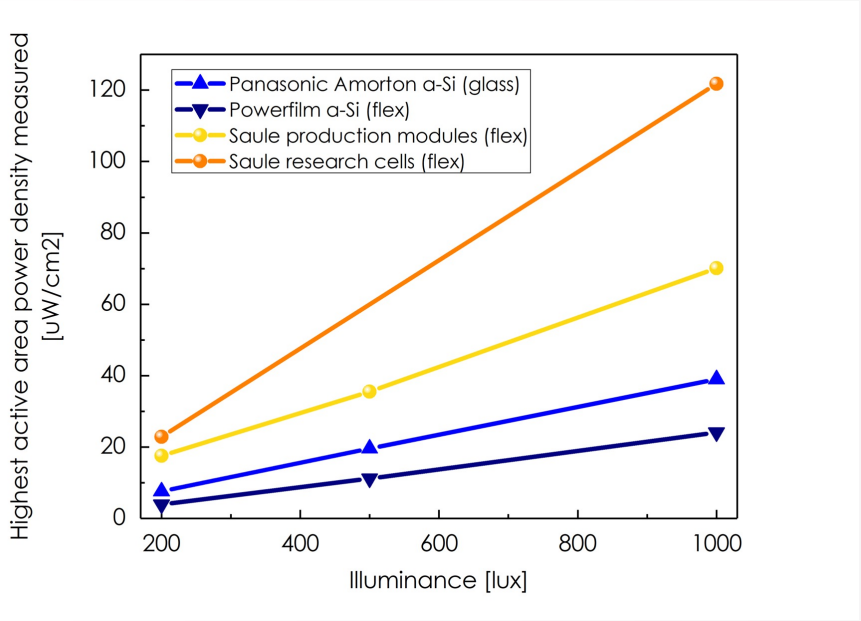
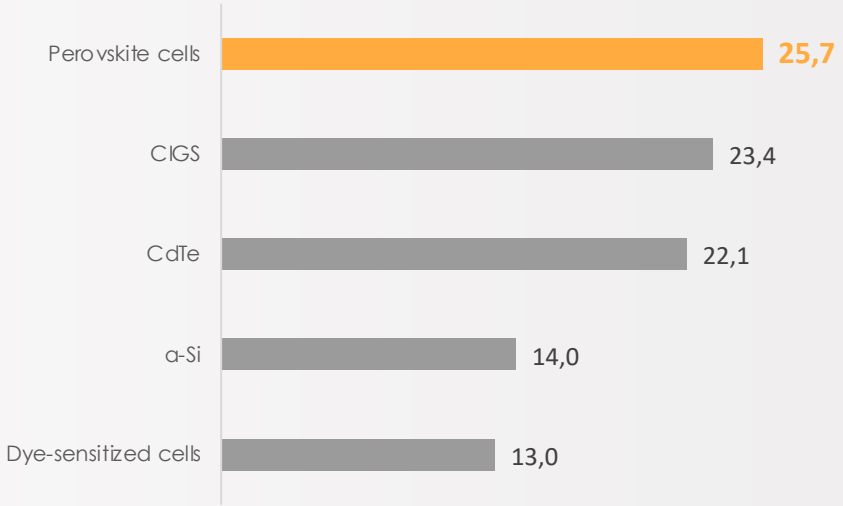
High performance indoors and outdoors

Excellent performance proven indoors



Source: Measurements at Saule

And huge potential outdoors



Highest 1-sun power conversion efficiency reported to date [PCE %]

Source: NREL

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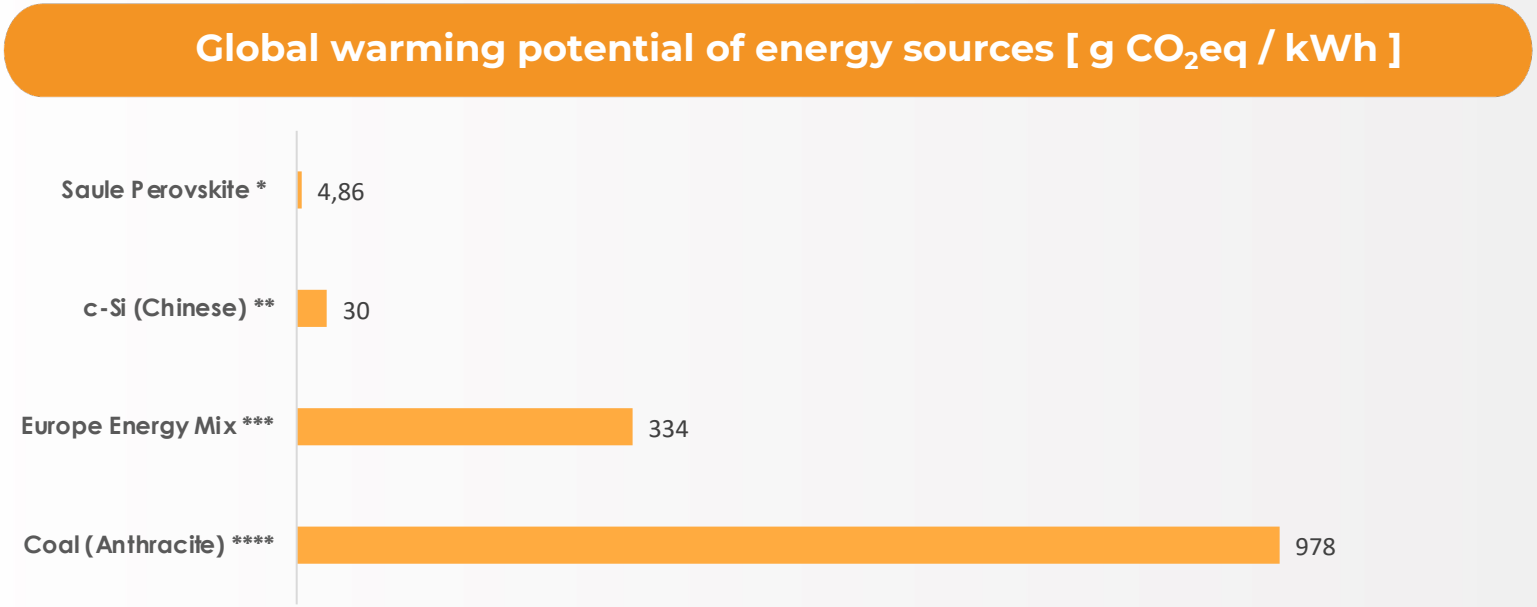
Excellent environmental impact

Perovskite solar cells can offset almost 1 kg of CO2 emission for each kWh energy generated



* Journal of Cleaner Production, 2022, 133665
** Solar Energy Materials and Solar Cells, 2021, 111277
*** Applied Energy, 2022, 117901
**** Coaltrans Conferences, 2021 August

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Excellent IP protection:

13
Patent families

37
Patent applications

7
Granted patents

167
Trade secrets

3
Trademarks

Europe, US, CN, JP
With granted protection

- IP policies established with the help of external IP advisor
- Dedicated IP and legal team working with world class attorneys
- Access to IP software, regular monitoring of FTO and competition
- Regular internal IP awareness trainings

Great market entrance strategy

Phase 1 (from 2022)	Phase 2 (from 2025)	Future opportunities
IoT	BIPV/BAPV	Niche markets

First product:
PESL (Perovskite Electronic Shelf Label)

Market size[1]:
USD 1.8 bn in 2020
Estimated USD 7.1 bn by 2026
CAGR 25.1%

Products:
Walling/building facades/ windows/sunblinds/rooftops

Market size[2]:
USD 14 bn in 2020
Estimated USD 87 bn by 2030
CAGR 20.1%

Products:
E-mobility
Consumer electronics
Space
Smart furniture
Others

[1]*Reportlinker.com "Smart Shelves Market by Component, Application And Region - Global Forecast to 2026"*

[2]*Building Integrated Photovoltaics (BIPV) Market Statistics and Analysis - 2030 (alliedmarketresearch.com)*

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First Market Application

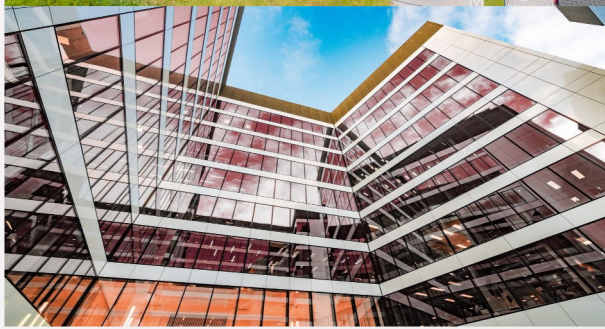
Our perovskite modules are performing exceptionally well in indoor light thus we started to look at **IoT sector** as a very promising fast growing market with huge future applications potential and with much higher margins than super competitive solar modules market for utility scale applications.

Our IoT modules perform with 25,5%* efficiency in indoor light which enables first commercial applications

** measured by Fraunhofer ISE*

Our first commercial implementation in IoT sector is power system for Electronic Shelf Labels for **Dynamic Price Changing** in retail stores

Utility-scale: BIPV and BAPV



BAPV value proposition

- **Retrofit** existing **buildings**
- Allows **mounting on low-load roofs** due to light weight
- Immense **uncontested surface** available - over 20M m^2 in Poland alone

BIPV value proposition

- Efficient **energy harvesting** on vertical surfaces
- **Offset** installation **costs** with integrated elements
- Improved **aesthetics** combined with **functionality**

Other aspects:

- **Very similar certification** requirements around durability, flammability
- The **production** to address both applications **will be also identical** for opaque modules
- Immense **uncontested surface** available - over 20M m^2 in Poland alone

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Solid roadmap for upscaling production

2022	2023	2024/2025	>2025
Pilot production line (capacity 40k m^2 p.a.)	**Pilot production line (capacity 40k m^2 p.a.)**	**Full scale production line (capacity 720k m^2 p.a.)**	**Capacity expansion, Multiplication**
▪ Line testing and process adjustments ▪ Product lifetime: 5 -10 yrs ▪ 1 m^2 efficiency: 10 %* ▪ Outdoor equiv.: 4 MW p.a. ▪ Target market: IoT (prototype solutions)	▪ Commercial production ▪ Product lifetime: 10-15 yrs ▪ 1 m^2 efficiency: 12-13 %* ▪ Target market: IoT (PESL) plus pilot BIPV/BAPV applications	▪ Commercial production ▪ Product lifetime: 15-20 yrs ▪ 1 m^2 efficiency: 15 %* ▪ Outdoor equiv.: 108 MW p.a. ▪ Target market: BIPV, BAPV	▪ Target lifetime: >20 yrs ▪ Target efficiency 1 m^2 : >20 %* ▪ Outdoor equiv.: 144 MW p.a. ▪ Target market: All markets

*** Outdoors value. Efficiency in indoors lighting conditions already reached 25.5%, measured by Fraunhofer ISE**

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