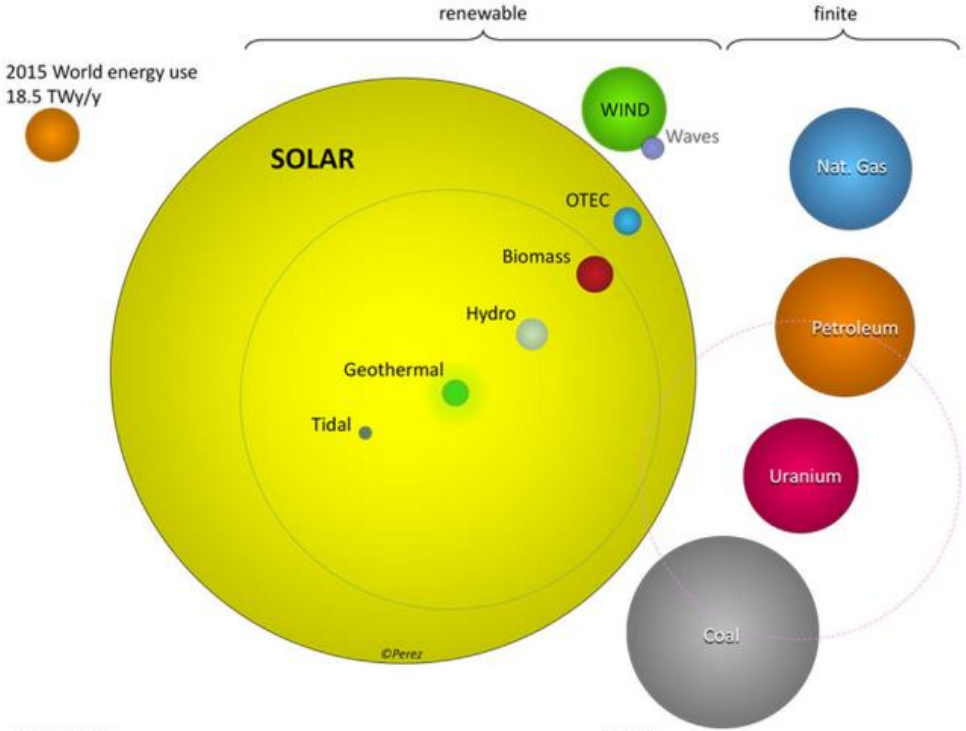
Solar energy harvester on nanoantenna, efficiency factor better than 50%

Problem (Marc Perez slide)



RENEWABLE			
Solar	23,000 TWy/y	Biomass	2-6 TWy/y
Wind	75-130 TWy/y	Hydro	3-4 TWy/y
Waves	0.2-2 TWy/y	Geotrm	0.2-3++ TWy/y
OTEC	3-11 TWy/y	Tidal	0.3 TWy/y

FINITE	
Nat. Gas	220 TWy
Petroleum	335 Twy
Uranium	185++ TWy
Coal	830 TWy

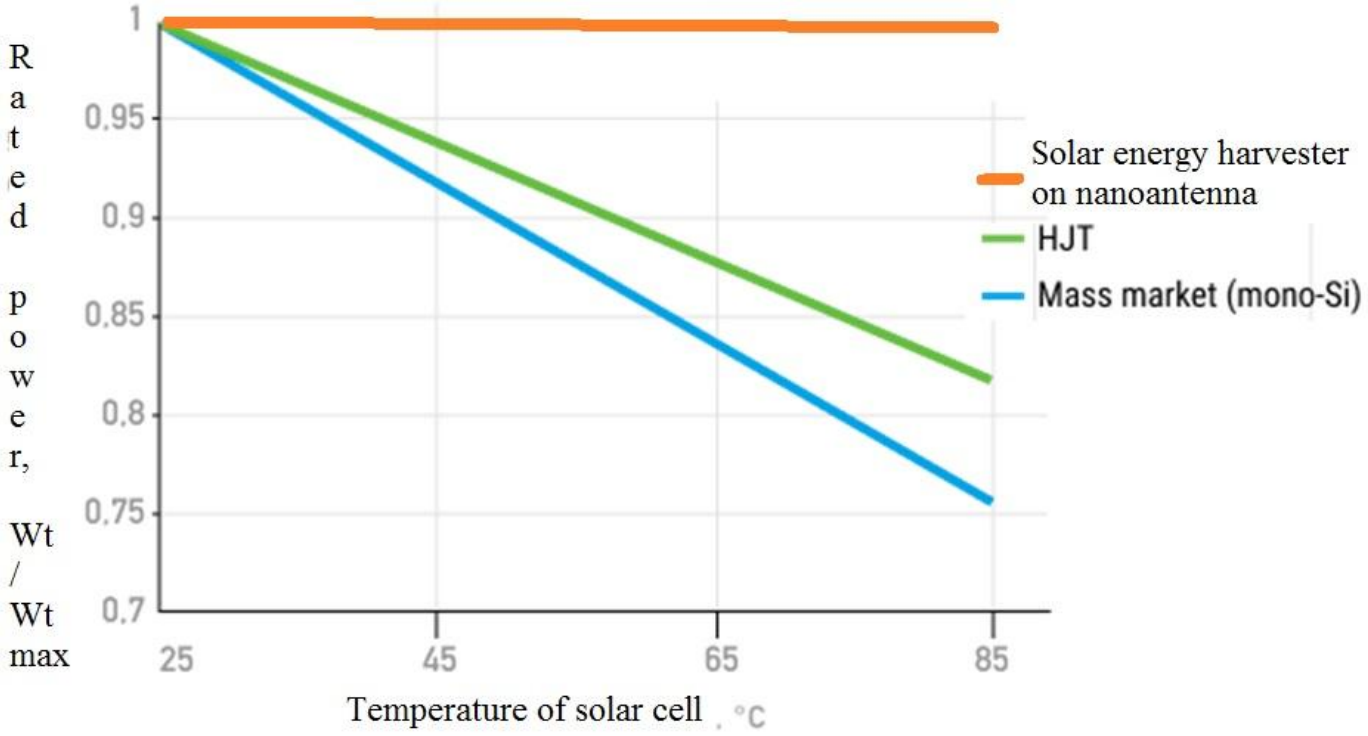
http://solarmarketpathways.org/wp-content/uploads/2017/08/NSC-Achieving-High-PV-Penetration-160526.pdf

Problem 1

Silicon monocrystal solar cell efficiency factor is 20%

Problem 2

Loss of efficiency factor when solar cell is heated



Problem

We collect only small part of solar energy

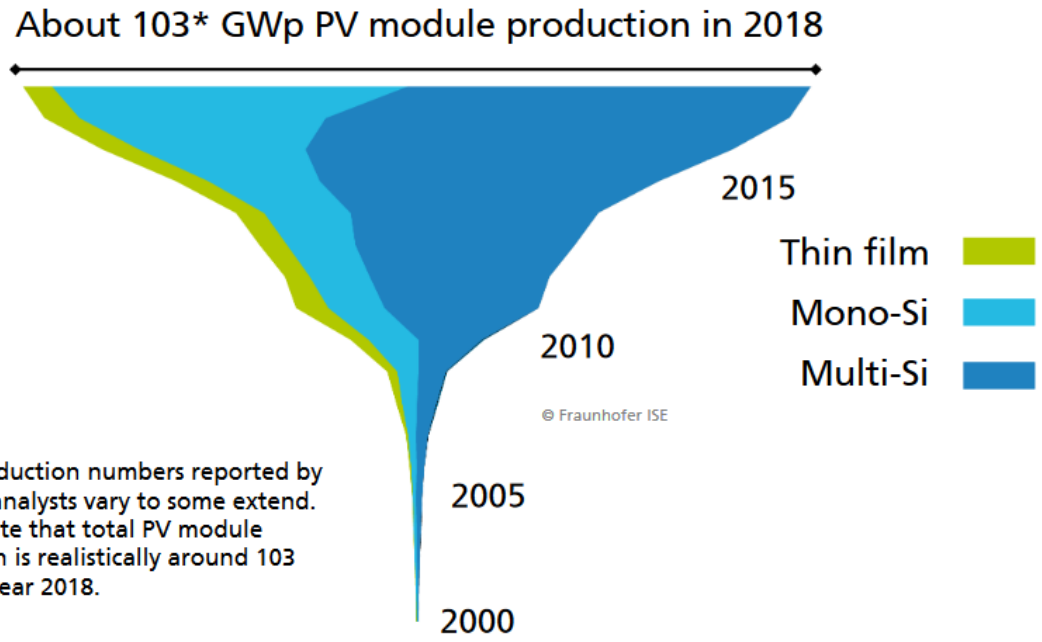
Solve. Nanoantenna (Optical rectenna)

Technology has approached the possibility of realizing an idea

https://en.wikipedia.org/wiki/Optical_rectenna

An **optical rectenna** turns electromagnetic waves into direct current electricity. While rectennas have long been used for radio waves or microwaves, an optical rectenna would operate the same way but with infrared or visible light, turning it into electricity.

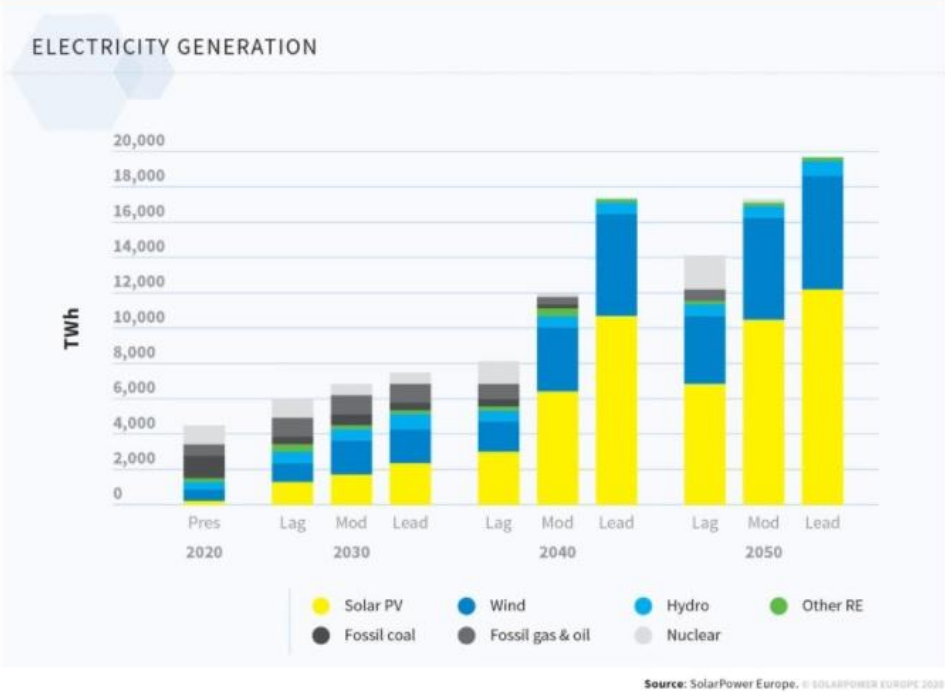
Annual PV Production by Technology
Worldwide (in GWp)



*2018 production numbers reported by different analysts vary to some extend. We estimate that total PV module production is realistically around 103 GWp for year 2018.

Data: from 2000 to 2010: Navigant; from 2011: IHS. Graph: PSE GmbH 2019

Electricity generation



Source: SolarPower Europe.

As of 2040, solar PV will become the dominant source of electricity generation across the three scenarios, and by 2050 it will reach at least 48% in the Laggard scenario and up to 63% in the Leadership scenario

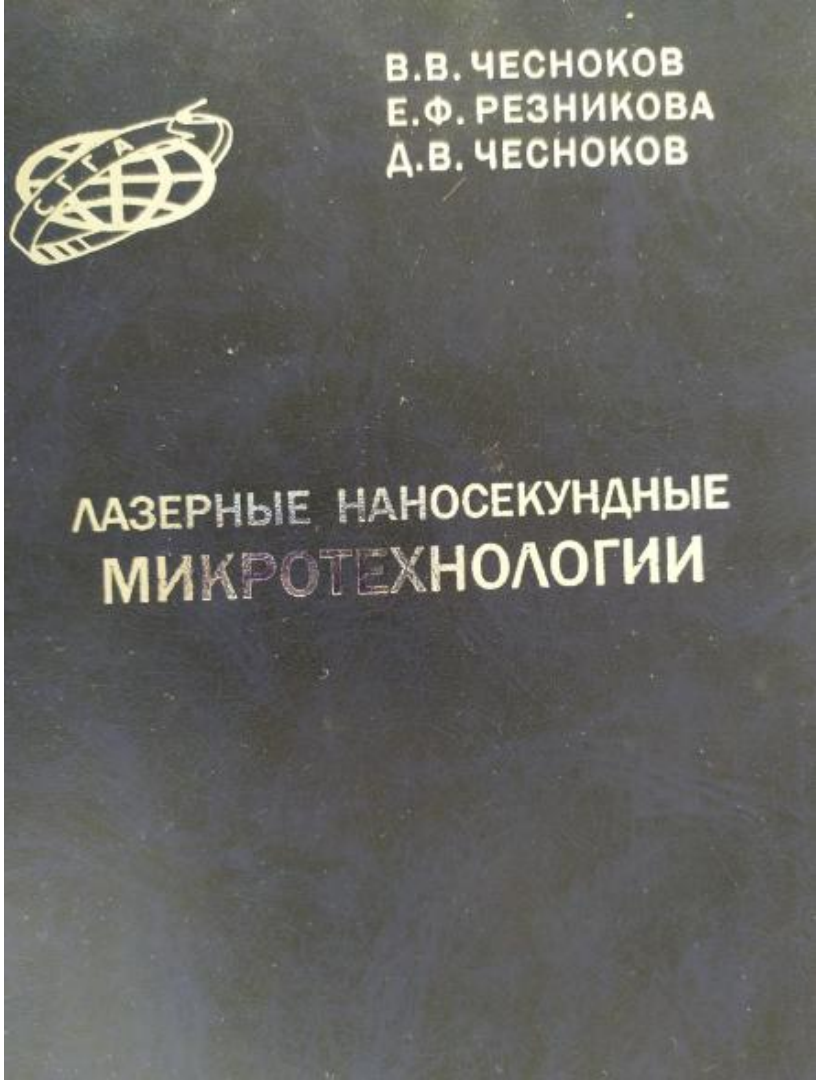
SolarPower Europe

UNIQUE SELLING PROPOSITION

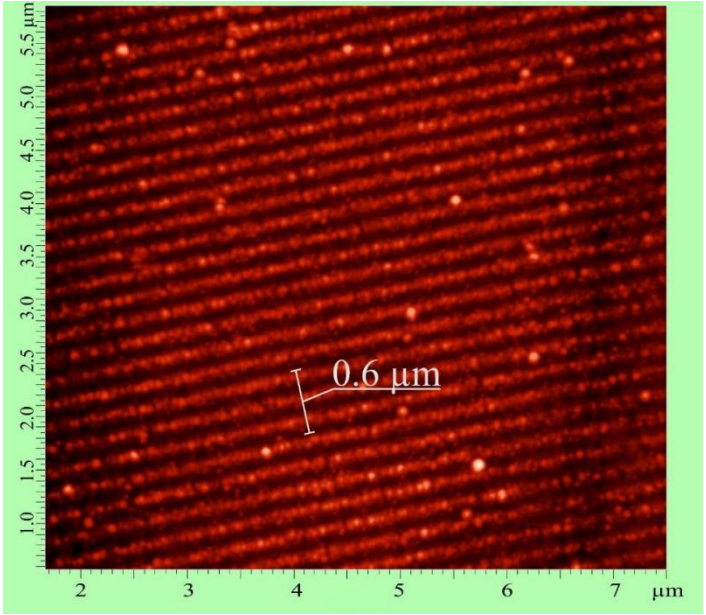
Collect twice more energy at the same costs and square

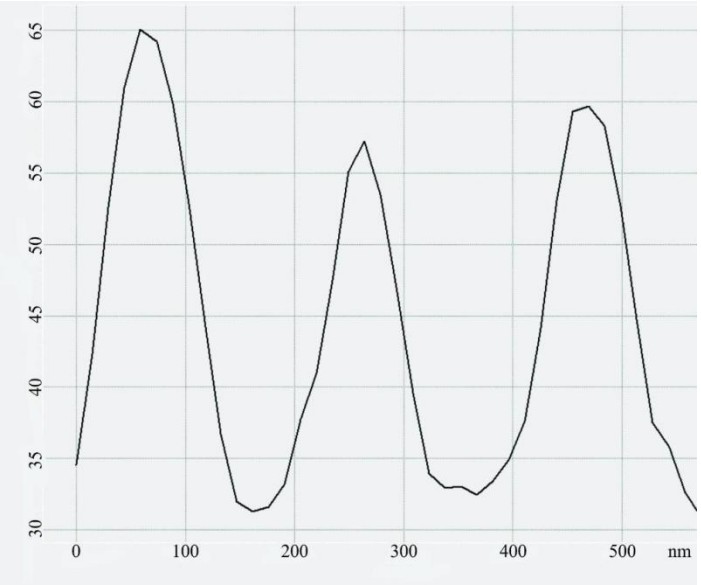
- 1. Efficiency factor better than 50%, theoretical 85%
- 2. Better than 500 Watt per square meter (Wt/m2)
- 3. Loss of efficiency factor when heating - 0

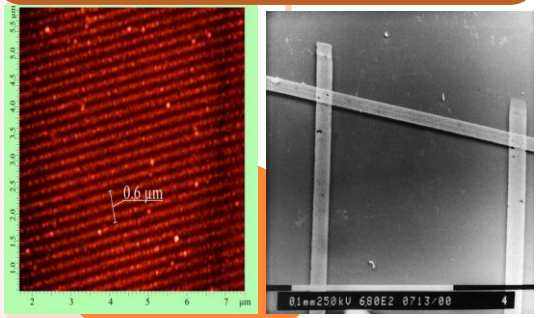
Laser nanosecond microtechnologies book, established 2003
Our CTO Dmitry Chesnokov is co-author



Laser induced periodic surface **NANO**structures
One stage LCVD process





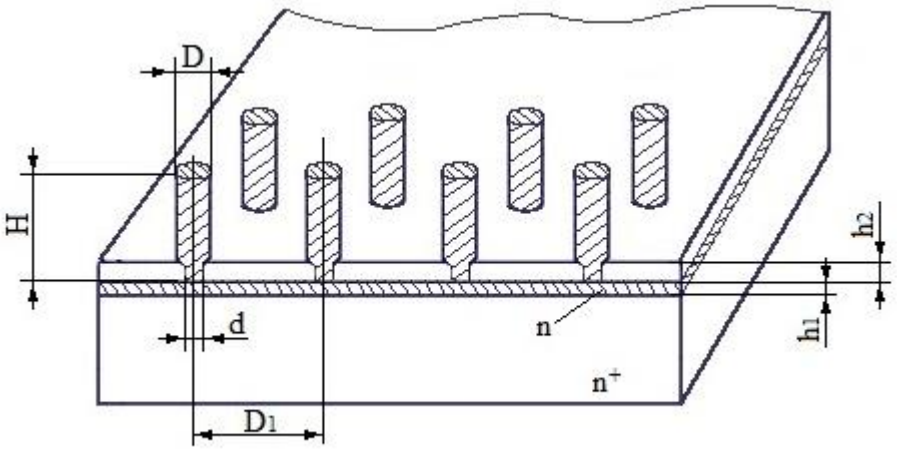
Science	R&D	Market
Interferential nanolithography for periodic nanostructures production  Laser Chemical Vapor Deposition (LCVD)	Developing of solar energy harvester production and technology equipment for LCVD	Technology equipment and license Companies that want to built in solar panel (power bank, electric car, etc.) Companies that install solar panels to customers Solar electric plants

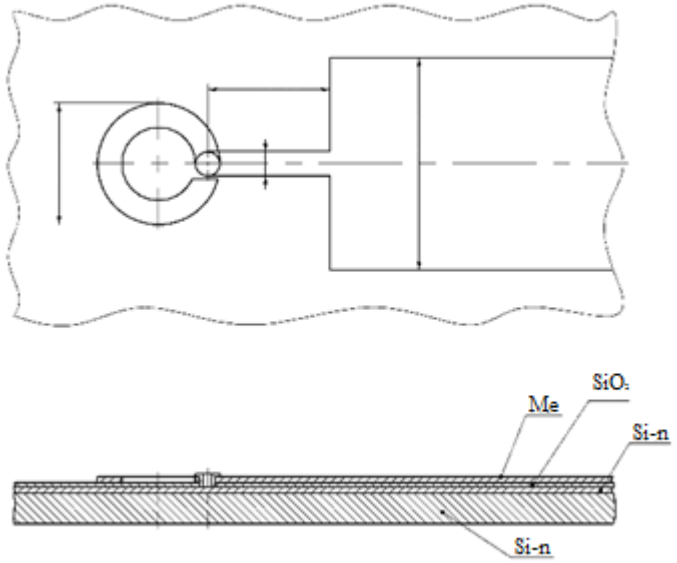
Roadmap

		Budget, USD	2020	2021	2022	2023	2024	2025
current stage	Schottky diode LCVD technology (prototype) nanoantenna LCVD technology (prototype)							
Pre-seed	optical rectenna prototype	100 000						
Seed	technology equipment development, small production, sales	3 000 000						
Round A	mass production technology global market	50 000 000						

Goal of optical rectenna prototype

Solar energy harvester element production technology at least 50 cm2.
One step process to get matrix of nanoantennas (optical rectennas)





Nurlan Usubaliev Director (CEO)	Dmitry Chesnokov Chief Designer, PhD (CTO)	Anton Pankratov USA representative
Entrepreneur with 5 year experience Engineering base education 10 years in b2b sales/marketing	Over 30 years in industry The author of 37 patents Head of 22 RnD for last 15 years	Entrepreneur with Over 10 year experience Advertising and marketing

THANKS FOR ATTENTION!

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Sono motor's vision (exapmle)

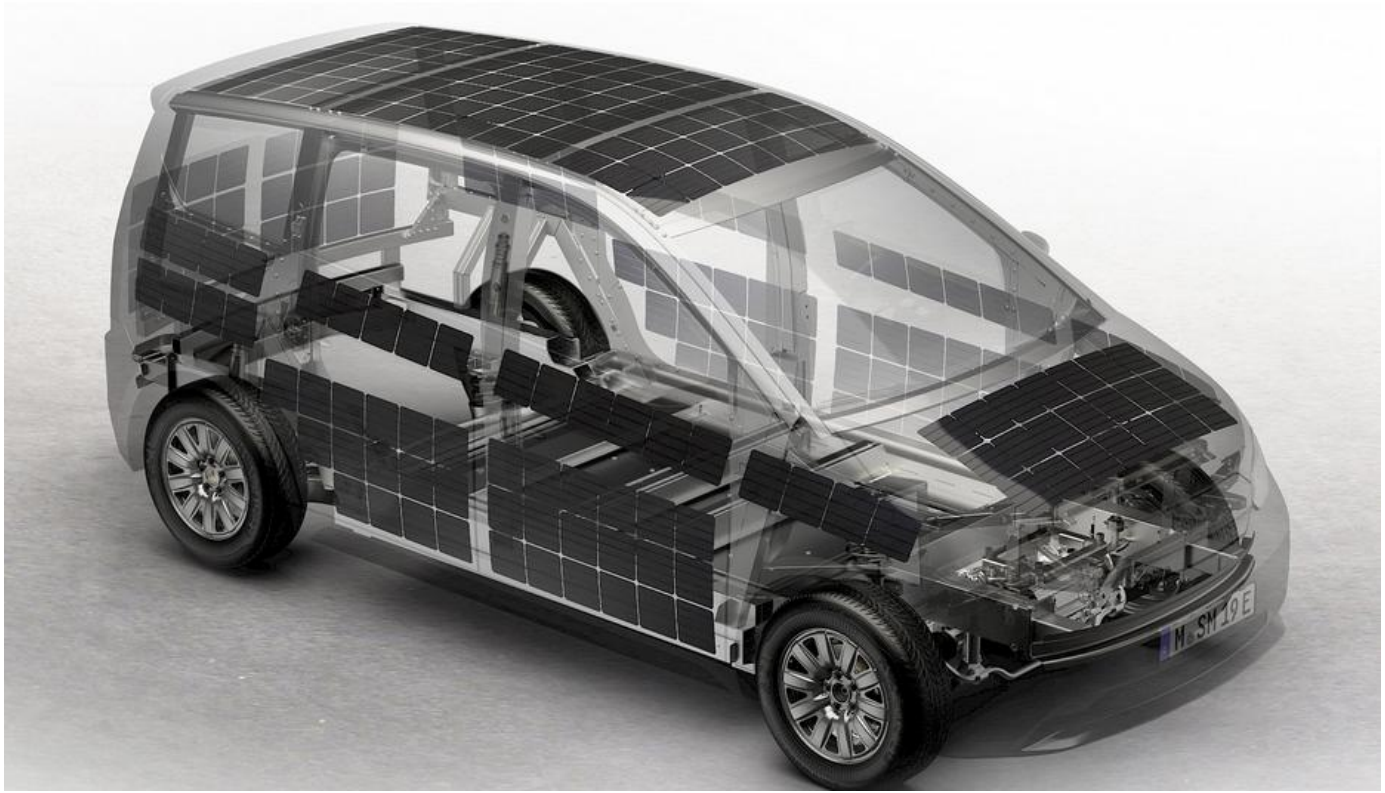

TABLE OF COMPARISON

technology	polysilicon	Monosilicon	Heterojunction	Nanoantenna
Efficiency	17%	21%	24%	better than 50%
Energy per m2	170 W/m2	200 W/m2	190 W/m2	better than 500 W/m2
Temperature Coefficient of Pmax, %/°C	-0,4	-0,36	-0,31	0
Price	X	1,4*X	2,8*X	we expect in mass production 1,4X