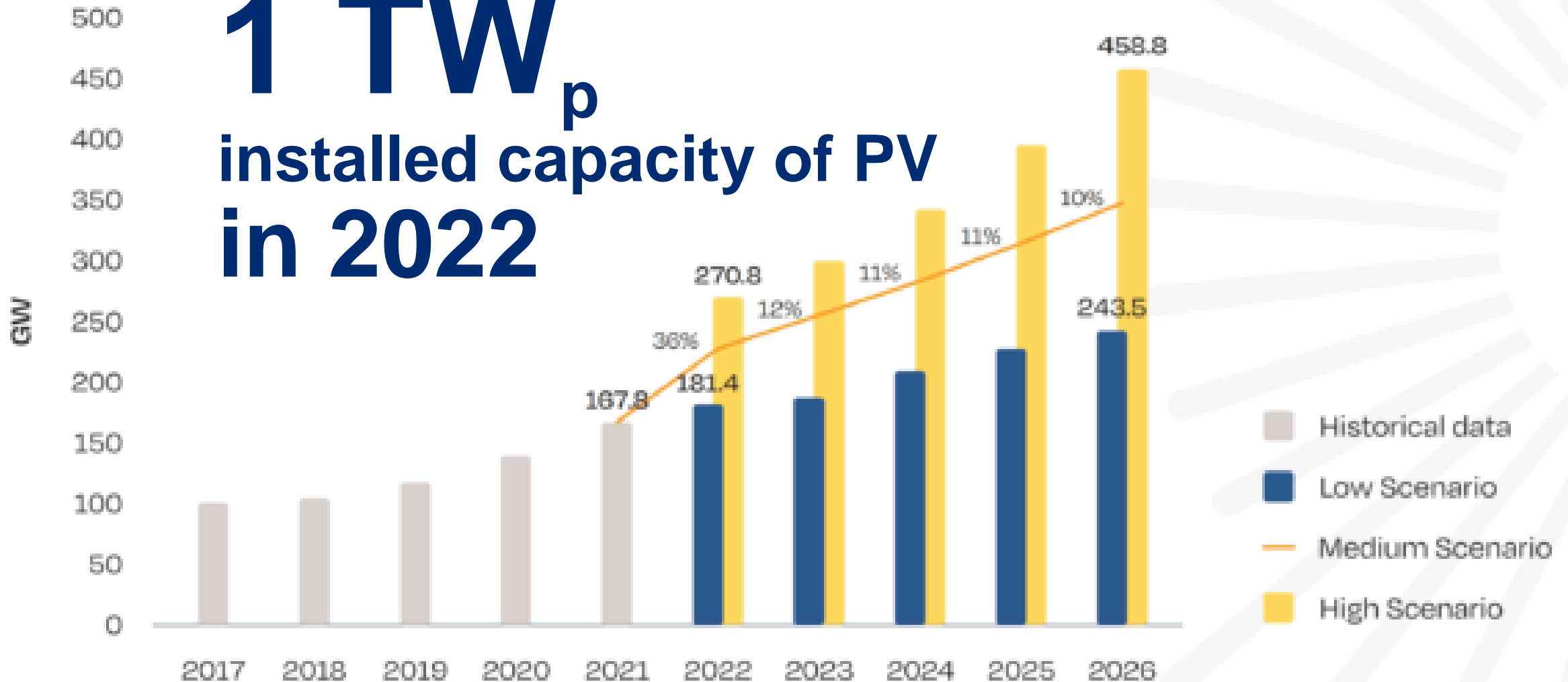


Soláry jako nový vládce elektrických trhů (souvislosti z pohledu Evropy a Česka)

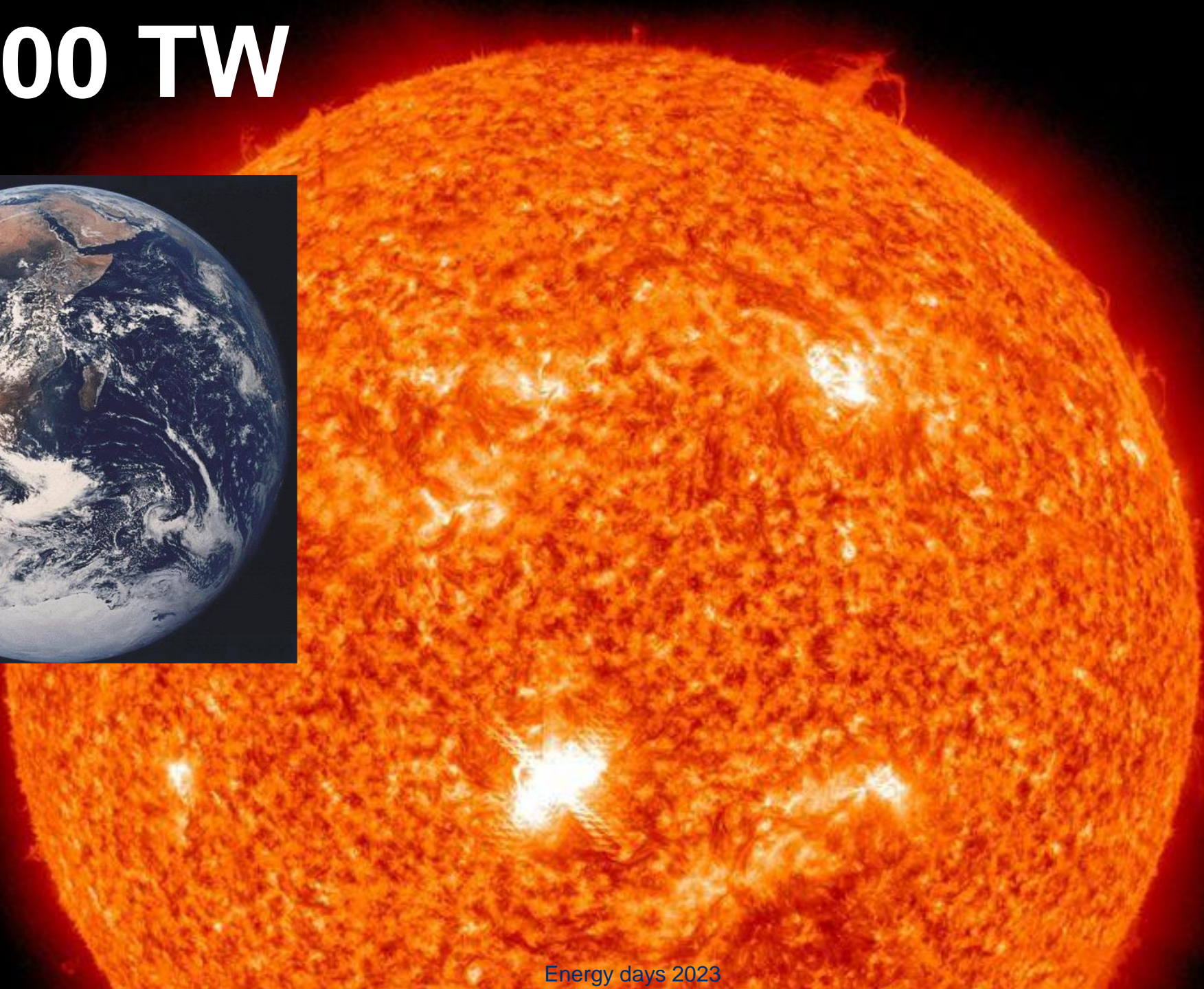
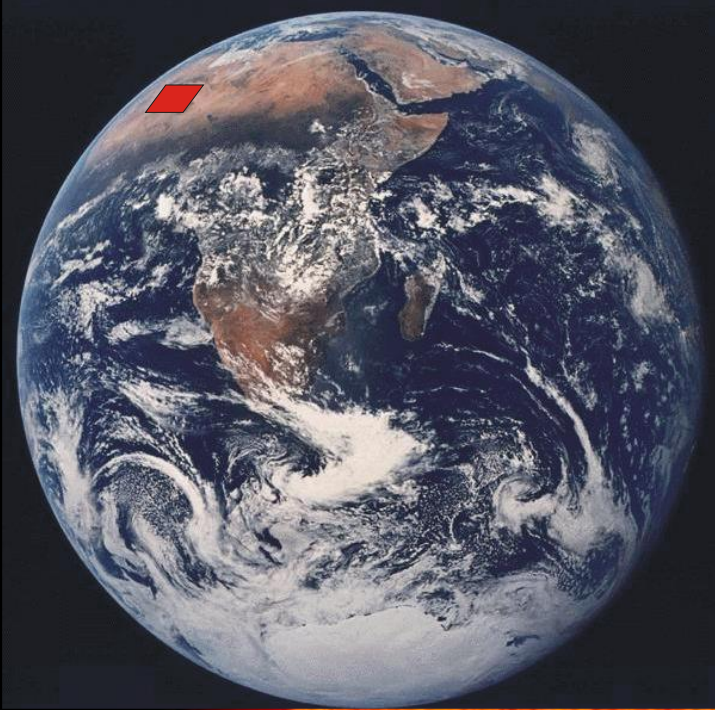
Antonín Fejfar
fejfar@fzu.cz

1 TW_p installed capacity of PV in 2022



© SOLARPPOWER EUROPE 2022

125 000 TW



Česko na „sluneční pohon“

Celkem

440 km²

6,6 mil. tun panelů

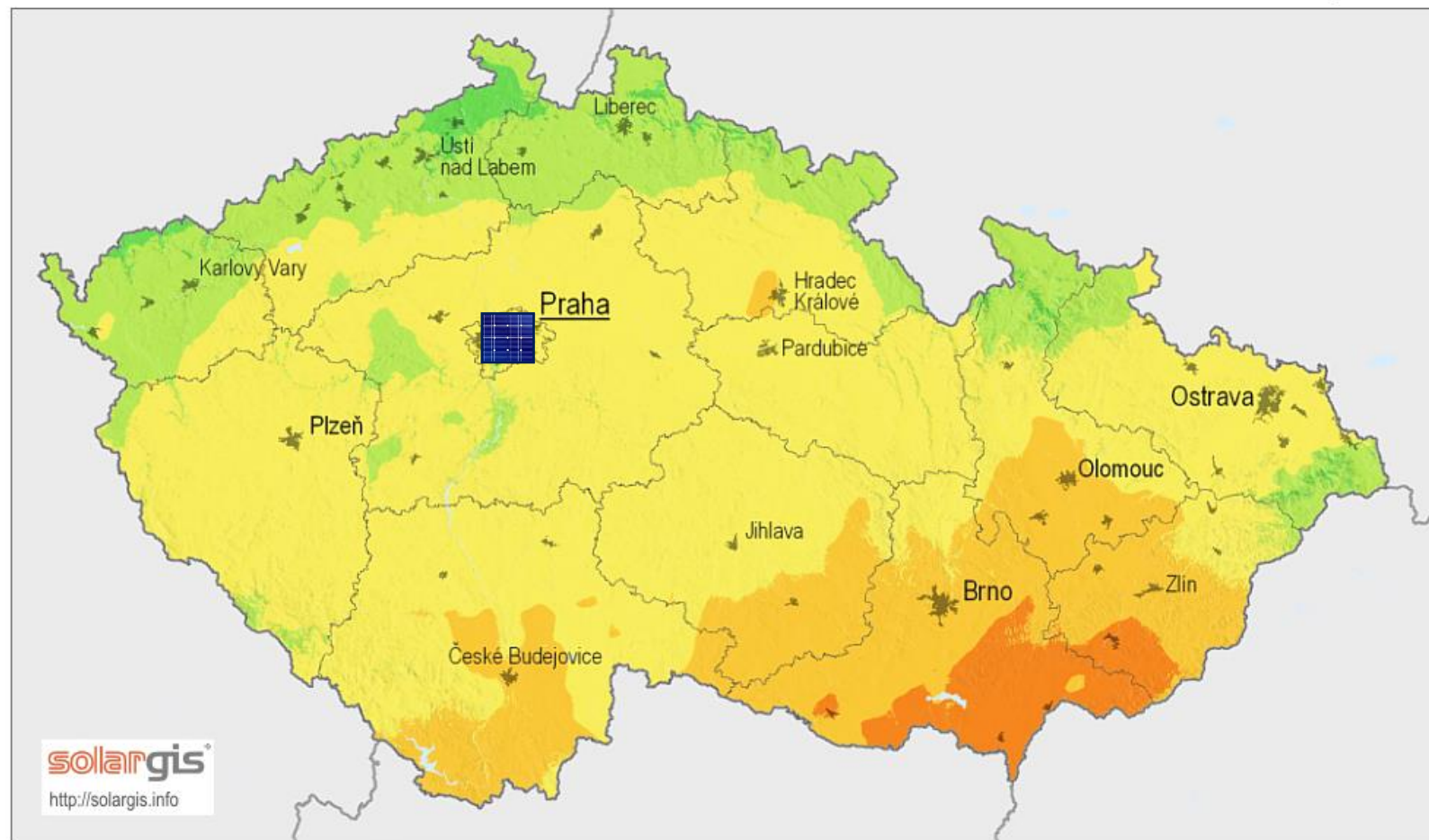
roční výměna cca

1/4 mil. tun

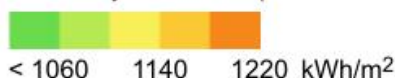
cca 400 mld. Kč

Globální horizontální záření

Česká republika



Průměrný roční úhrn (4/2004 - 3/2010)



0 25 50 km

© 2011 GeoModel Solar s.r.o.

“I see solar becoming the new king of the world’s electricity markets”

IEA Executive Director Fatih Birol



listed among The 100 Most Influential People of 2021,
Time Magazine

renewables are expected to overtake coal as the primary means of producing electricity by 2025

The combined share of solar photovoltaic (PV) and wind in global generation will rise to almost 30% in 2030 from 8% in 2019, it said, with solar PV capacity growing by an average 12% a year.

27°32'22.81"N 71°54'54.91"E



Bhadla Solar Park

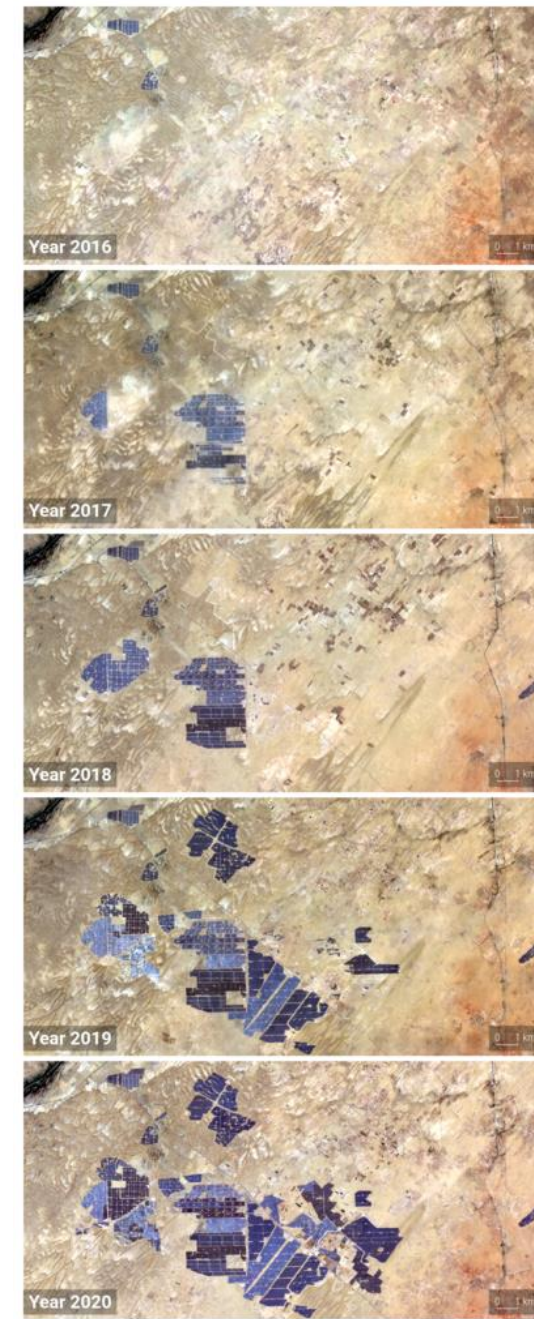
Bhadla Solar Park is the largest solar park in the world as of 2020, and is spread over a total area of 5,700 hectares (14,000 acres) in Bhadla, Phalodi tehsil, Jodhpur district, Rajasthan, India.^[1]

The park has a total capacity of 2245 MW.^[1] The park had witnessed the lowest bid for solar power in India as of December 2020 at ₹2.44 (3.2¢ US) per kilowatt-hour.^{[4][5]}

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

Contains modified Copernicus Sentinel data 2020

Bhadla Solar Park: Photovoltaic power plants cluster development near Bhadla (Rajasthan, India). Satellite imagery source: Copernicus Sentinel Hub, Sentinel-2, True color a) 2016-05-21, L1C product, b) 2017-05-26, L2A product, c) 2018-07-10, L2A product, d) 2019-05-06, L2A product, e) 2020-05-10, L2A product Composed by Solargis, Rendered in QGIS.



Photovoltaic power plants cluster development near Bhadla, Rajasthan, India.
Satellite image source: Copernicus Sentinel Hub, Sentinel-2, True color
a) 2016-05-21, L1C product, b) 2017-05-26, L2A product, c) 2018-07-10, L2A product,
d) 2019-05-06, L2A product, e) 2020-05-10, L2A product
Composed by Solargis, Rendered by QGIS.

Začátky

Karl Benz, 1885



Inventor Karl Benz seated on the 1885 Benz Motorwagen, a three-wheeler called Benz Patent Motorcar. The first patent (DRP No. 37435) for a gas-fueled car on January 29, 1886

Chapin, Pearson, Fuller, Bell Labs 1954



O 65 roků později

1950

a monocoque streamlined 6-seat fastback saloon body with a drag coefficient (Cd) of just 0.32.



In 2010, in the UK, Tatra T87 had been selected by public vote in the 'Classic Car of the Year' competition as the winner of the 1940s category.

2019

635 GWp solar installed = 3 000 km² , providing 3 % of electricity in the EU



O dalších 70 let později

2020

na světě jezdí 1,400,000,000 aut = 10 tis. km²



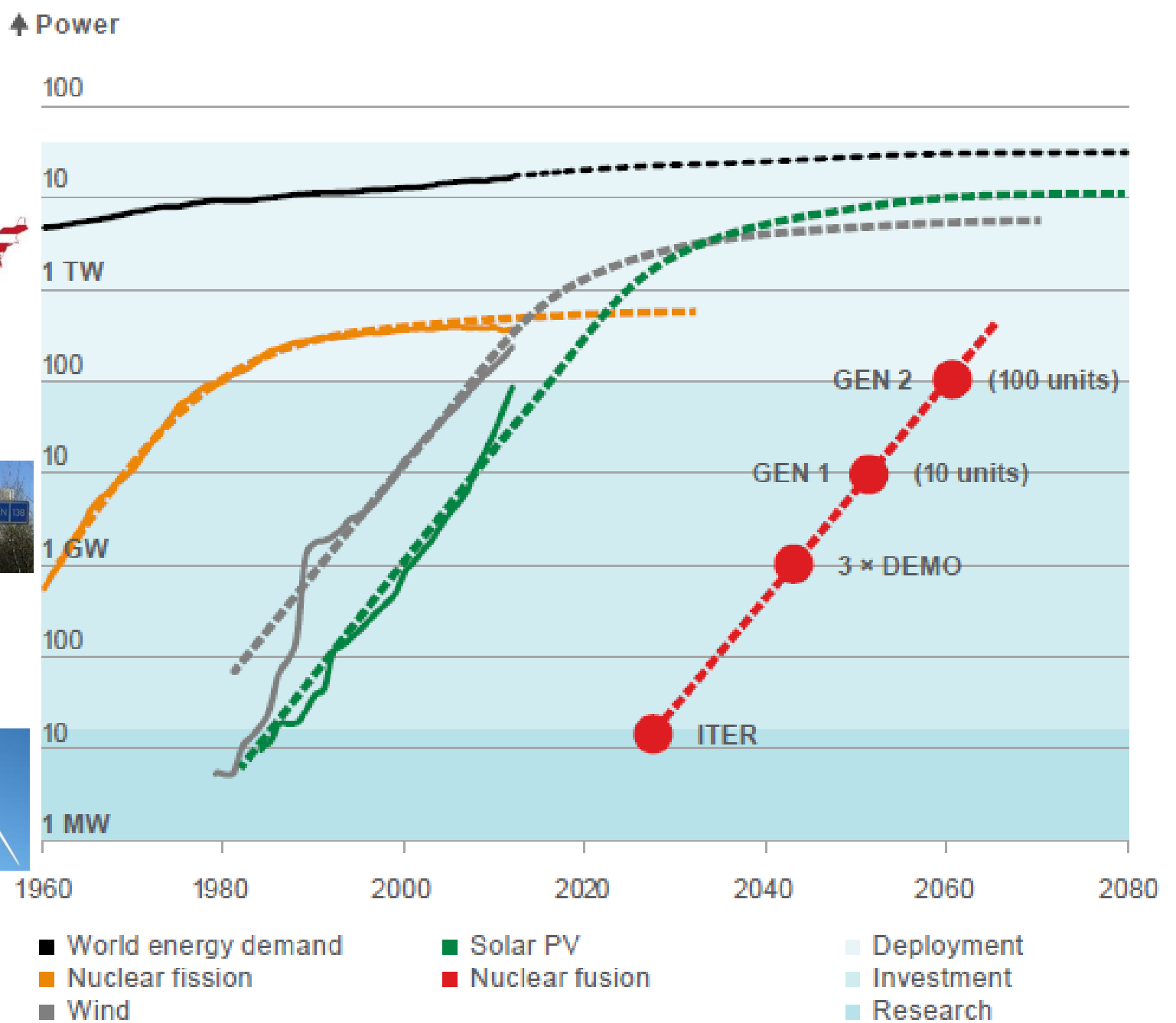
2089



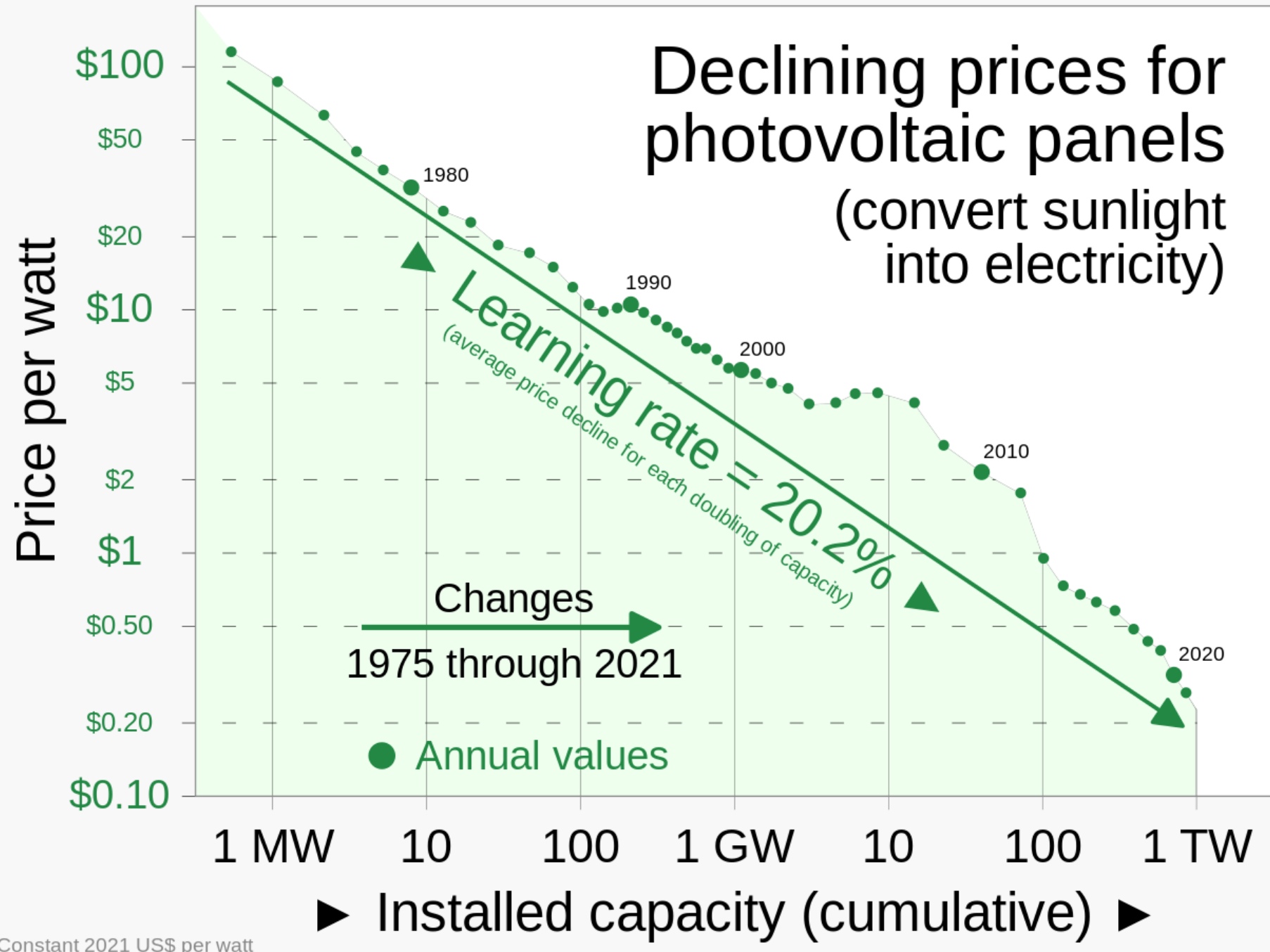
Nástup energetických zdrojů

modely - - - - -
 skutečnost - - - - -
 (podle OECD a IEA).

Why we have solar panels but no nuclear fusion power) by Niek Lopes Cardozo, Guido Lange and Gert Jan Kramer (NTvN 83, October 2017, page 350-354

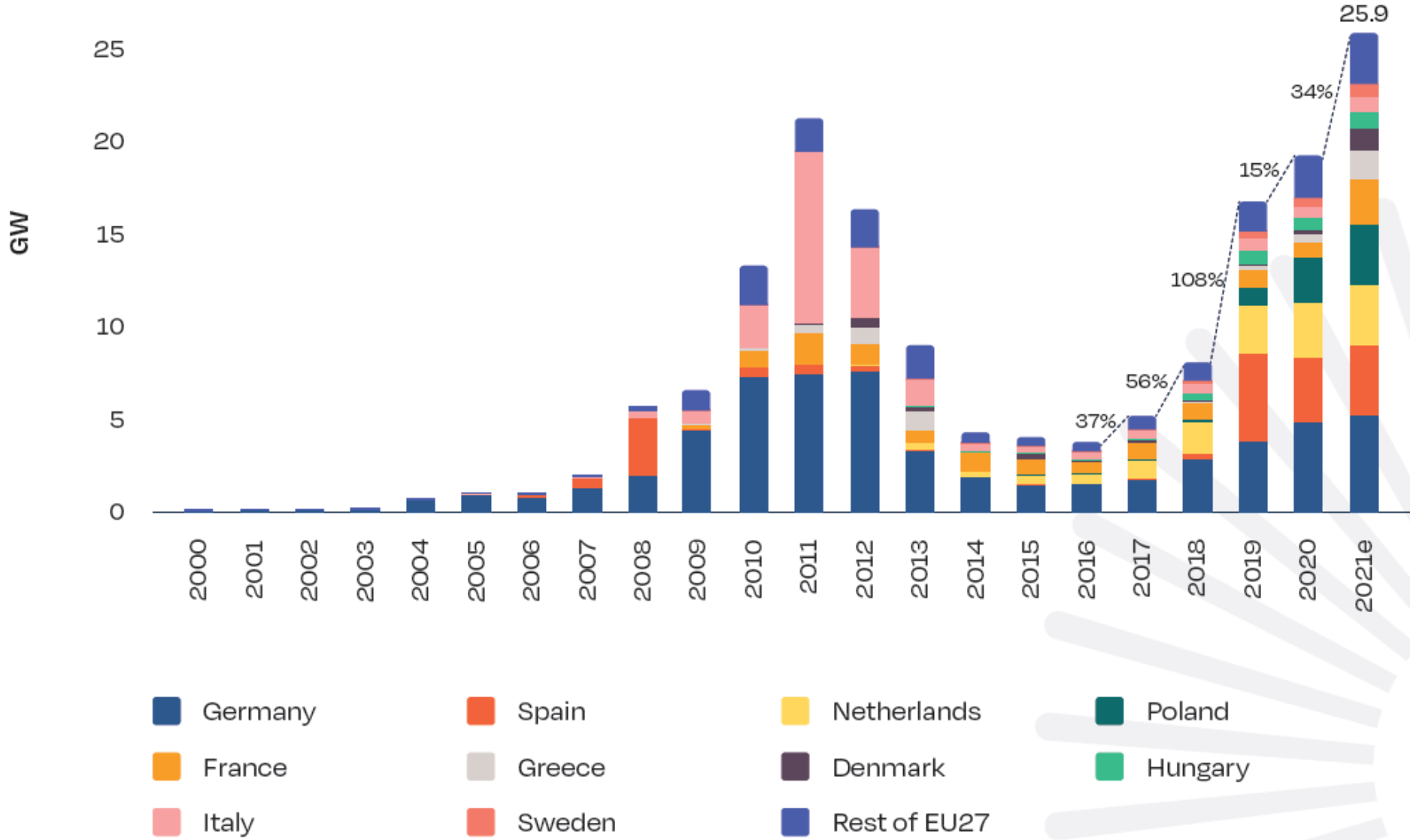


Swansonův zákon



Constant 2021 US\$ per watt

EU27 ANNUAL SOLAR PV INSTALLED CAPACITY 2000-2021



“RePower EU”:
 >420 GW of
 new solar
 generation
 capacity, this
 decade.

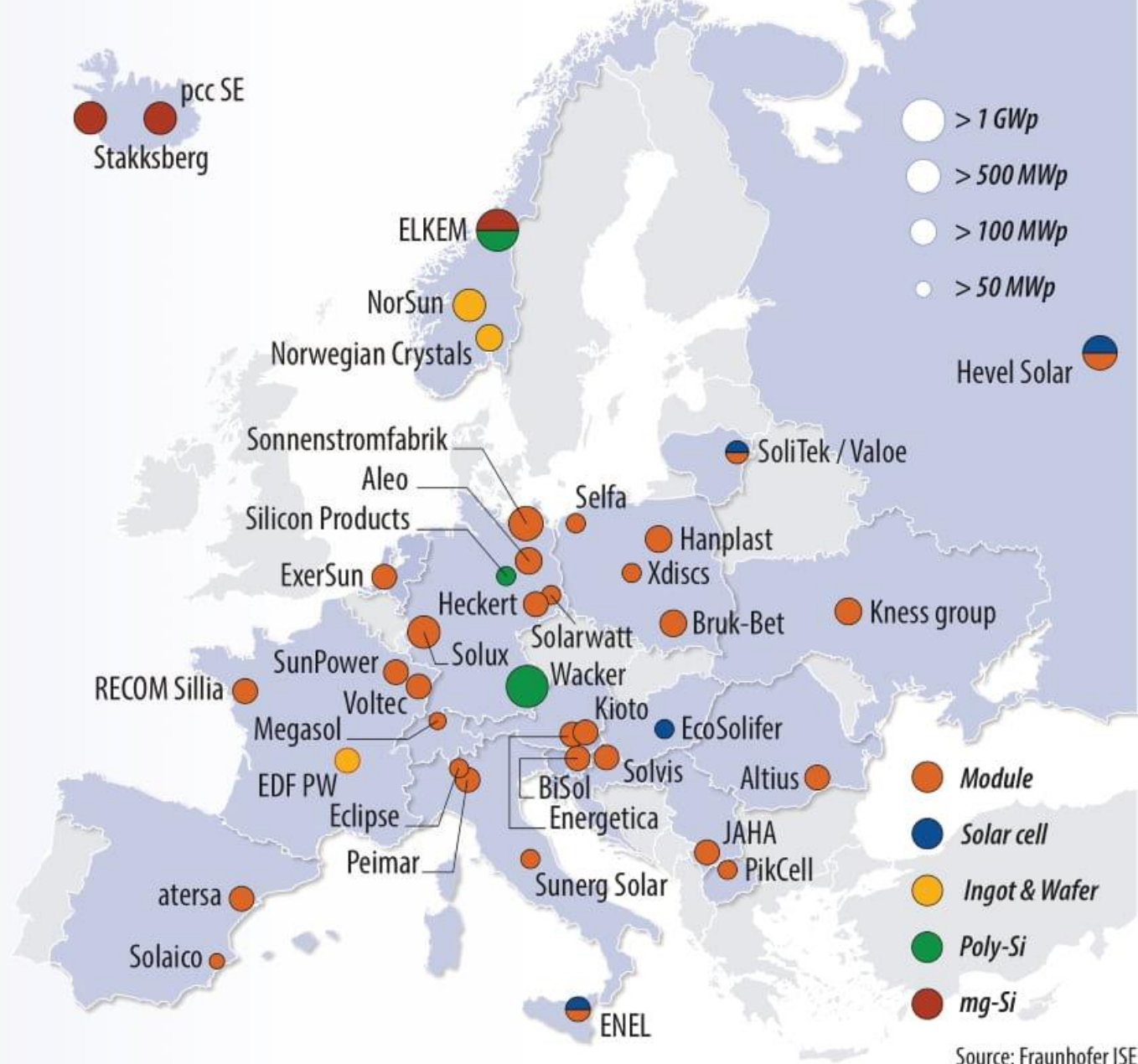
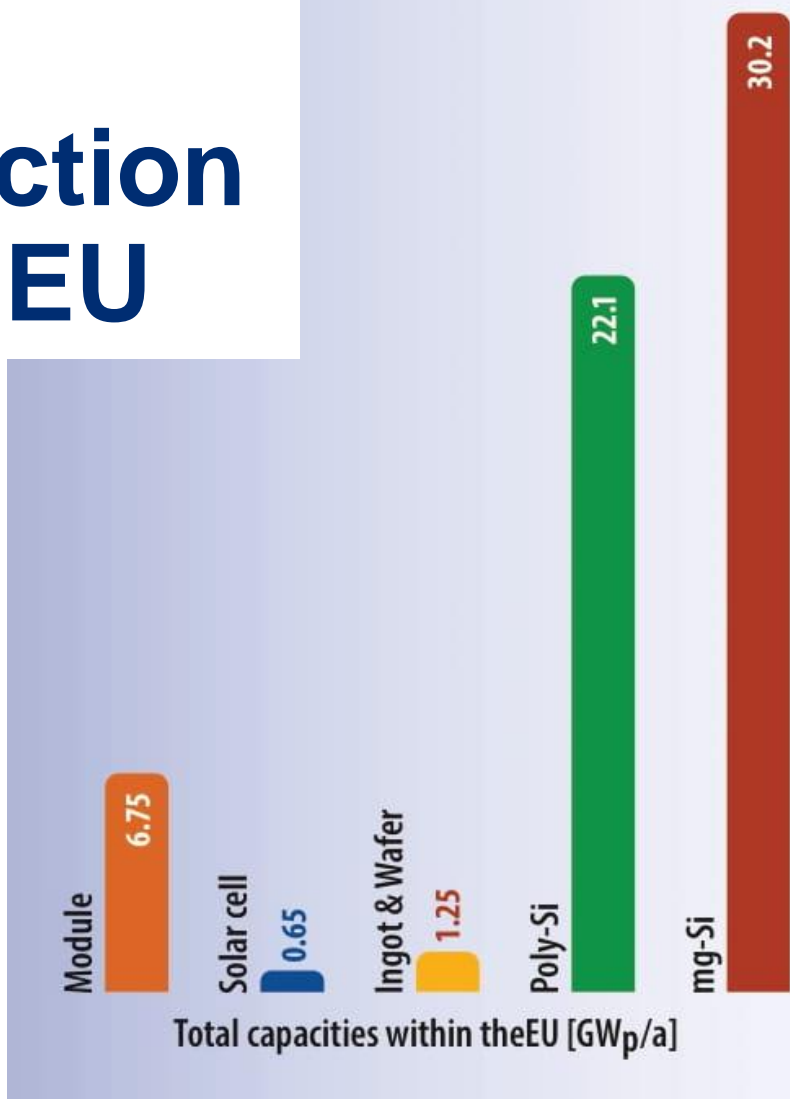
J. Christiansen, EU Market Outlook for Solar Power, (2021) 68.

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Current European c-Si PV manufacturing landscape

Status Quo, end of 2020

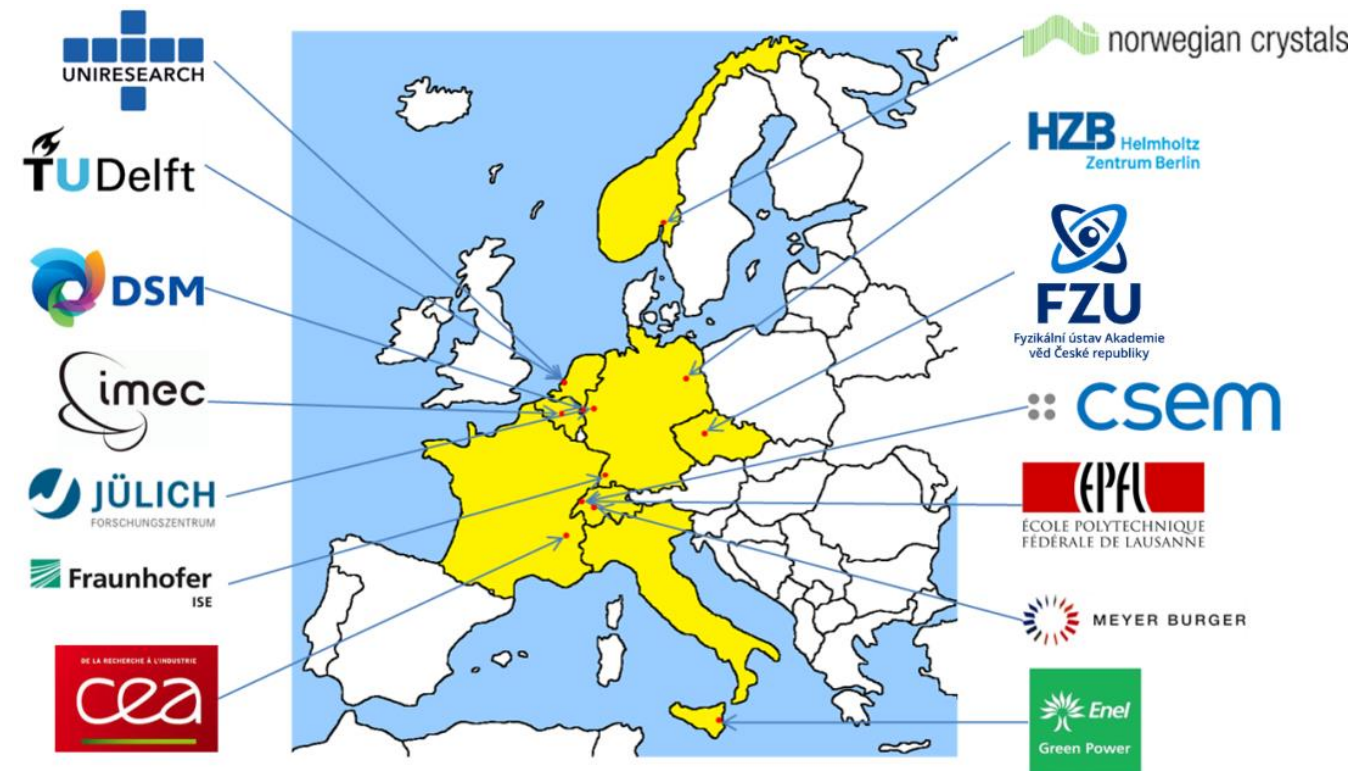
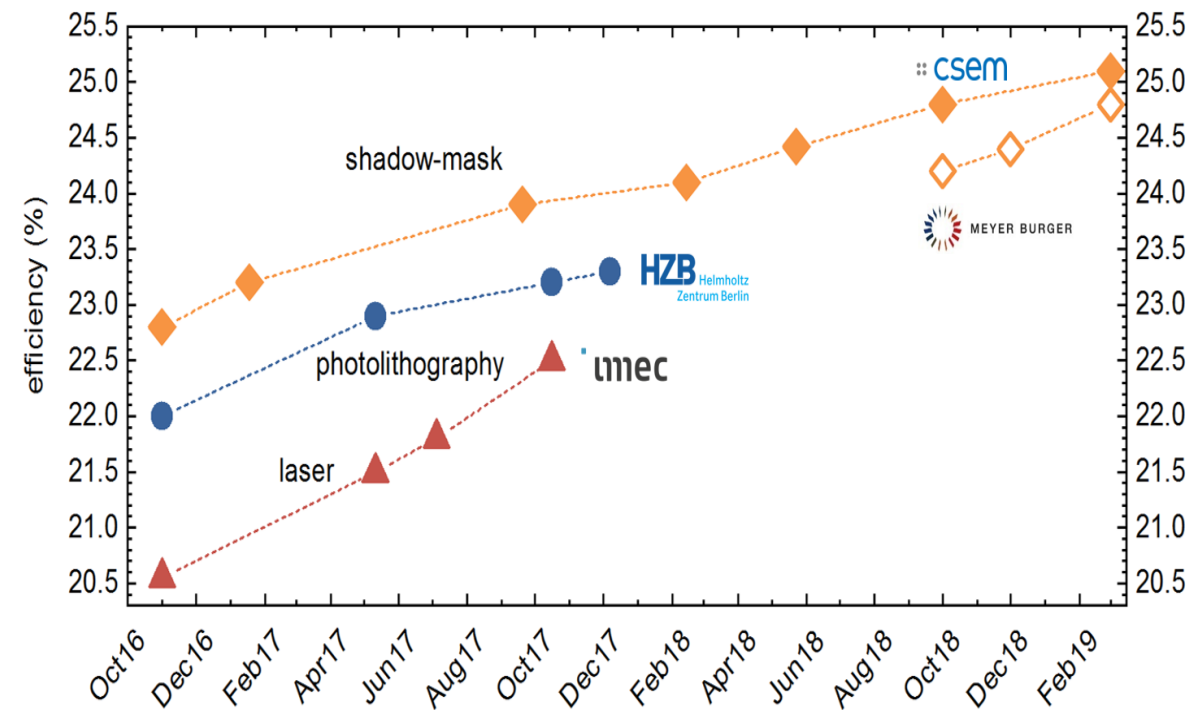
PV production in the EU



Source: Fraunhofer ISE

<https://www.pv-magazine.com/2022/03/12/the-weekend-read-eu-solar-manufacturing-the-time-is-now/>

H2020 project NextBase ended in September 2019



Follow-up on the H2020 NextBase project

1) The European Commission has included the NextBase project among its Success Stories:

Mass-produced European solar panels on the horizon

https://ec.europa.eu/research/infocentre/article_en.cfm?artid=52665

2) Enel Green Power inaugurates new HJT production line at 3SUN factory, Italy

<https://www.enelgreenpower.com/media/press/2019/10/enel-green-power-inaugurates-new-hjt-production-line-at-3sun-factory>

3) June 2020: Meyer Burger moves to become a solar cell and module manufacturer

<https://www.pv-magazine.com/2020/06/19/meyer-burgers-wants-to-become-a-solar-cell-and-module-manufacturer/>

4) March 2021: Meyer Burger to start PV cell, module production in May 2021 at Freiberg and Bitterfeld Wolfen, Germany

<https://www.pv-magazine.com/2021/03/12/meyer-burger-to-start-pv-cell-module-production-in-may/>



MEYER BURGER



HORIZON EUROPE PROGRAMME

TOPIC HORIZON-CL5-2021-D3-03-13

Demonstration pilot lines for alternative innovative PV technologies



Funded by the
European Union



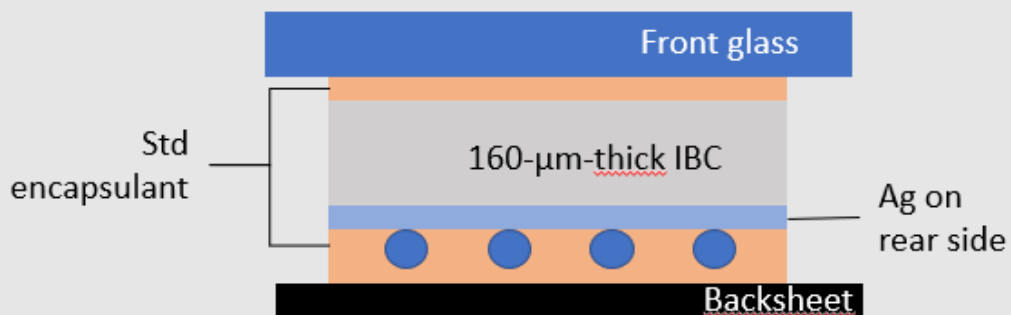
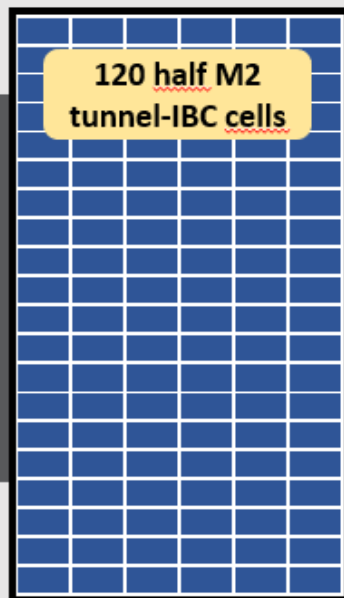
PILATUS

No	Full name partner	Short name	GA Member	GA Deputy
1	Uniresearch	UNR	Anna Molinari	Piter Miedema
2	Meyer Burger (Germany) GmbH	MBG	Andreas Waltinger	Kenny Kluger
3	Meyer Burger (Industries)	MBI	Jochen Fritsche	
4a	Fraunhofer CSP	FHG	Christian Hagendorf	Marko Turek
4b	Fraunhofer ISE	FHG	Paul Gebhardt	
5	FZU	FZU	Martin Ledinsky	Antonin Fejfar
6	EURAC	EURAC	Atse Louwen	David Moser
7	EXATEQ	EXATEQ	Gerry Knoch	
8	TNO	TNO	Martin Späth	Bonna Newman
9	Norwegian Crystal	NCR	Øyvind Østrem	Matthias Peschke
10	Uni Liège	ULIEGE	Angélique Léonard	Sabela Teixeira Taboada
11	Padanaplast	PADA	Antonello Casale	Caterina Bocchia
12	ISRA	ISRA	Klaus Veit	Christopher Berge
13	CSEM	CSEM	Gizem Nogay	Bertrand Paviet-Salomon
14	MBCH	MBCH	Rainer Grischke	



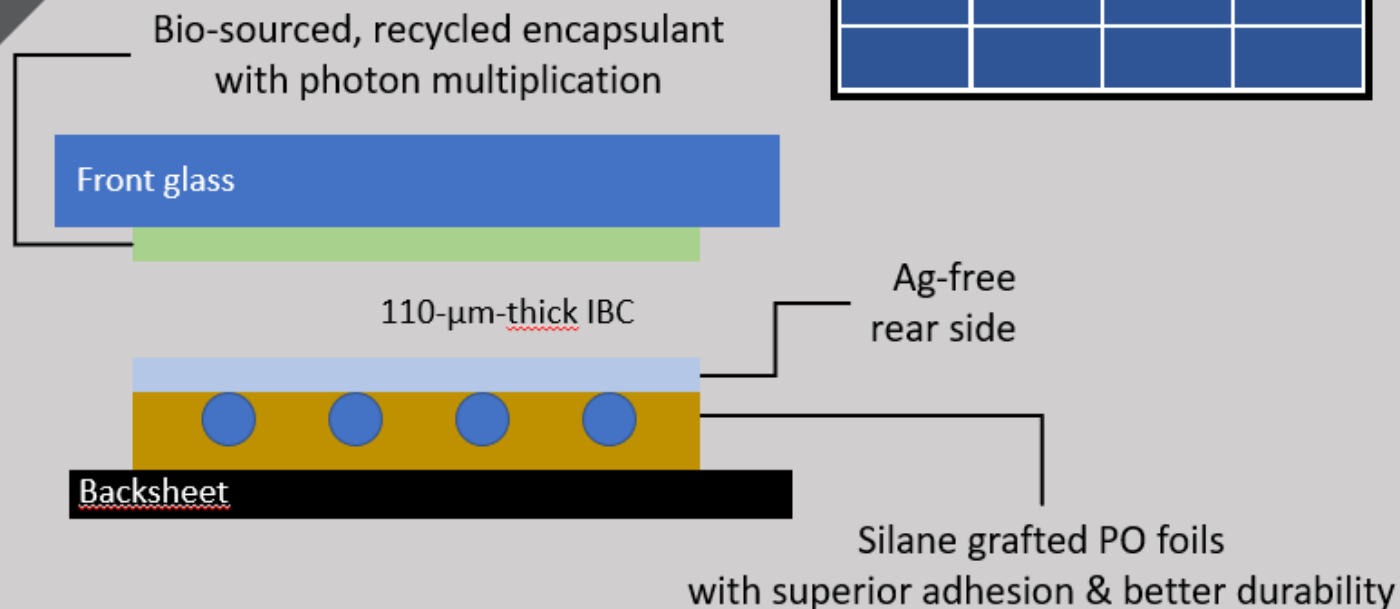
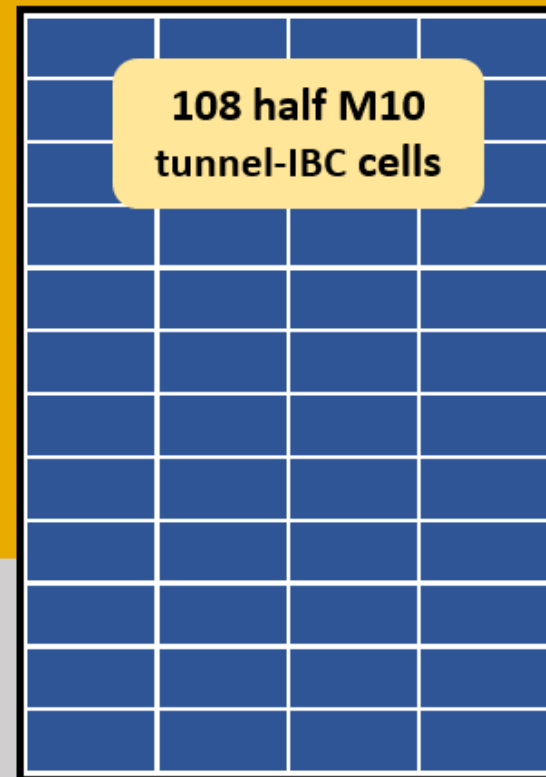
Current status

- Cell spacing: 1.5 mm
- Wafer thickness: 160 μm
- 25-year lifetime
- P_{max} : 350 W

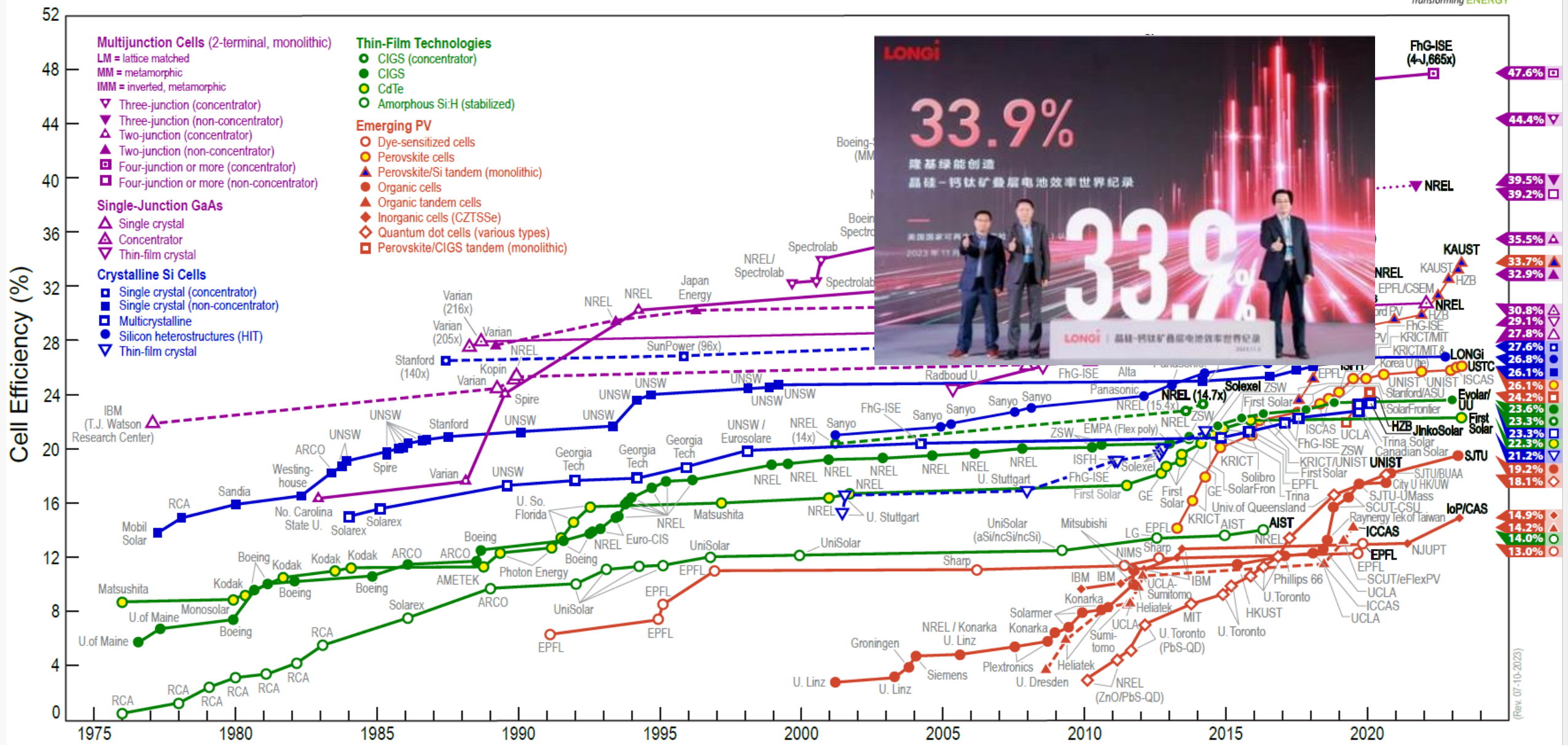


PILATUS innovation

- Cell spacing reduced
- Reduction of string & edge spacing
- Wafer thickness reduced to 110 μm
- 40-year lifetime
- P_{max} : 450+ W
- Unique / secured data



Best Research-Cell Efficiencies



(Rev. 07-10-2023)

STRATEGIE AV21

Špičkový výzkum ve veřejném zájmu

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Dr. Martin Hermle, Fraunhofer-Institut für Solare Energiesysteme ISE

Alfred Hicks, National Renewable Energy Laboratory, NREL

Dr. Greg Smestad, Sol Ideas Technology Development, San Jose, California, USA

Jutta Trube, Int'l Technology Roadmap for Photovoltaics (ITRPV) 8th ed.



Děkuji za pozornost

