





Vision for PV - Role of European R&D&I

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Strategic Energy Technology Plan

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Steering Committee



ETIP PV SC meeting – Sep. 10, 2018 – ISFH, Hameln

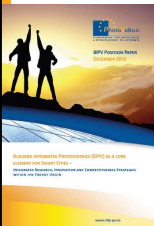
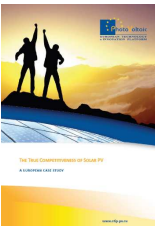
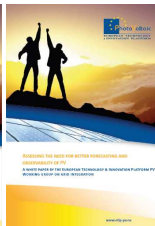



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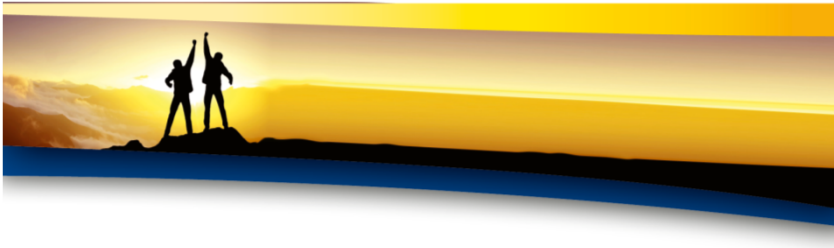
ETIP PV publications (2016 – 2018)

- Building Integrated Photovoltaics as a core element for Smart Cities (Dec 2016)
- The true competitiveness of solar PV. A European case study (March 2017)
- Assessing the need for better forecasting and observability of PV (April 2017)
- Supporting the Development of the European PV Industry and Markets through Enhanced Quality (Aug 2017)
- PV manufacturing in Europe: Conference report 18-19 May 2017 (Nov 2017)
- PV Quality and Economy (Sep 2018)

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 **ETIP PV Vision for PV**



Photovoltaic Solar Energy: Big and Beyond
Sustainable energy to reach the 1.5 degrees climate target

Vision and claims of the
European Technology and Innovation Platform for Photovoltaics (ETIP PV)

Released on 3 Dec 2018

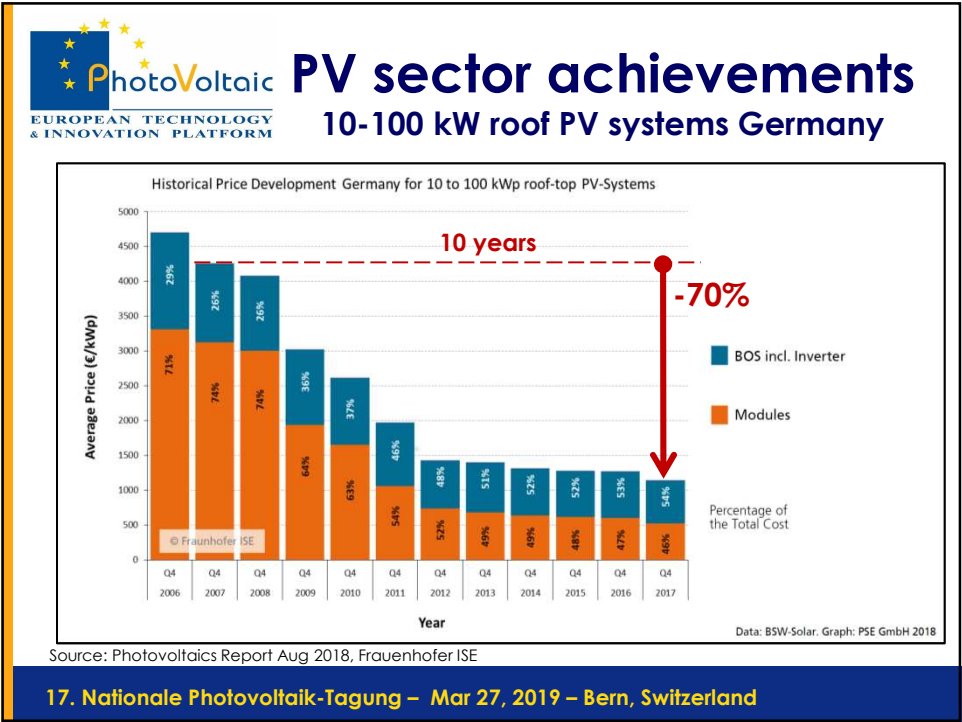
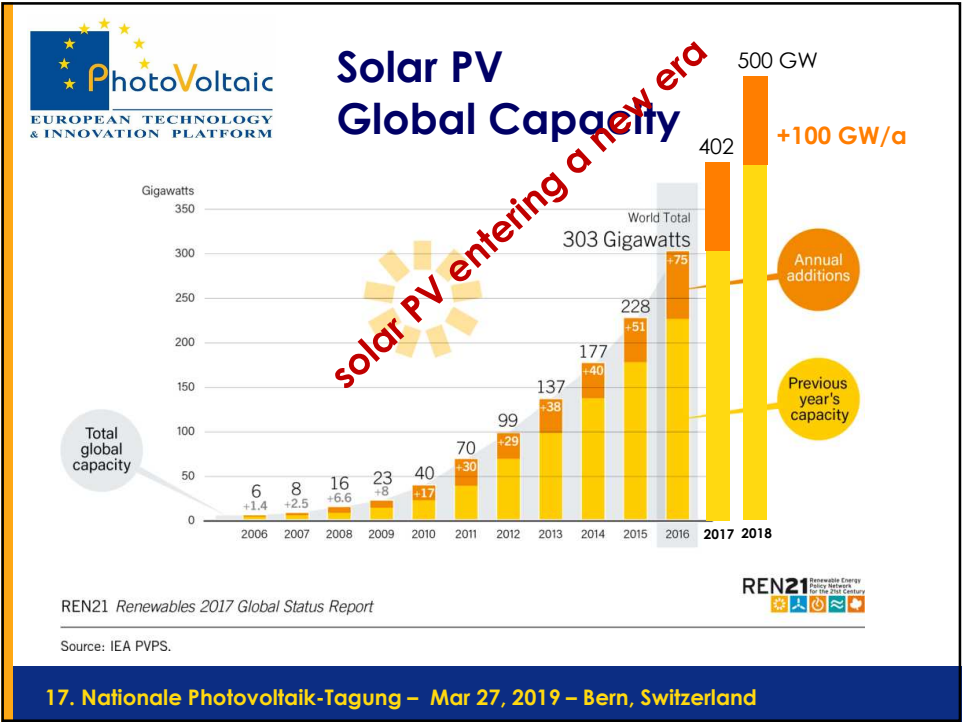
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 **We are with Greta!**



„There is no Planet B“ – eine Schülerin bei der Demonstration mit ihrem Plakat
Foto: Julian Stratenschulte / dpa

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Quo vadis PV

- New efficiency records
- New low-price records
- 2017 39% of all added global electricity generating capacity from PV (70% RES-E)
- 2018 global cumulative power 0,5 TW
- 2022e global cumulative power 1 TW
- 2028e global annual production 1 TW

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Scary times


- Global Climate Change, increase of CO₂ emissions continues

COP21 target (1,5 – 2 °C)

- Net zero CO₂ emissions in mid-2050s
- Massive CO₂ removal from the ecosystem afterwards

J. Rogelj et al. Scenarios towards limiting global mean temperature increase below 1.5 °C, *Nature Climate Change* 8 (2018) 325–332.

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100% Renewables

Recent electricity studies have highlighted the importance of **Solar PV** to achieve the goal of 100% renewables in a cost-effective and sustainable way

M. Ram, D. Bogdanov, A. Aghahosseini, A.S. Oyewo, A. Gulagi, M. Child, H-J. Fell, C. Breyer; Global Energy System based on 100% Renewable Energy - Power Sector (2017); Lappeenranta University of Technology, Lappeenranta, Finland, <https://bit.ly/2hU4Bn9>

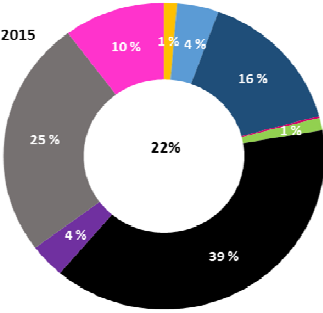
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Electricity Generation in 2015 and 2050

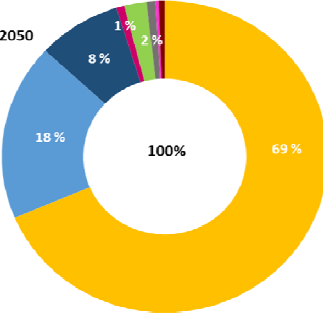
C. Breyer, EU Sustainable Energy Week, Brussels, June 7, 2018

2015



| Source | Percentage |
|---------------|------------|
| Fossil Coal | 39% |
| Nuclear | 10% |
| Fossil Gas | 25% |
| Wind | 4% |
| Hydro | 16% |
| Biomass/Waste | 1% |
| Geothermal | 1% |
| Solar PV | 1% |

2050



| Source | Percentage |
|---------------|------------|
| Solar PV | 69% |
| Wind | 18% |
| Hydro | 8% |
| Fossil Coal | 1% |
| Fossil Gas | 1% |
| Fossil Oil | 1% |
| Nuclear | 1% |
| Biomass/Waste | 1% |
| Geothermal | 1% |
| Others | 2% |

- Solar PV
- Wind
- Hydro
- Geothermal
- Biomass/Waste
- Fossil Coal
- Fossil Oil
- Fossil Gas
- Nuclear
- Others

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Vision for PV

“Big and Beyond”

Photovoltaics provides key building block of future energy supply in order to deliver on Paris Agreement

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Vision for PV

- Photovoltaic Solar electricity has recently become **the lowest cost renewable energy**
- PV allows to **significantly decrease GHG emissions** in the electricity sector and
- PV supports a **socially acceptable energy transition**
- PV needs to be **deployed massively in the EU, and manufacturing and installation capacity need to grow accordingly** in order to limit EU's dependence on energy import and PV import.

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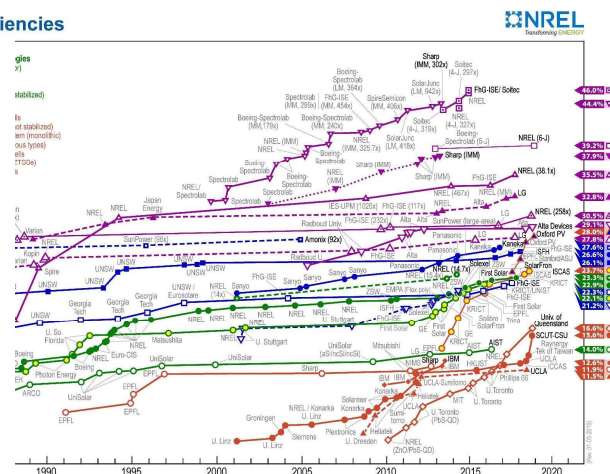
Quo vadis R&D&I

Best Research-Cell Efficiencies

csem

EPFL
ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

Empa



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Quo vadis R&D&I

In PV technology

- Si - ITRPV report 2019
- TF PV & ST PV

- PK/Si
- PK/CIGS
- PK/PK







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R&D&I topics

Technological innovations (i)

- across the whole value chain incl. reliability and bankability
- iPV – integrated PV – innovative PV
 - BAPV, BIPV
 - Urban- and Environment-integrated PV (agroPV, floatingPV)
 - IoT- and Vehicle-integrated PV
 - all limited to **market niches for end-products**

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R&D&I topics

Technological innovations (ii)

- Off-grid / Micro-grid / PV + Storage
- Intelligent Power Control / Smart Grid
- Cyber-Security
- P2X (power to heat, fuels, chemicals and materials)
- R&D is more interdisciplinary then ever

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R&D&I topics

Non-Technological innovations

- New business models
- Blockchain (e.g. SunContract)

en
way



SSNC SBTC \$ETH #Crypto #SunContract



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Annual conference of the European Technology & Innovation Platform for PV


READYING FOR THE TW ERA

28 May 2019
• BIP, Rue Royale 2-4, 1000 Brussels, Belgium •




"Make earth cool again!"

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**The PV era
is just getting started ...**

- Energy
- Ecology
- Society



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