



eni Research and Technological Innovation

An overview – October 2016

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PVT

4

3D X-ray

3

5

Production
Flow Assurance

3D Room

2

Galileo
Meeting Room

1

EST
Green Diesel

6

R&D center - Bolgiano

TopTennis

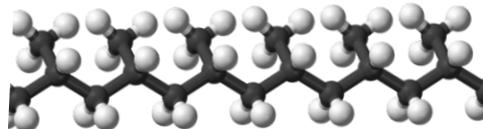
Campo Sportivo
Comunale 'GPSque
2



ANGEWANDTE CHEMIE
HERAUSGEGEBEN VON DER GESELLSCHAFT DEUTSCHER CHEMIKER
76. Jahrgang / Nr. 18, 1964 / Seite 763-772
FORTSETZUNG DER ZEITSCHRIFT „DIE CHEMIE“ - VERLAG CHEMIE - GMBH - WEINHEIM/BERGSTRASSE
SONDERDRUCK

Stereospezifische Homopolymerisation des Cyclopentens [*]

VON PROF. DR. G. NATTA, PRIV.-DOZ. DR. G. DALL'ASTA UND PROF. DR. G. MAZZANTI
ISTITUTO DI CHIMICA INDUSTRIALE, POLITECNICO, MILANO, UND
ISTITUTO DI RICERCA BASE G. DONEGANI, SOC. MONTECATINI, MILANO (ITALIEN)

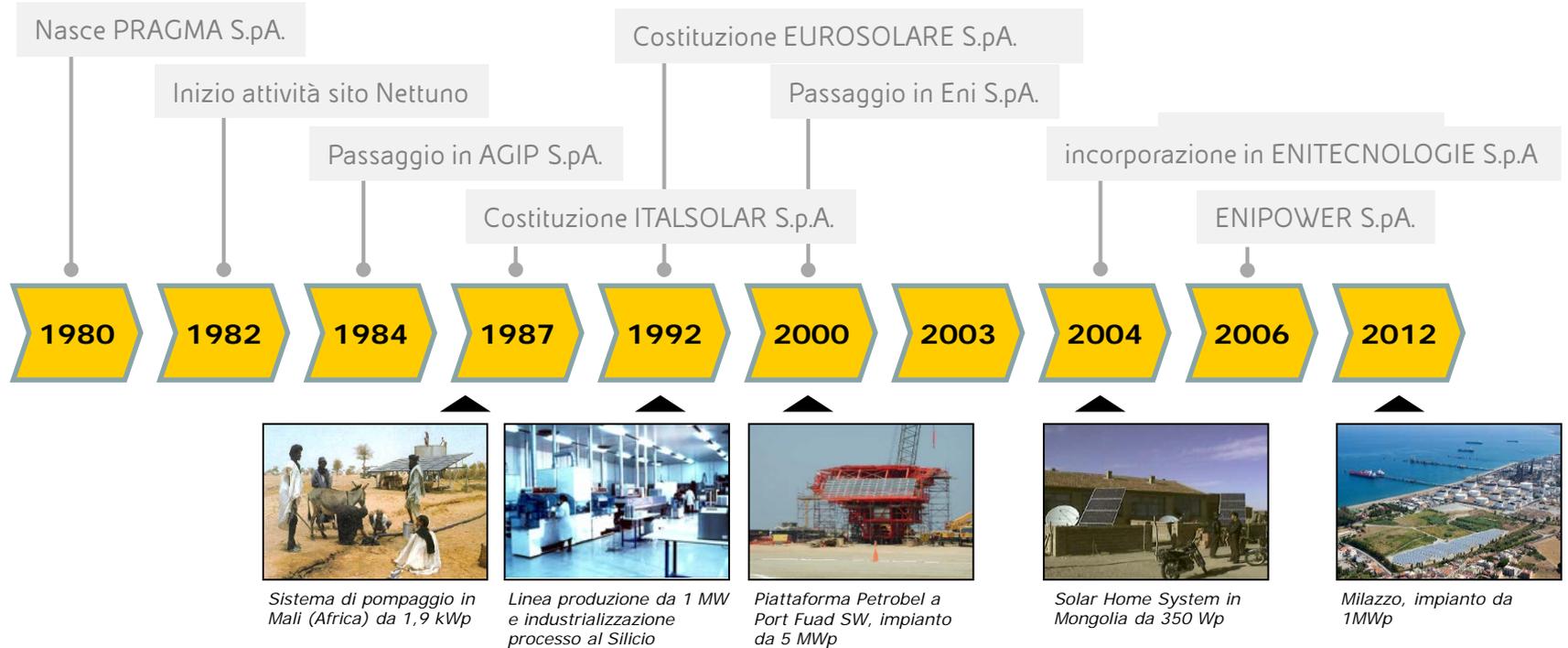


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Timeline rinnovabili: ricerca sull'energia solare



Timeline rinnovabili: attività industriale solare



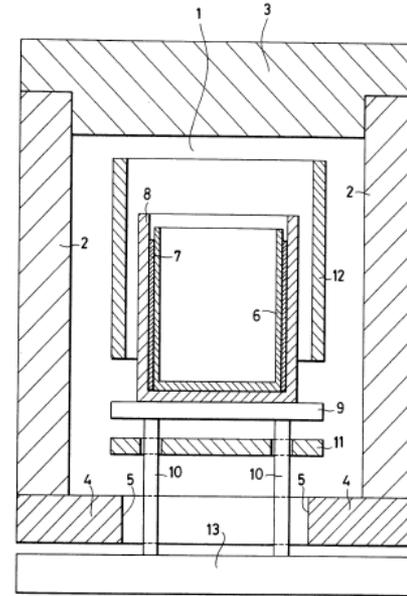
Brevetto silicio multicristallino

54 Process for the preparation of polycrystalline materials and equipment suitable to the accomplishing thereof.

30 Priority: 21.12.84 IT 2419684

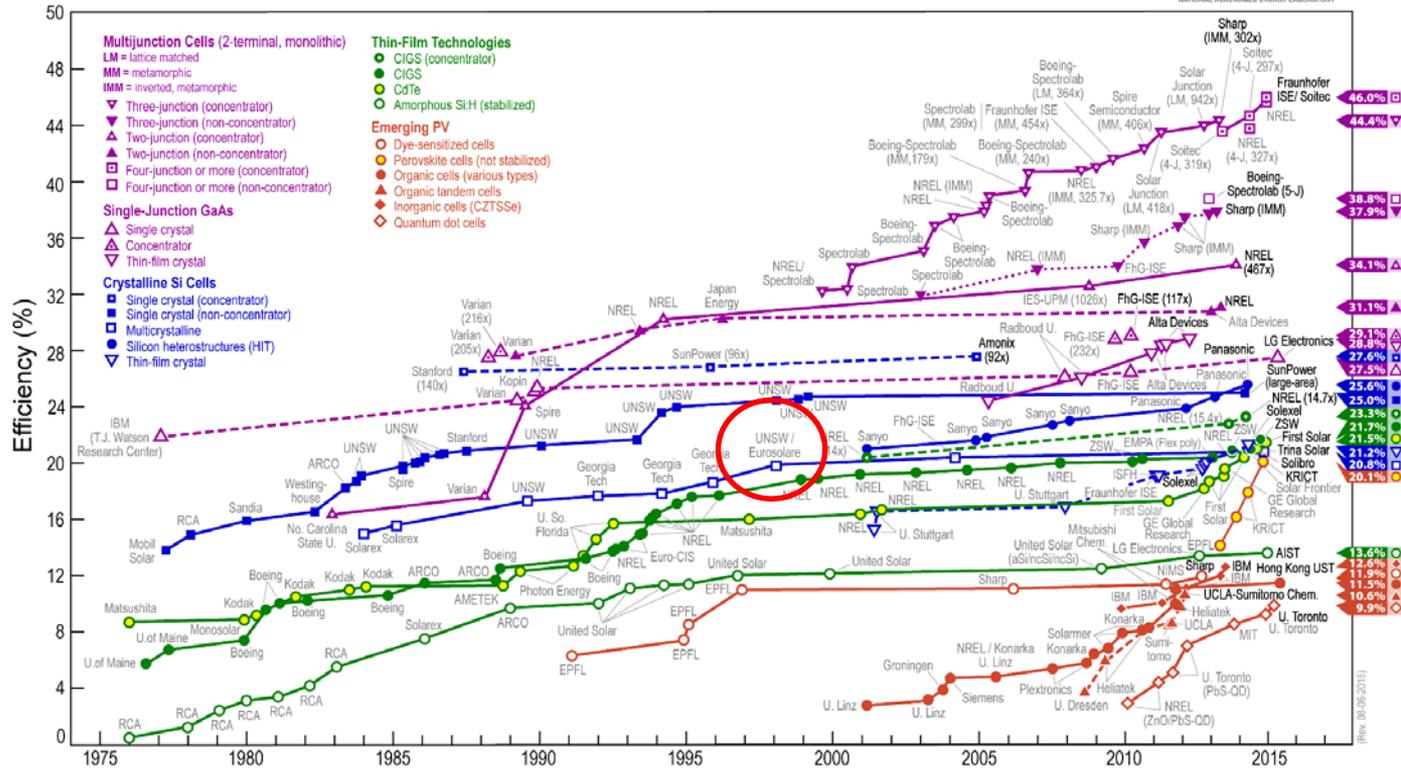
43 Date of publication of application:
02.07.86 Bulletin 86/27

73 Proprietor: PRAGMA S.p.A.
Viale Brenta 29
I-20139 Milano(IT)



Silicio da record

Best Research-Cell Efficiencies

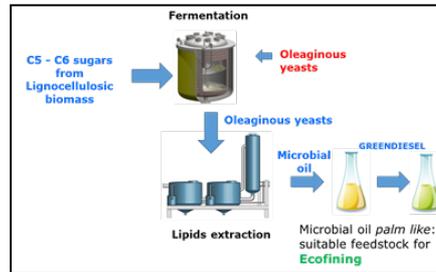
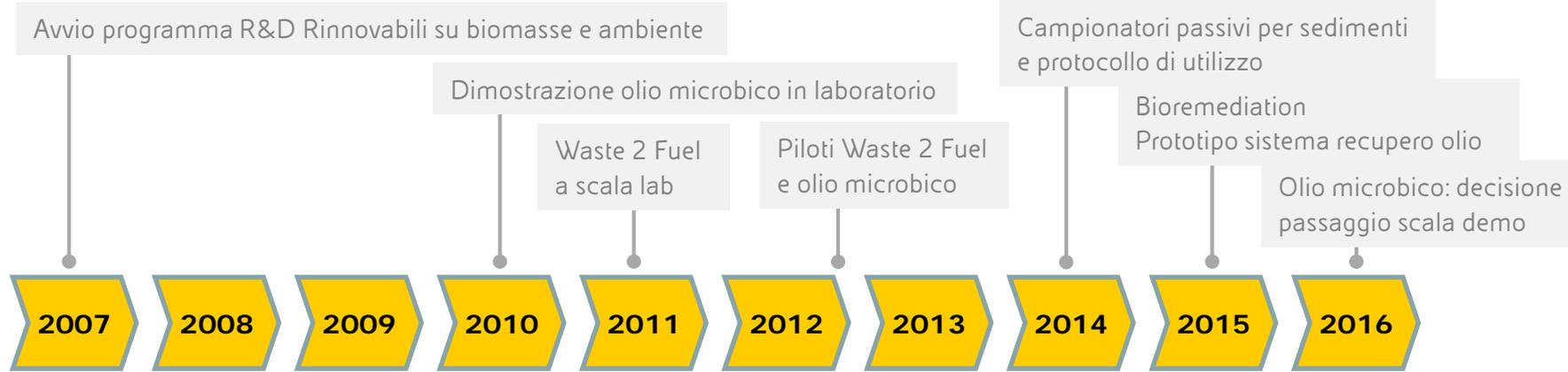


- Con il silicio Eurosolare (Eurosil) cella di efficienza record a fine anni 90
- Il record ha resistito 5 anni



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Timeline rinnovabili: ricerca su ambiente e biomasse



Timeline rinnovabili: prossime milestone

Dimostrativo
Waste 2 Fuel

Smart Windows:
lancio prodotto

Dimostrativo
CSP eni

Dimostrativo
Energy Storage

Impianto industriale
Organic PV

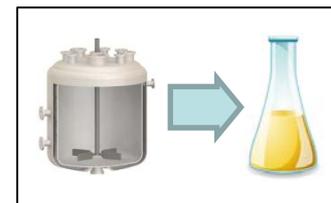
Impianto industriale
bio-olio di nuova generazione

2017

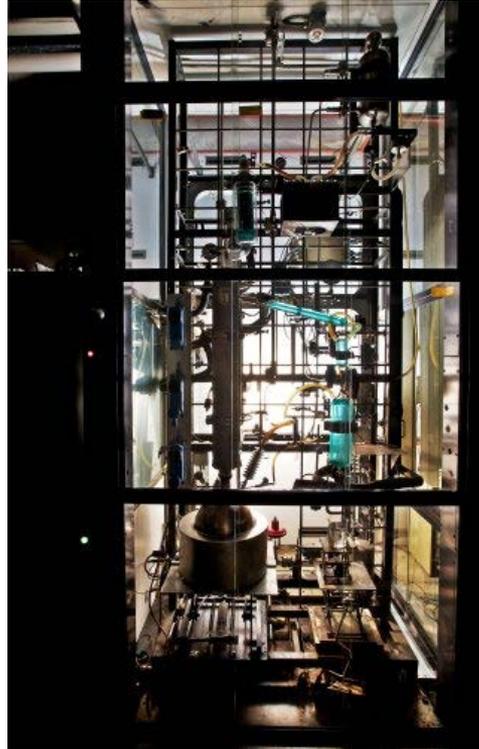
2018

2019

2020



Laboratories: solving problems, finding solutions





Chemical EOR



Clean Sea

Rapid CUBE



Green Refinery



Energy Transition

- Direct conversion of natural gas to methanol
- New adsorbent materials for CNG transportation
- New materials for the separation of H_2S and CO_2
- Conversion of CO_2 and H_2S to polymers, fibers, and building materials

Renewable Energy technologies under development



Solar Energy - PV windows
Semitransparent solar energy concentrators, with low silicon consumption and suited for residential building integration (BIPV)



Solar Energy – polymeric cells and “paper like” cells
Low cost materials on flexible substrate for portable devices



Solar Energy – CSP
A solid and robust technology for solar energy conversion

density power microgrid Energy Storage gather and store energy
coil supercapacitor storage flywheel hybrid battery
superconducting system



waste



to



fuel

Waste to Fuel
eni technology for II generation biofuels production from organic fraction of municipal solid waste



Biomass to Fuel
eni technology for II generation biofuels production from lignocellulosic biomass through fermentation-based processes



Renewables utility scale and hybrid solutions
Preliminary studies for renewable power plants installation (utility scale or hybrid plant renewables - fossil - waste to energy)



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Solar Energy – Concentrating Solar Power

Development of a competitive CSP technology with lower investment costs (-30%) and easy fabrication procedures



Deployment

- Demonstration in an industrial site under way
- Exploitation of CSP technology in industrial sites in planning phase



CSP Pilot Plant

- Technology demonstration



Cooperation Eni-MIT



Ready July 2016



Installation 1Q 2017

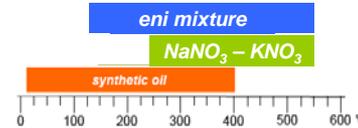
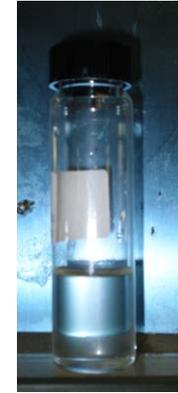
New Heat Transfer Fluid & Selective Coating

Developed more efficient heat transfer fluids

- Patent applications for a **low melting point salt mixture (T= 93°C)**
- Optimized a **ternary salt mixture** Li/Na/KNO₃ (T_f = 140°C)

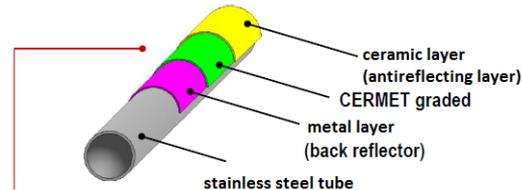


-10% estimated cost of electricity



Developed a new selective coating for receiver tube

- Patent application
- Good optical properties, comparable to commercial products
- Suitable for use at 400°C

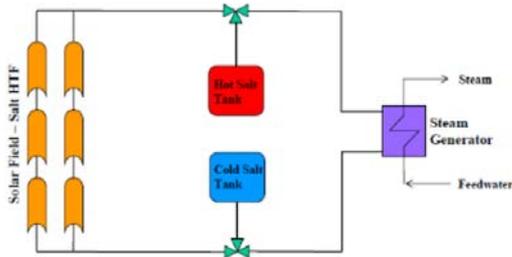


Coating structure
(compressive layer < 0.5 micron)



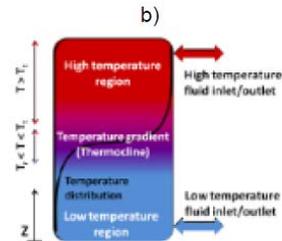
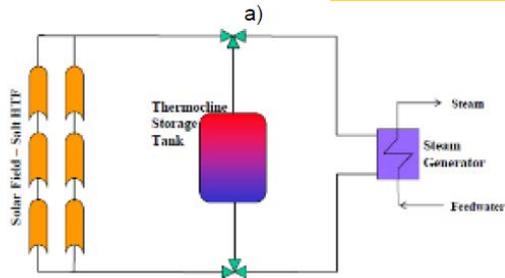
CSP Thermal storage

Current technology



- Two tanks with molten salts
- Proven technology
- Commercially available
- High CAPEX

Innovative technology in development



- One tank (Thermocline) with concrete/solid media
- Numerical simulation and laboratory tests
- Reduced costs expected (30-40%)



Solar Energy – Printable Polymer Solar Cells

- Low cost, low weight, flexible solar cells based printed inks.
- Easily scalable production methods
- low environmental impact



MAIN RESULTS

- Efficiency 10% at lab scale
- Printed modules with roll-to-roll process



Deployment

- Develop new products & identify market opportunities
- Further technology development



Solar Energy – Photovoltaic windows

Semi-transparent PV devices using proprietary materials able to concentrate sunlight and shift spectrum

MAIN ACHIEVEMENTS

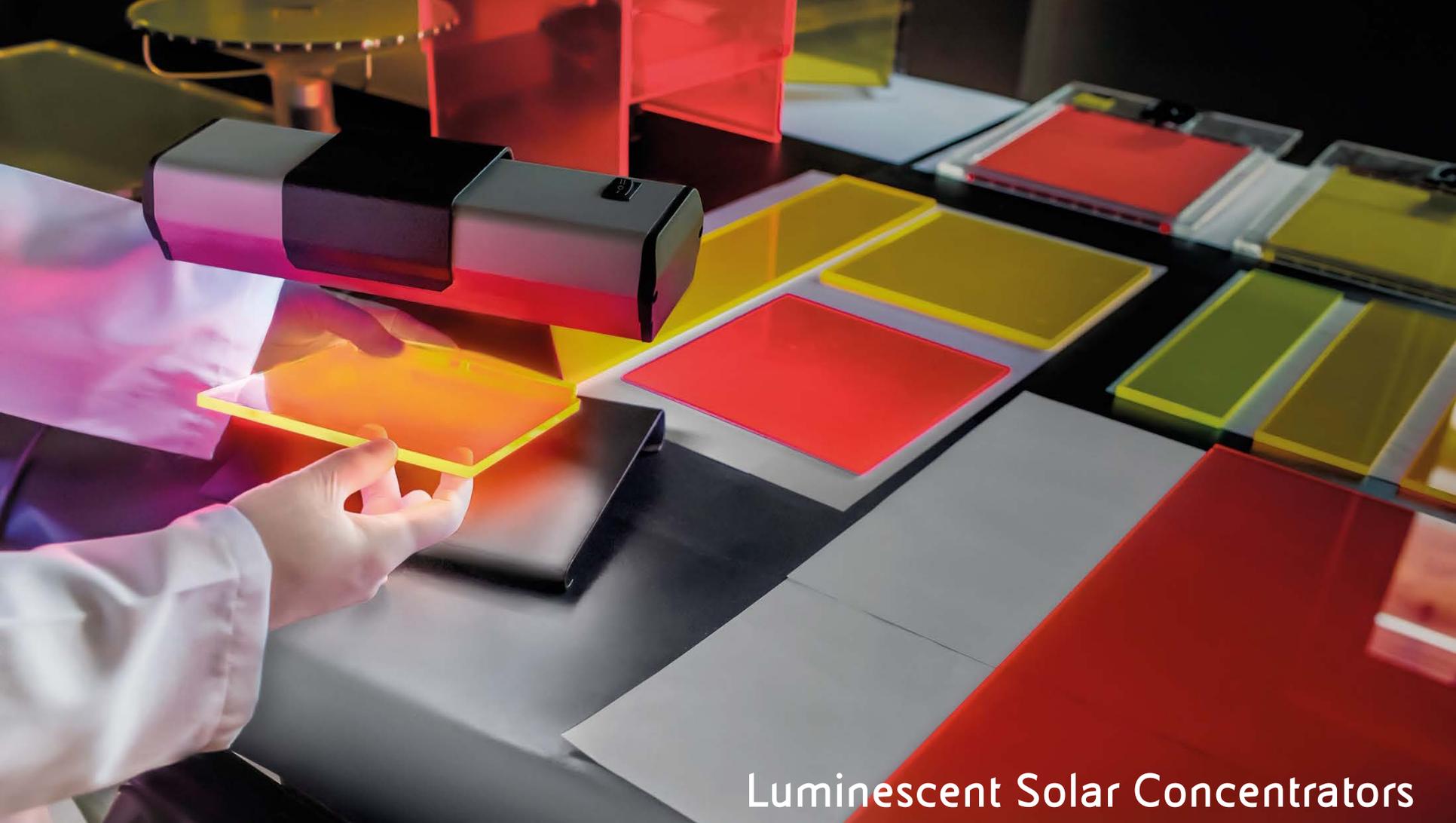
- Patented high performance fluorescent dyes
- Several demo applications in windows, shelters, consumer products



DEPLOYMENT

- Development of new products: smart windows, noise barriers
- Commercial agreements under development



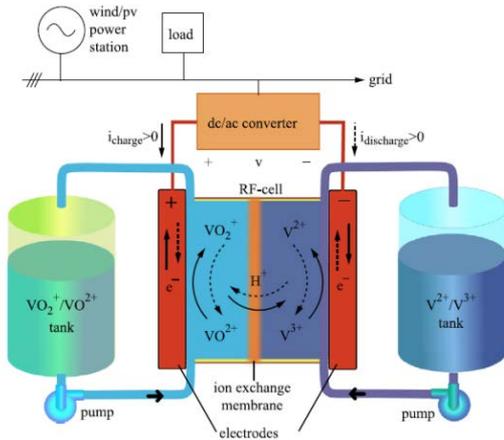


Luminescent Solar Concentrators

Energy Storage

TECHNOLOGY

Research and development of energy storage devices at medium-large scale (up to 100 MW) with high discharge times (hours to days).



WHY?

- Load balancing for grid-connected power stations
- Competitive energy storage technologies for communities
- Off-grid energy storage in remote areas



DEPLOYMENT

- Integration of PV plants and storage options to be selected between advanced commercial/new technology

