

(Open) Innovation for Sustainability

Renewable Energy session

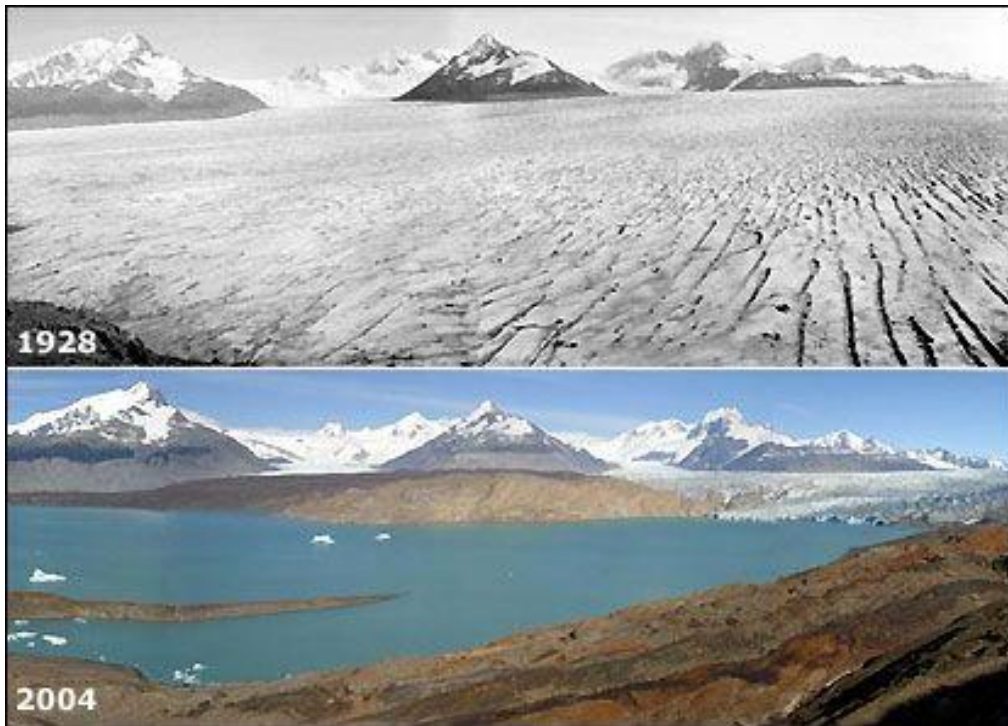
Robert Kirschbaum, VP Open Innovation

November 28th, 2012

Content

- **Wake-up call**
- **Introduction to DSM**
- **(Open) Innovation**
- **Sustainability examples**
- **Learnings**

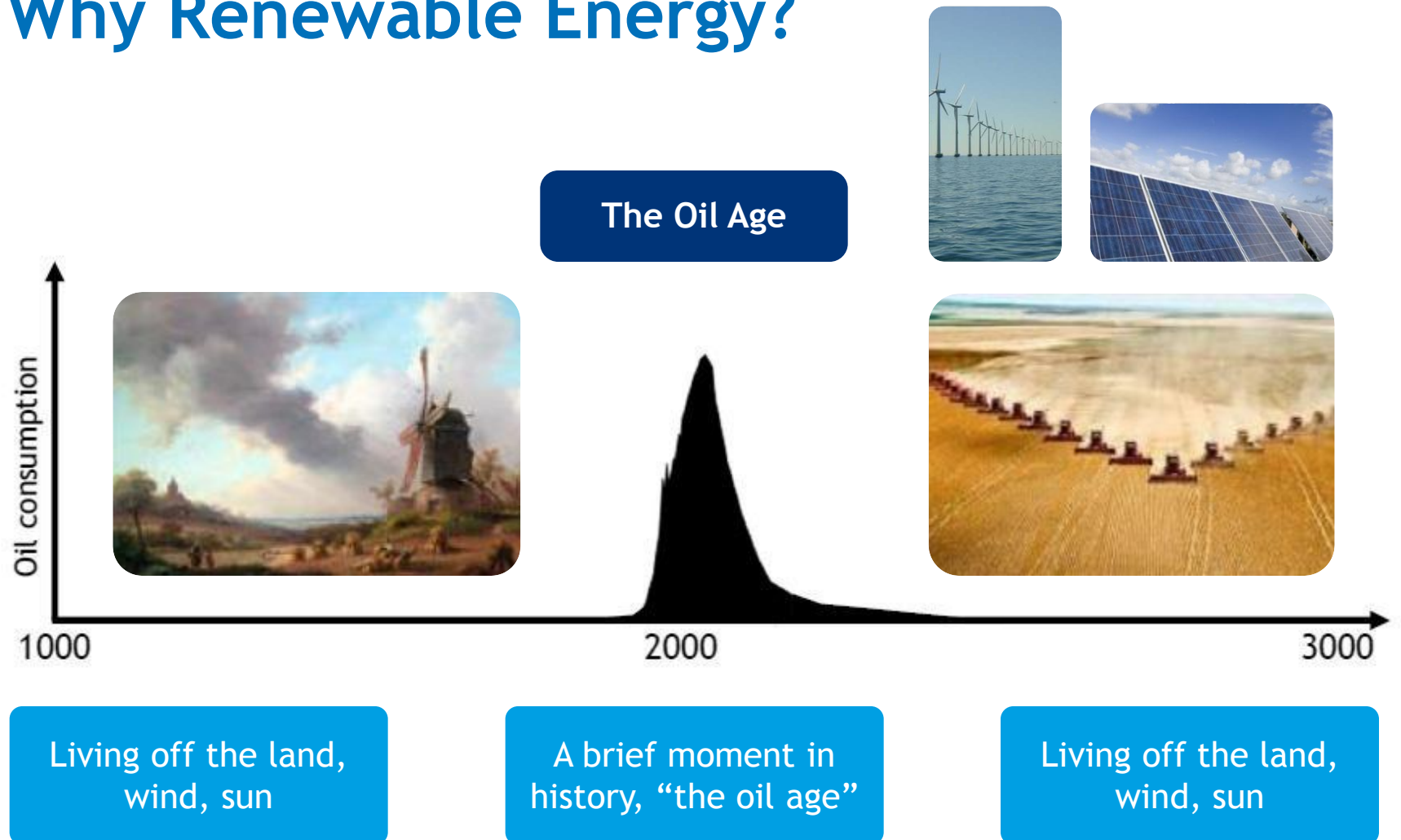
Climate Change..... ?



Climate Change will become very tangible



Why Renewable Energy?



DSM's transformation

Coal Mining → (Petro)chemicals → Life Sciences & Materials Sciences

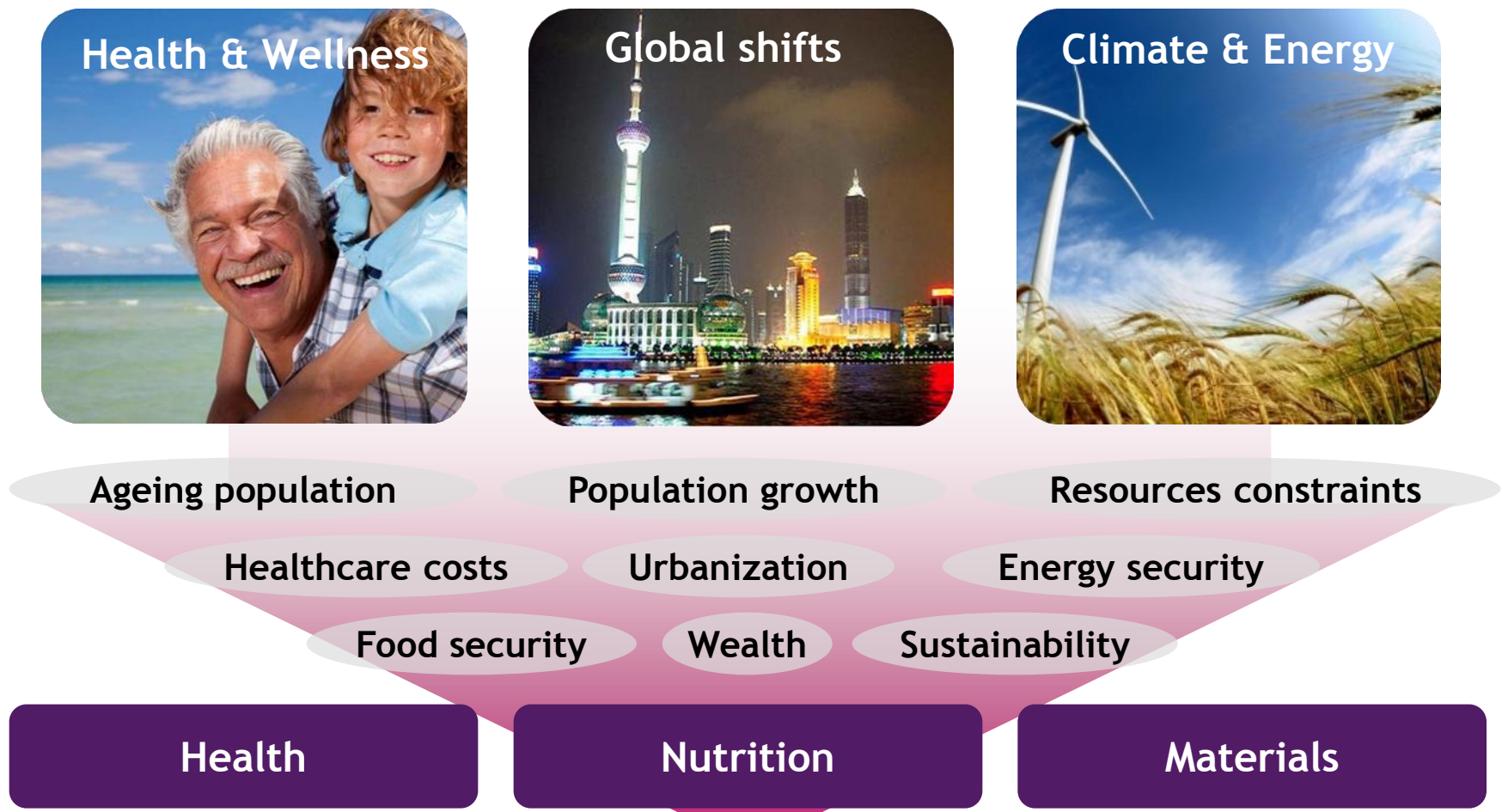


Royal DSM in 2011

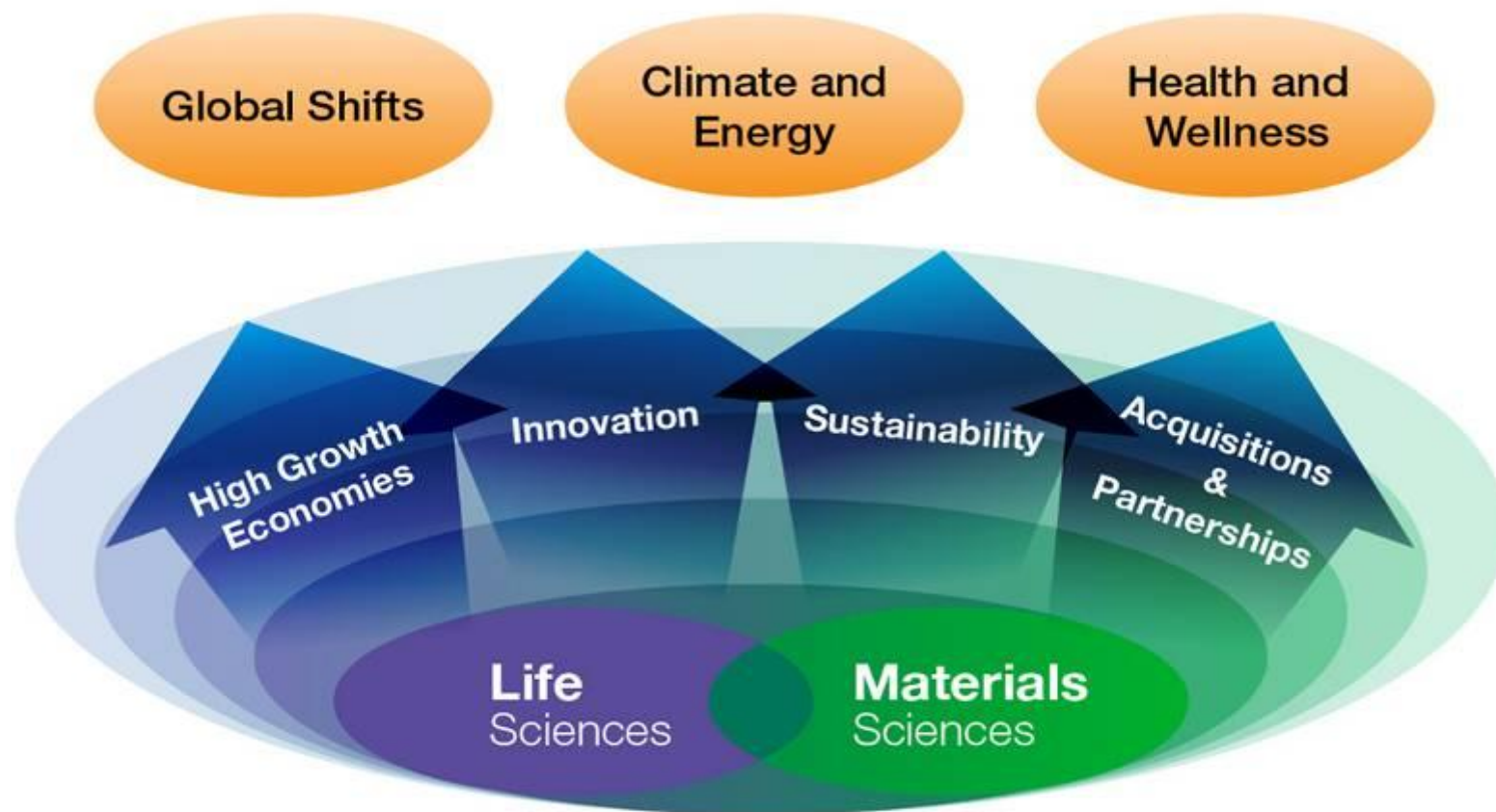
- Global science-based company active in health, nutrition and materials.
- Develops solutions that nourish, protect and improve performance.
- Annual net sales of € ~9 billion
- ~22,000 employees
- No 1. Dow Jones Sustainability World Index
- 10% of our people are in R&D + Innovation
- ~5% of the annual sales is invested in R&D
- Credit rating Single A



Global societal trends drive DSM's markets



DSM in motion: *driving focused growth*



People - Planet - Profit: creating value along three dimensions

Accelerating and supporting innovation



New Business Development



EBA Biomedical

**EBA Bio-based
Products & Services**

**EBA Advanced
Surfaces**

Business Incubator

Enablers




Excellence in Innovation

CTO Office

Licensing

Venturing

Why do we need Open Innovation?



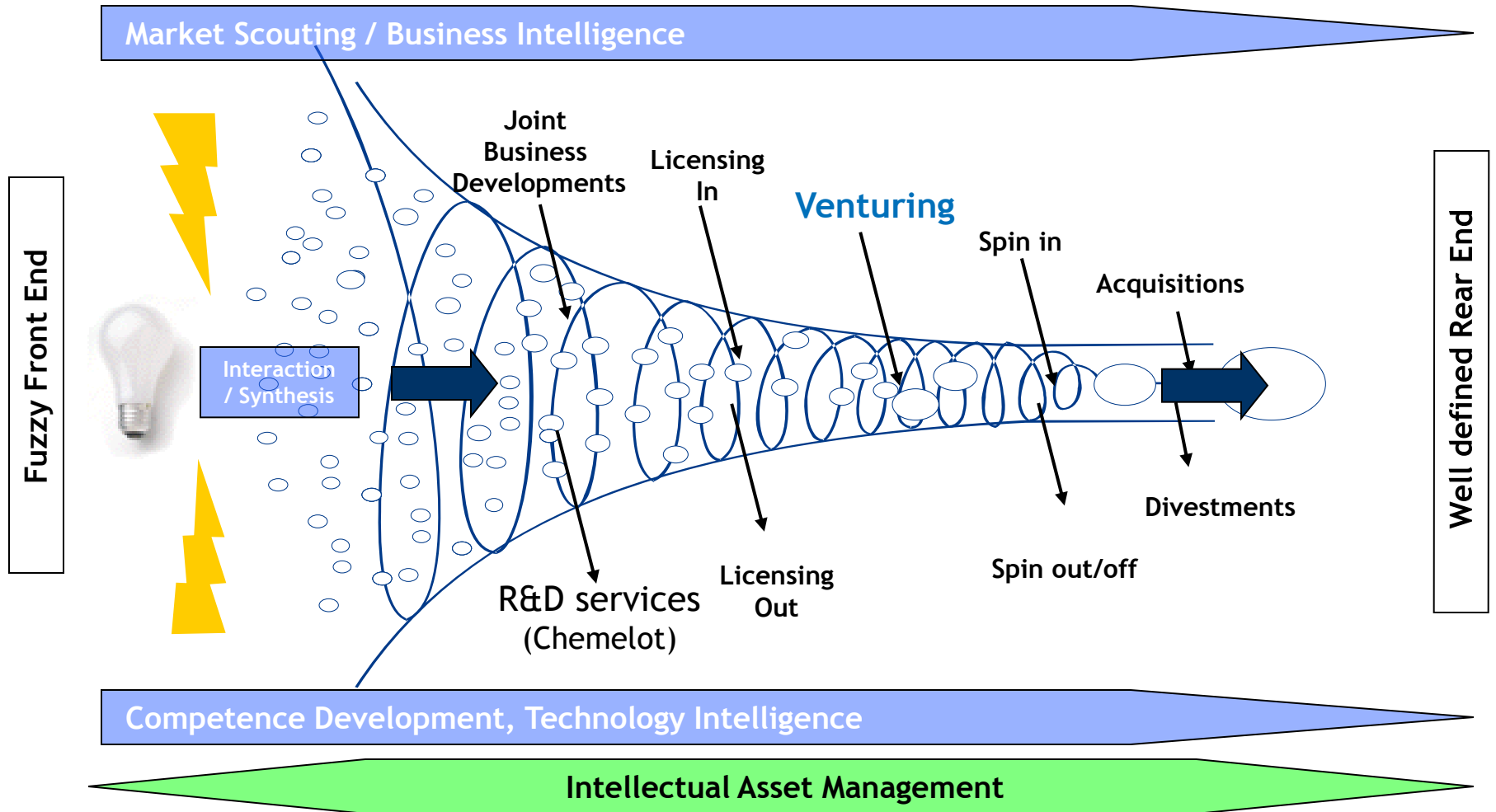
99.999996%
of world
population
outside
DSM!

DSM

Networks
needed!

Value Creation by Open Innovation

Open innovation is no longer a competitive advantage
It has become a competitive necessity!



Venturing: How to mitigate risks?



Venturing integral part of innovation

Since 2001

-> Scouted and screened more than **3,800 companies**, which provided useful insights and complementary windows on-the-world for our businesses

Resulting in

- **40 direct investments**; 26 still active in current portfolio
- 14 divested or stopped. Net financial result is positive
- **Partnerships realized with 30 portfolio companies** in various forms and to varying degrees
- **Partnerships with ~ 50 other start-ups** which DSM Venturing scouted but did not invest in !



Light weight containers for multimodal logistics and air cargo



Light weight composites: 20 Km/liter



Innovation is our sport



“outstanding corporate innovator”



Velox2 : Speed record 113 Km/hr.



Rotor Blades

Jumbojet (747) :

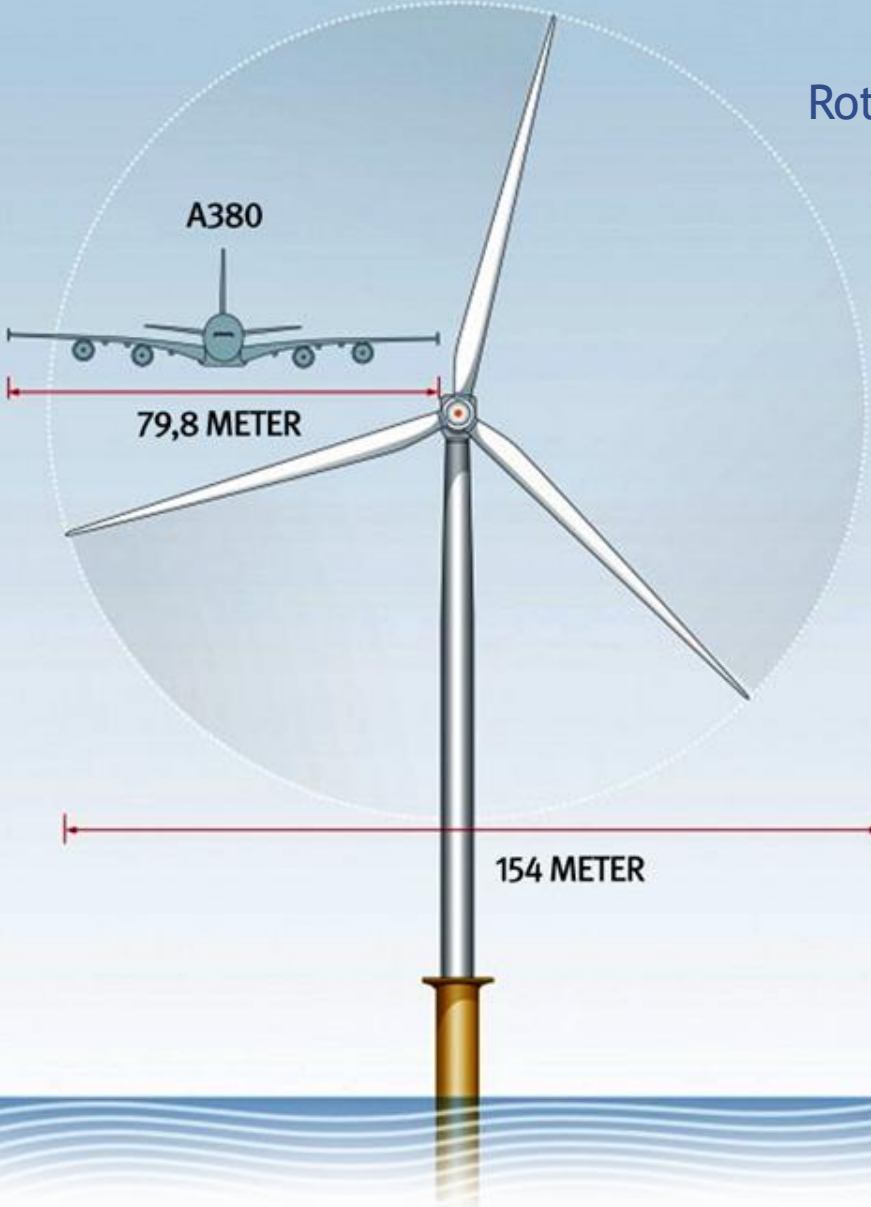
64,4 meter

Largest Windturbine :

77 meter

A380:

79,8 meter



Dyneema contributes to Sustainability



35-foot Prototype – Loring, Maine (2012)



Ascended to **350 feet**, produced power at altitude, and landed in **automated** cycle

Generate over **2x** power from top-selling Southwest turbine when lifted to high altitude

DSM and Solar, another Moore's law?

300 Million year



Coal from carbon layers; solar energy captured for 300 million year

70 Million year



Hydrocarbons as derivate of natural oil; solar energy captured for 10-70 million year before using



DSM 

Bio fuels captured from biomass where solar energy was stored for approximately 1 year

1 year



Solar PV, immediate use of solar energy

1 nano seconde



1902

1970

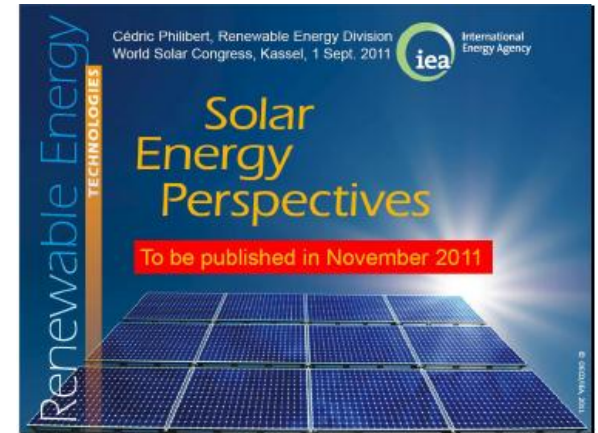
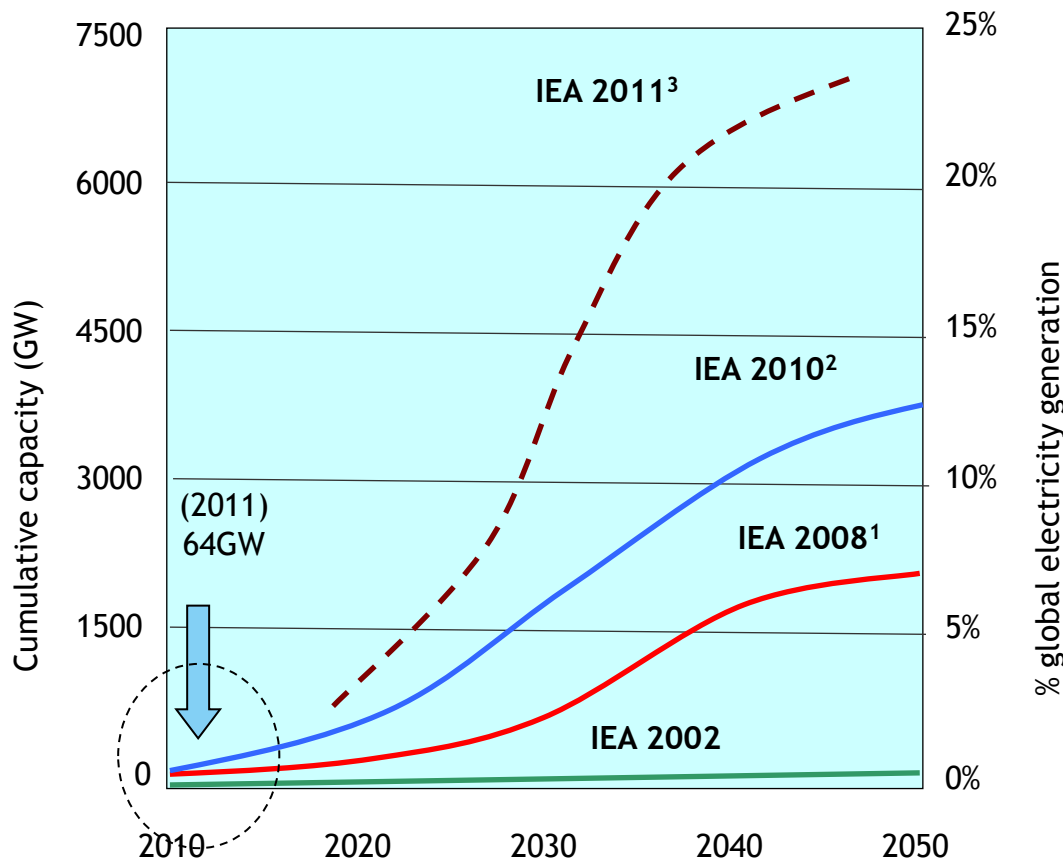
2000

2010

2020

Solar energy, a fast growing new market segment

The IEA foresees that after 2060, 50% of electricity demand will be generated by solar energy



IEA = International Energy Agency

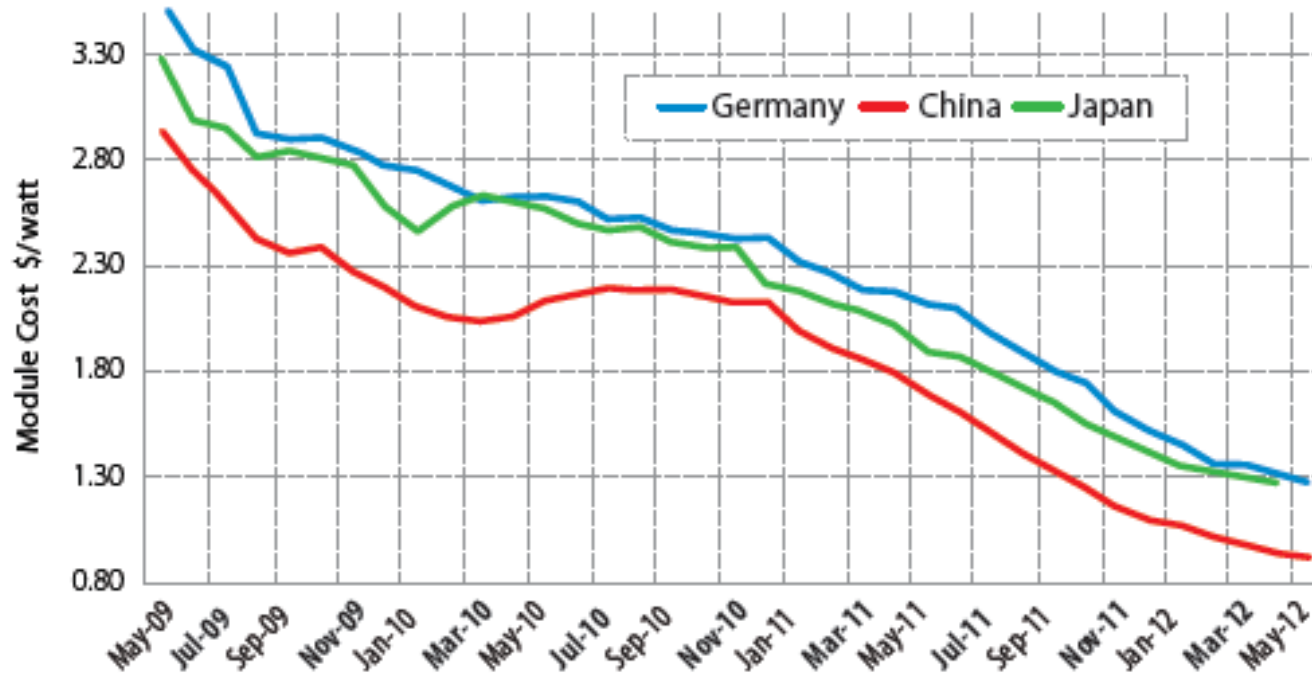
¹ blue map scenario

² technology roadmap PV

³ solar energy perspectives

Price development of Solar PV energy on module level

Spot Market Price for PV



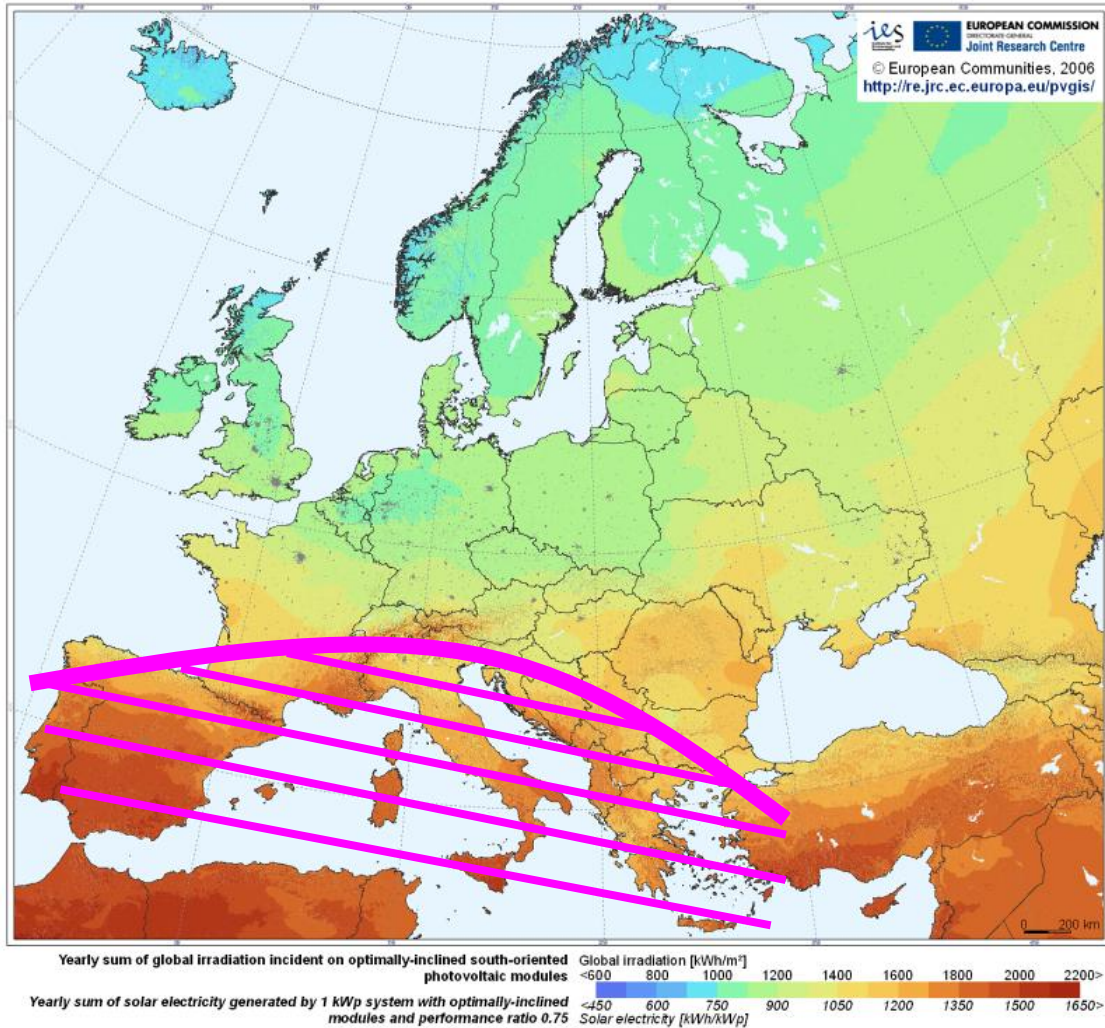
© Principal Solar Institute

Data Source: pvXchange

Solar energy, looking for grid parity [€/kWh]

'Grid parity' (consumer prices) in Europe – 2015

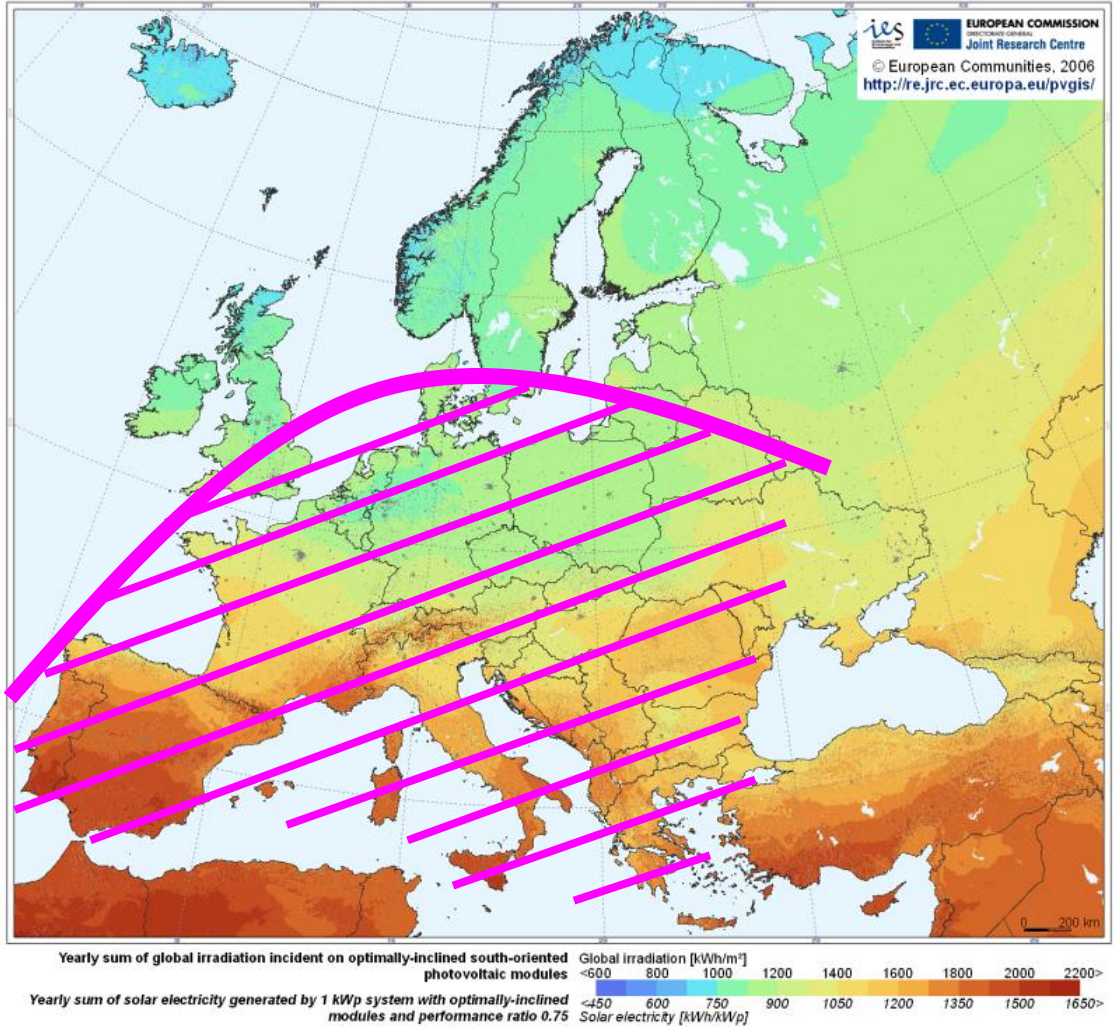
Photovoltaic Solar Electricity Potential in European Countries



Solar energy, looking for grid parity [€/kWh]

'Grid parity' (consumer prices) in Europe – 2020

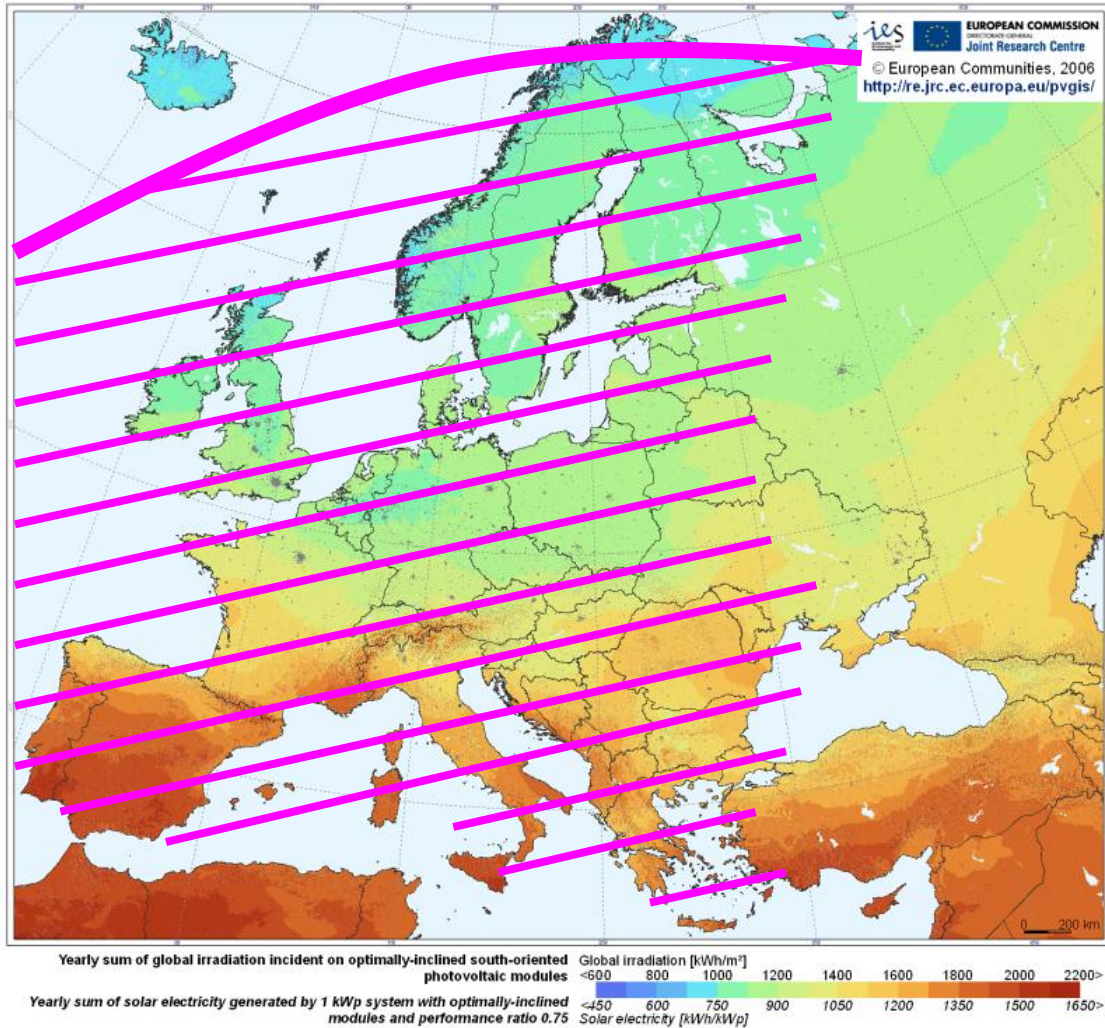
Photovoltaic Solar Electricity Potential in European Countries



Solar energy, looking for grid parity [€/kWh]

'Grid parity' (consumer prices) in Europe – 2030

Photovoltaic Solar Electricity Potential in European Countries

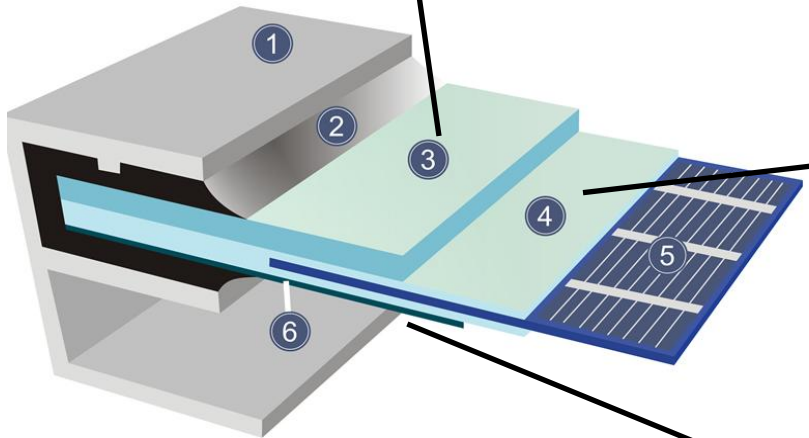


DSM current solar business opportunities in c-Si

- 1 module frame
- 2 sealant
- 3 cover glass
- 4 encapsulant
- 5 solar cell
- 6 backsheet



AR coating technology for solar cover glass



Encapsulant material



Backsheet components



Junction box



Power inverter



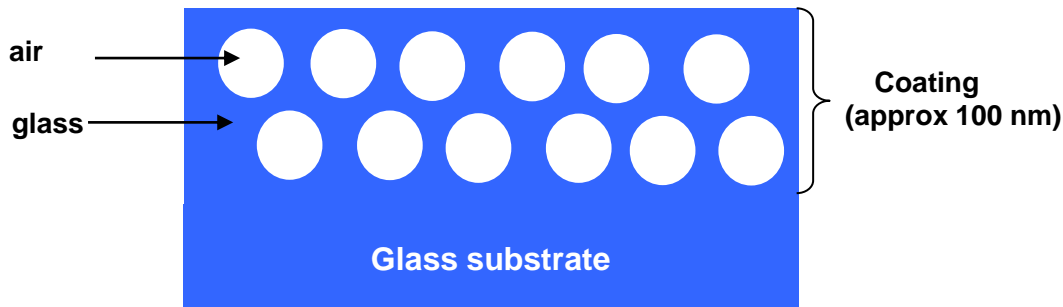
Anti Reflective Coatings

Market

- Demand for anti-reflective (AR) coated solar cover glass is growing strong
- AR coatings are expected to become standard

Value proposition

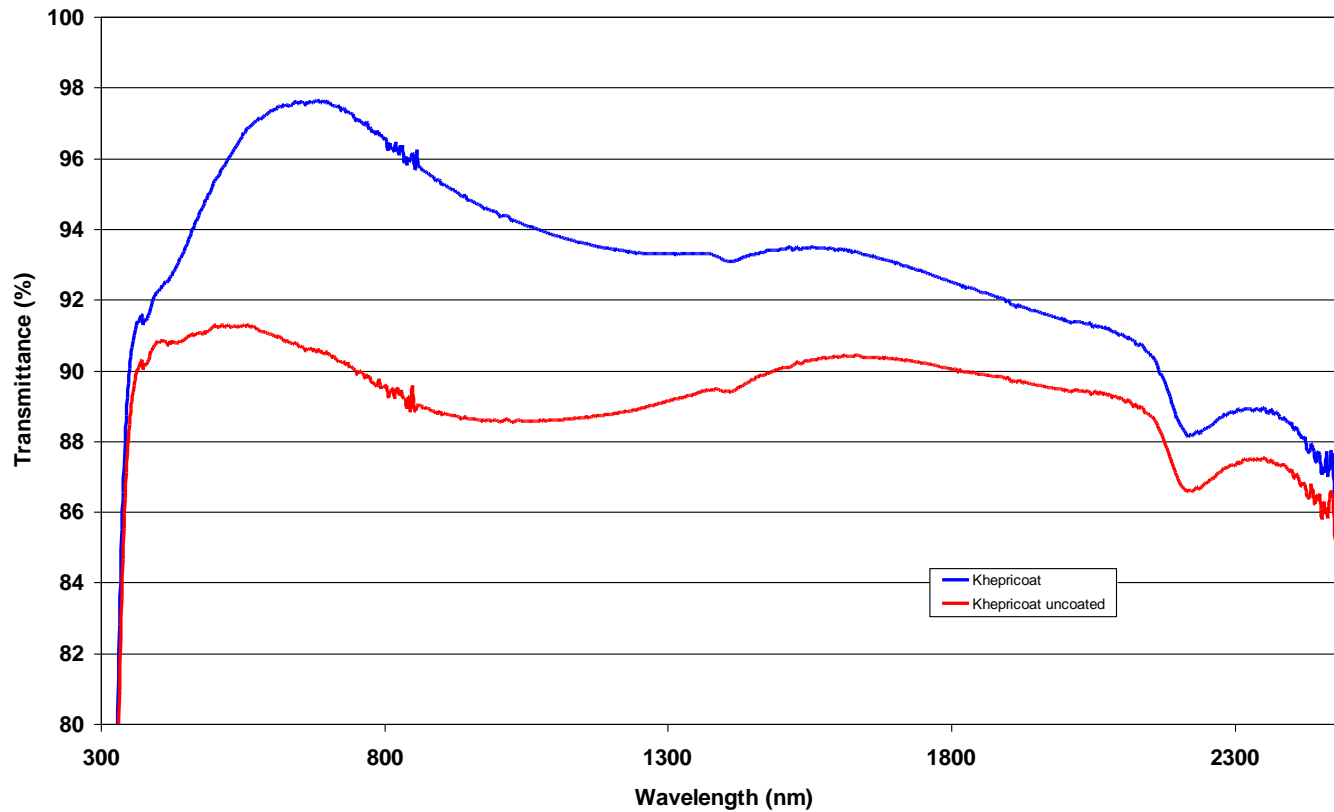
- KhepriCoat™ AR coating provides an improvement of PV module efficiency of up to up to 4% due to reduction of reflection of the sunlight on the solar cover glass



Contact: jan.grimberg@dsm.com

KhepriCoat ®

Transmission coated and uncoated glass



Exact® Plastomers - encapsulant

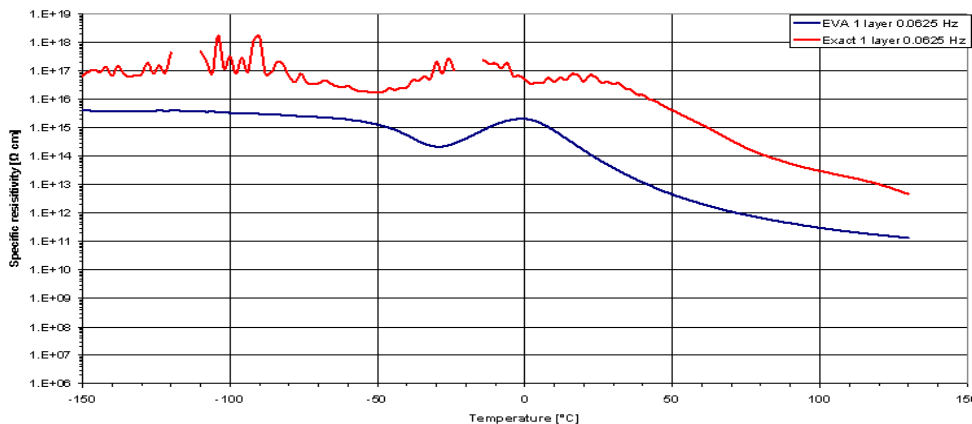
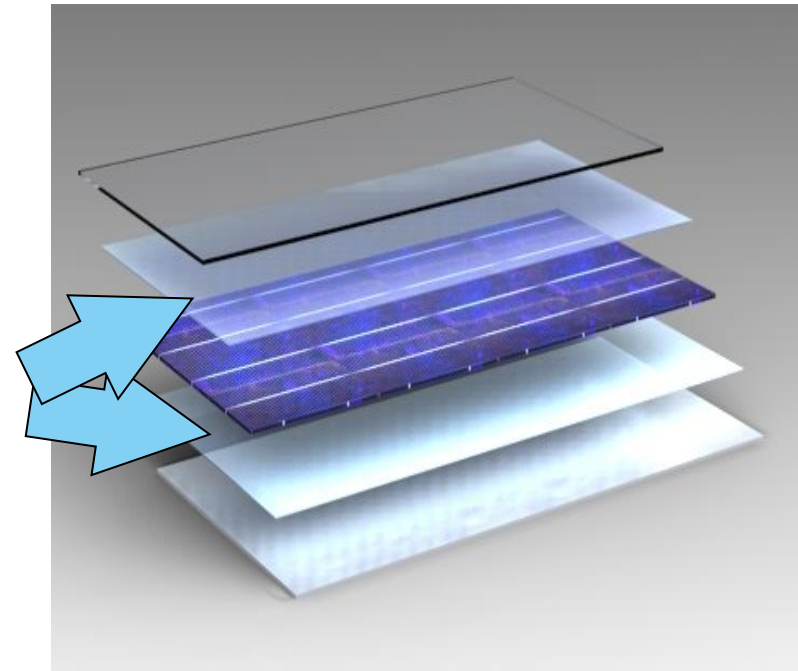
Market

Huge volumes for encapsulants for PV cells

Value proposition

Exact® Plastomers are durable and clean polymers

- lowest WVTR rate
- no formation of acetic acid due to moisture
- enhanced PID resistance & electrical performance
- high optical transparency in time
- insures mechanical decoupling also at lower temperatures
- perfect encapsulant & broad processing window
- Far better volume resistivity as function of T :



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Engineering Plastics - solar electronics

Market

Polymeric components for solar electronics in junction boxes, inverters, cables & connectors

Value proposition

Portfolio of engineering plastics

- Stanyl® TC as heat dissipating polymer for ALU dye cast replacement in junction boxes and micro-inverters



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DSM Innovation Center - backsheet (project)

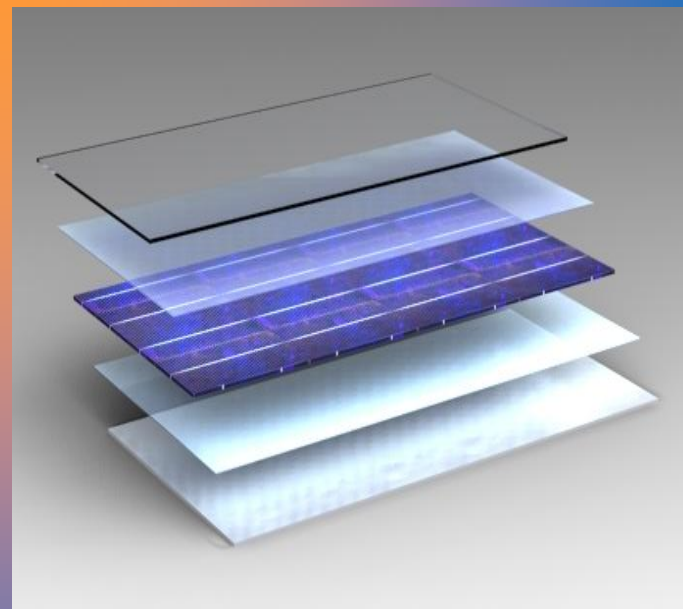
Market

Huge volumes for backsheet for PV cells

Value proposition

Cost effective replacement of “Tedlar” backsheet by

- **Understanding requirements in the application**
By applying improved encapsulant materials, other requirements may be set for backsheet material. Understanding the failure mechanisms of cell failure will lead to better formulations of the requirements.
- **Applying the right engineering plastics and coatings with the most appropriate manufacturing technologies as already applied in packaging industry**



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DSM Business Focus; longer term


Building Integrated PV components & systems



SMARTROOF

The Sun Tile – Smartile


Innovation through cooperation

 **Potential for Solar Energy**

Transforming PV – The Automotive Analogy



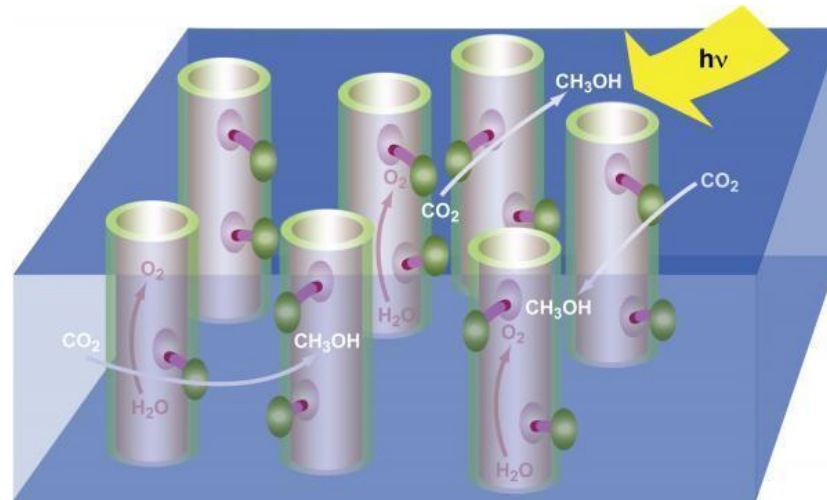
*Weight Savings = 0.7 kg per door
Elimination of 50 parts*



Power your home with your home




.. And the holy grail: artificial photosynthesis



Questions ?





BRIGHT SCIENCE. BRIGHTER LIVING.™