

Investor day

Innovation: serving the Habitat strategy

Didier Roux

Paris, 15 November 2010



Innovation in the Habitat market

Didier Roux



*Energy and the environment:
A strategic concern for Saint-Gobain*

Contents

Introduction

- Habitat and the challenges facing our planet...

Strategic, cross-business programs in response to changing market needs

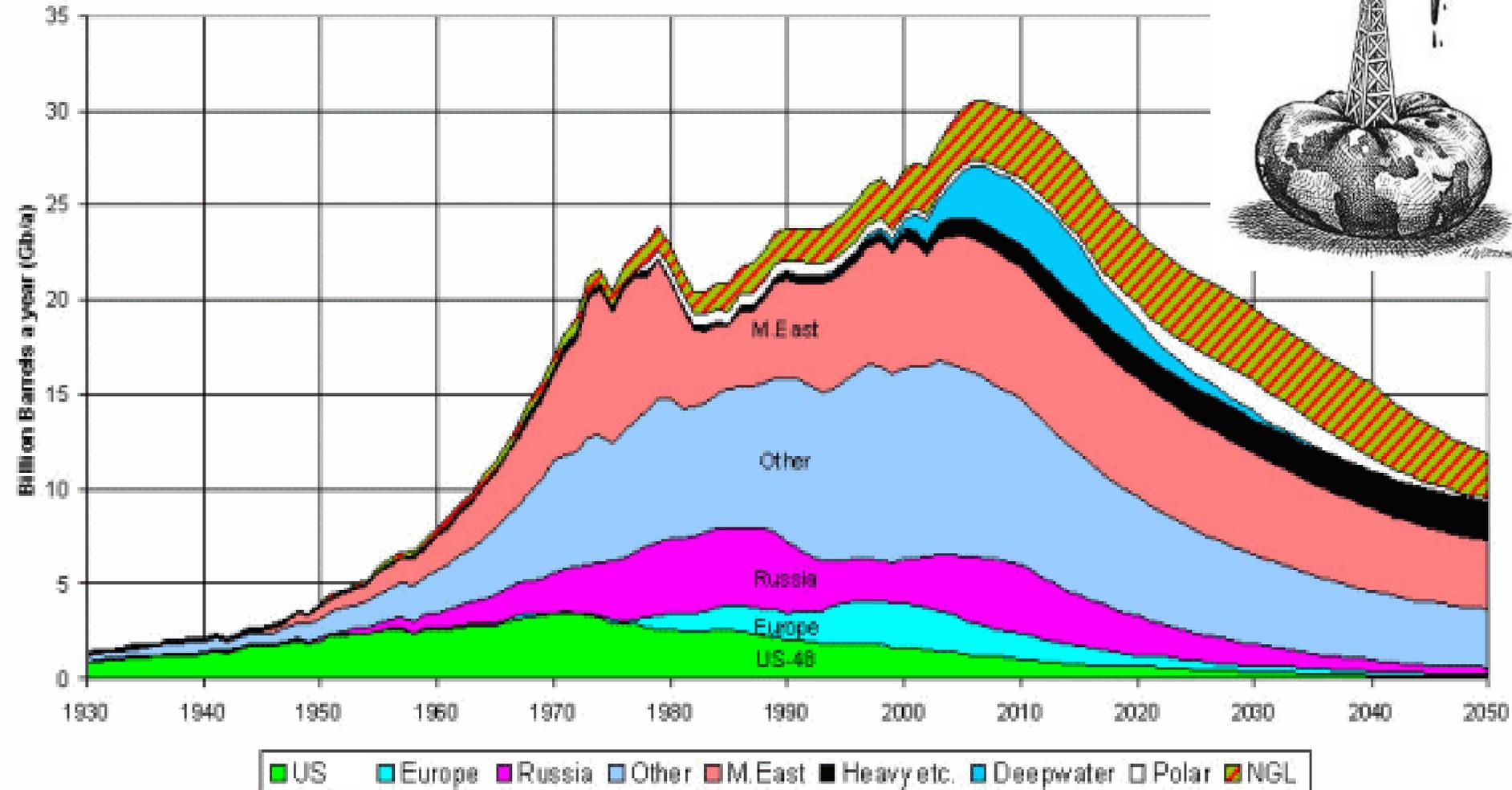
Increased resources

- Budget, patents, research centers, looking outward...

Conclusion

People will have used fossil fuels for only a very short period in the history of mankind

OIL AND GAS LIQUIDS 2004 Scenario



The green house effect

S'il n'y avait pas d'effet de serre

- 18 °C

A diagram showing a cross-section of the Earth. A yellow arrow representing solar radiation points towards the Earth from the top left. An orange arrow representing outgoing infrared radiation points away from the Earth towards the top right. The Earth is shown with a blue atmosphere and a green and blue surface. The temperature is indicated as -18 °C.

La vie grâce à l'effet de serre

+ 15 °C

A diagram showing a cross-section of the Earth. A yellow arrow representing solar radiation points towards the Earth from the top left. An orange arrow representing outgoing infrared radiation points away from the Earth towards the top right. A curved orange arrow represents the greenhouse effect, showing radiation being reflected back towards the Earth's surface. The Earth is shown with a blue atmosphere and a green and blue surface. The temperature is indicated as +15 °C.

Un risque de déséquilibre

+ ?? °C

A diagram showing a cross-section of the Earth. A yellow arrow representing solar radiation points towards the Earth from the top left. An orange arrow representing outgoing infrared radiation points away from the Earth towards the top right. A curved orange arrow represents the greenhouse effect, showing radiation being reflected back towards the Earth's surface. The Earth is shown with a blue atmosphere and a green and blue surface. The temperature is indicated as +?? °C.

Temperature reconstruction

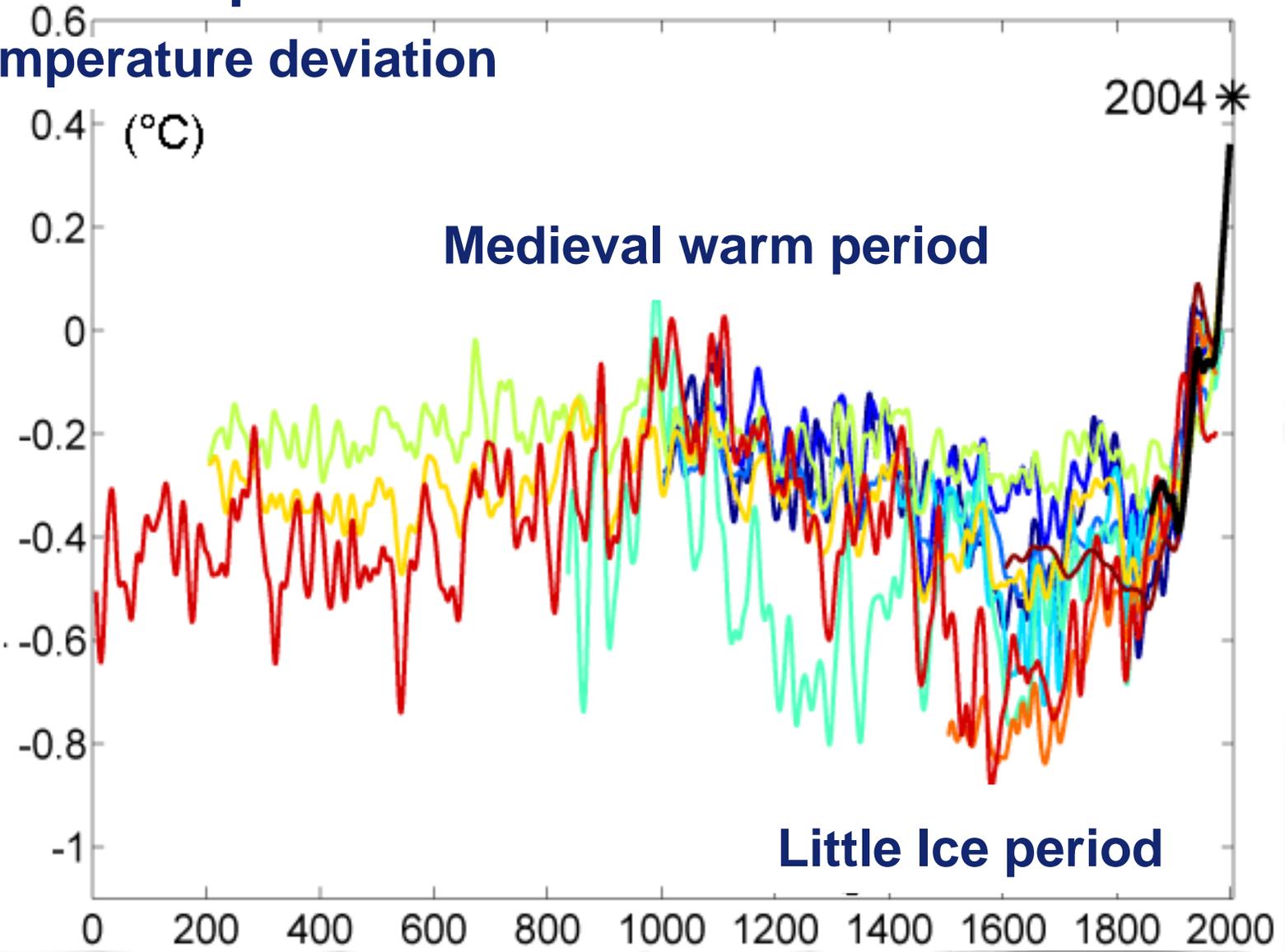
Temperature deviation

(°C)

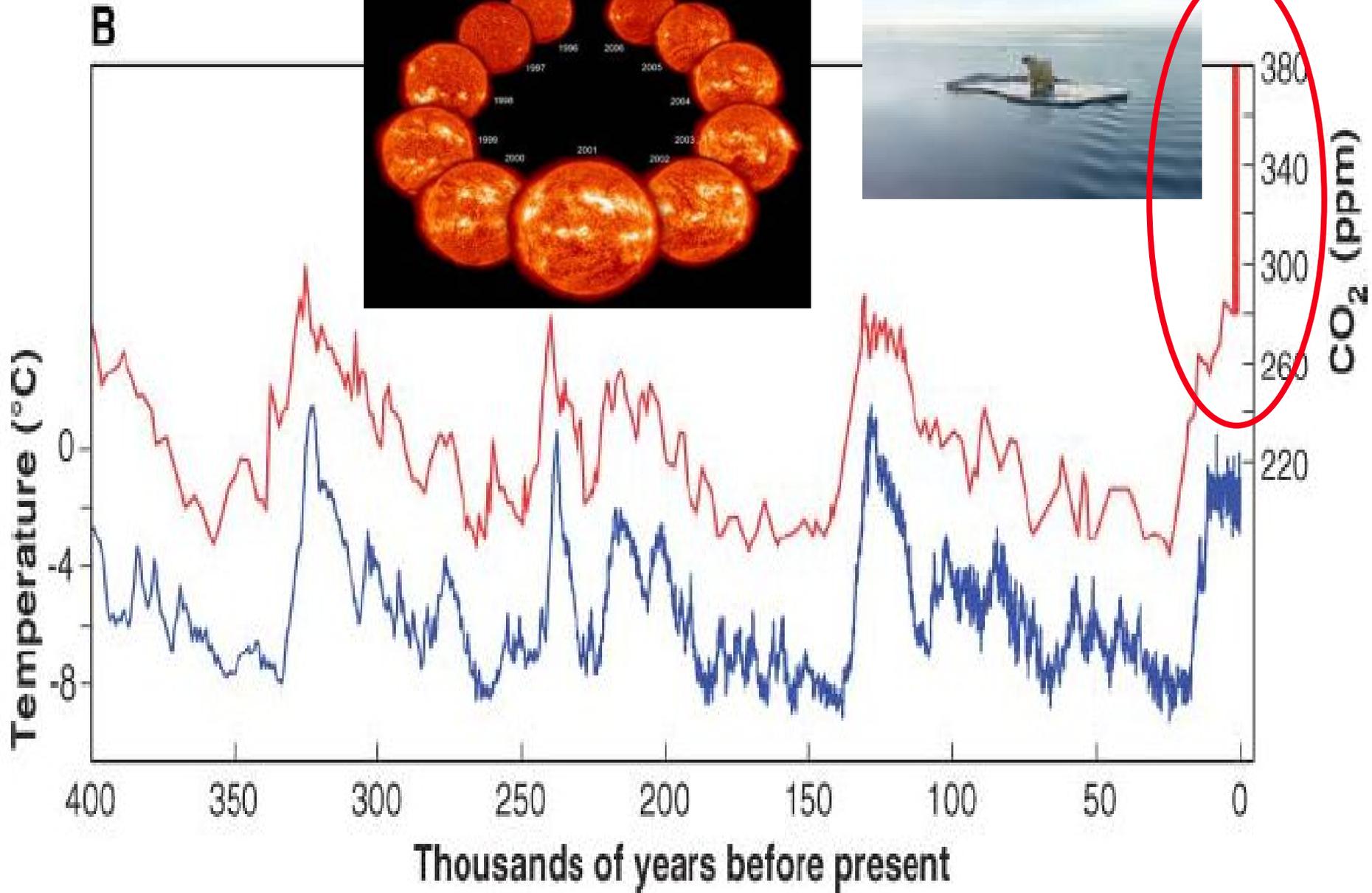
2004*

Medieval warm period

Little Ice period



Vostok Curve



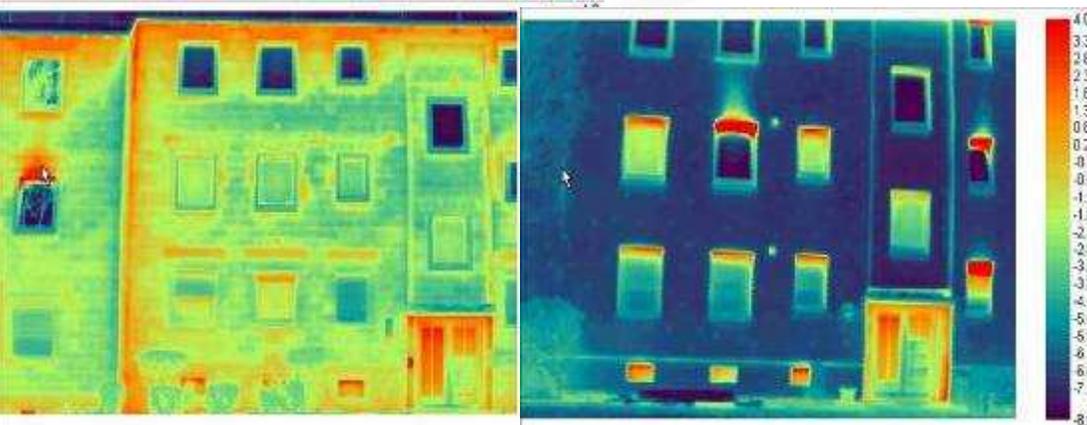
In conclusion

■ We need to:

- prepare for the end of fossil fuels
 - ▶ Slow down consumption
- limit CO₂ emissions

■ This means:

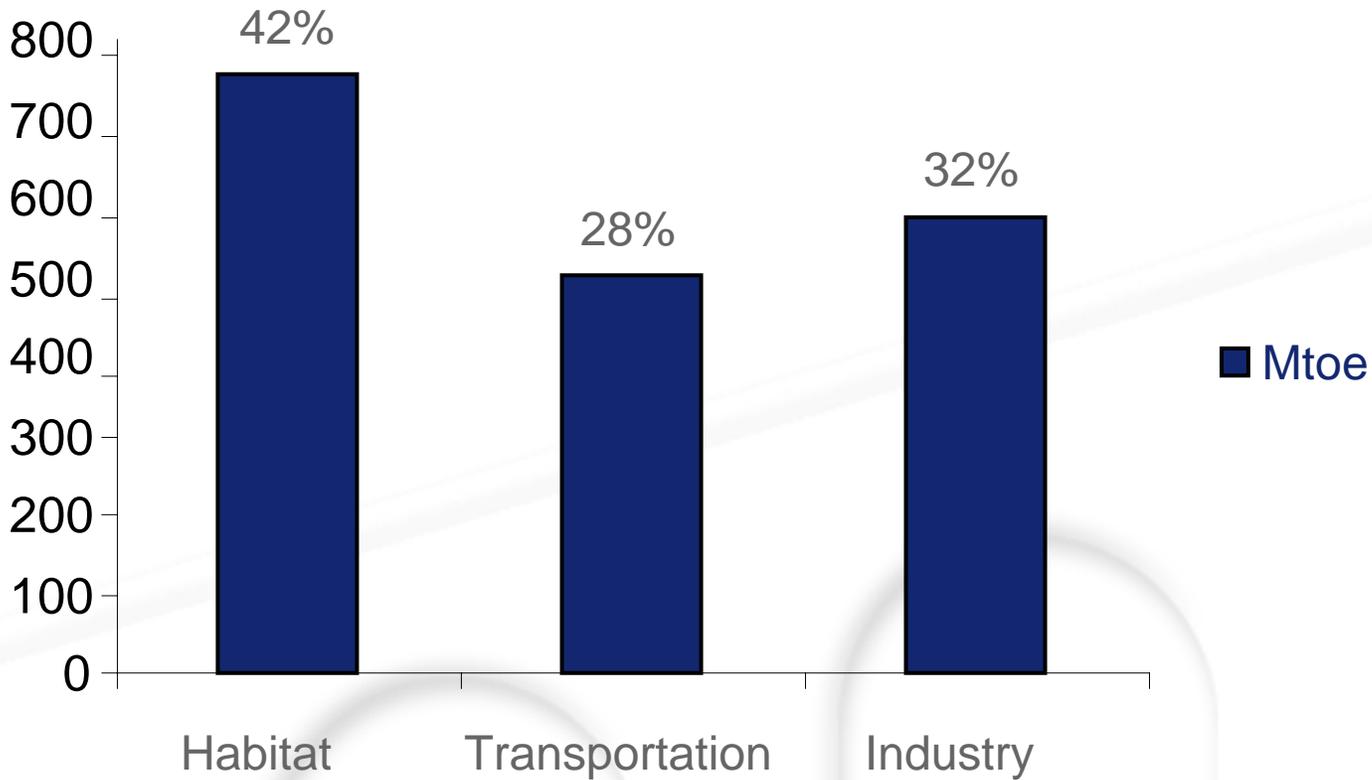
- saving energy
- identifying renewable energy sources



Energy and the environment

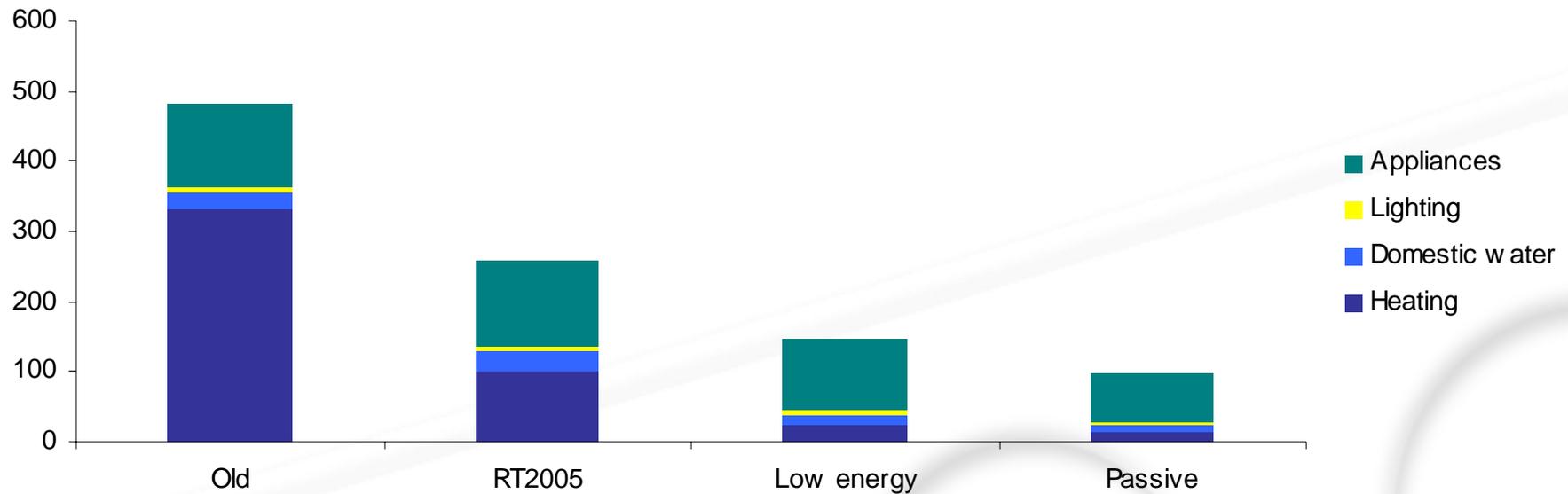
Energy use in Europe

Millions of tons oil equivalent (Mtoe)



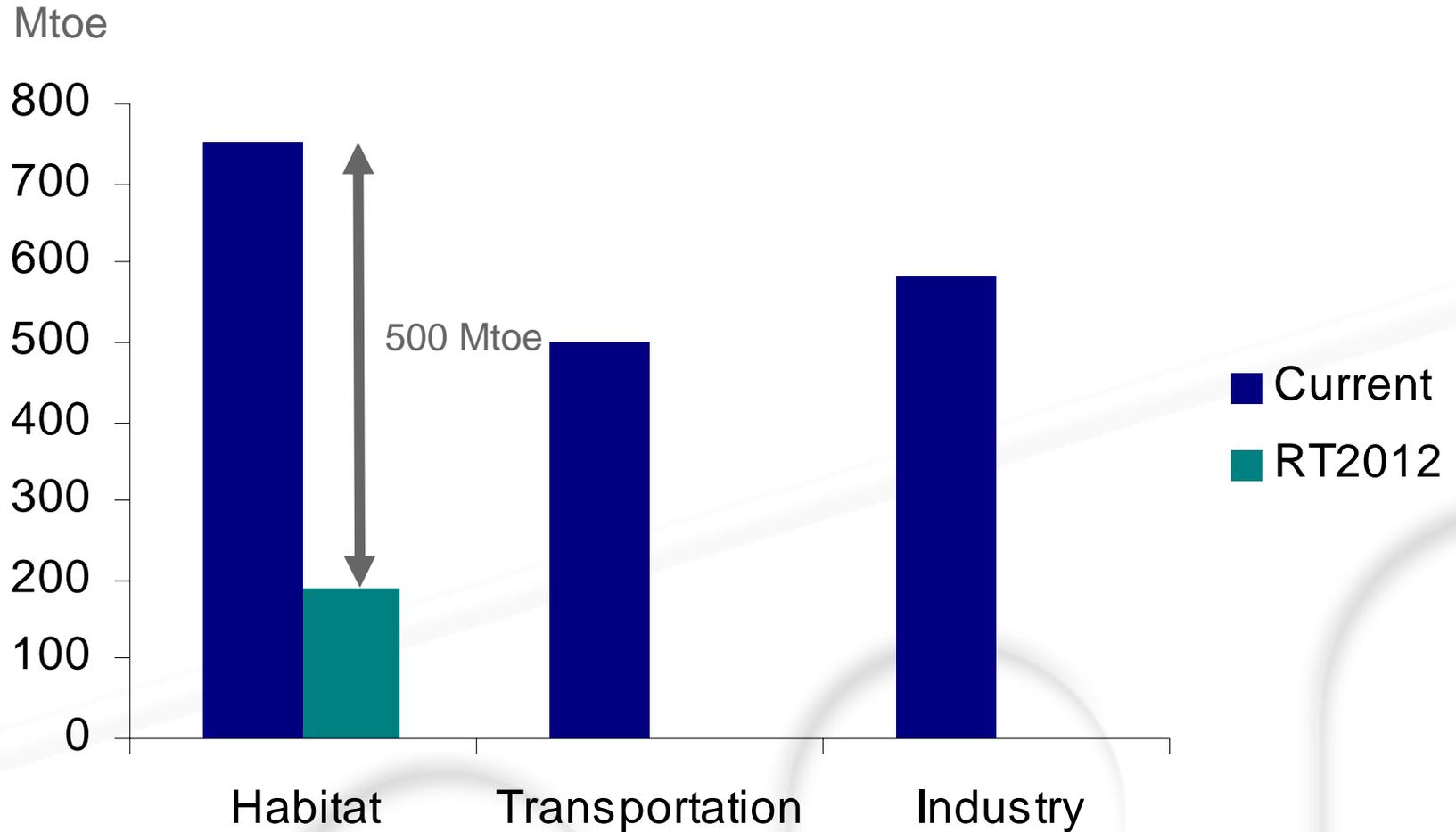
Energy consumption in buildings

kWhpe/m²/year



Europe/USA

Potential savings > 500 Mtoe (25%)



Contents

Introduction

- Habitat and the challenges facing our planet...

Strategic, cross-business programs in response to changing market needs

Increased resources

- Budget, patents, research centers, looking outward...

Conclusion

Strategic, cross-business programs

- Strategic research programs to save energy
- Strategic research programs to develop renewable energy sources
- Cross-business programs

Strategic research programs to save energy

- High performance insulation
- External insulation
- Active Glazing
- Lighting
- Solid Oxide Fuel Cells (SOFC)

We like a glass house...



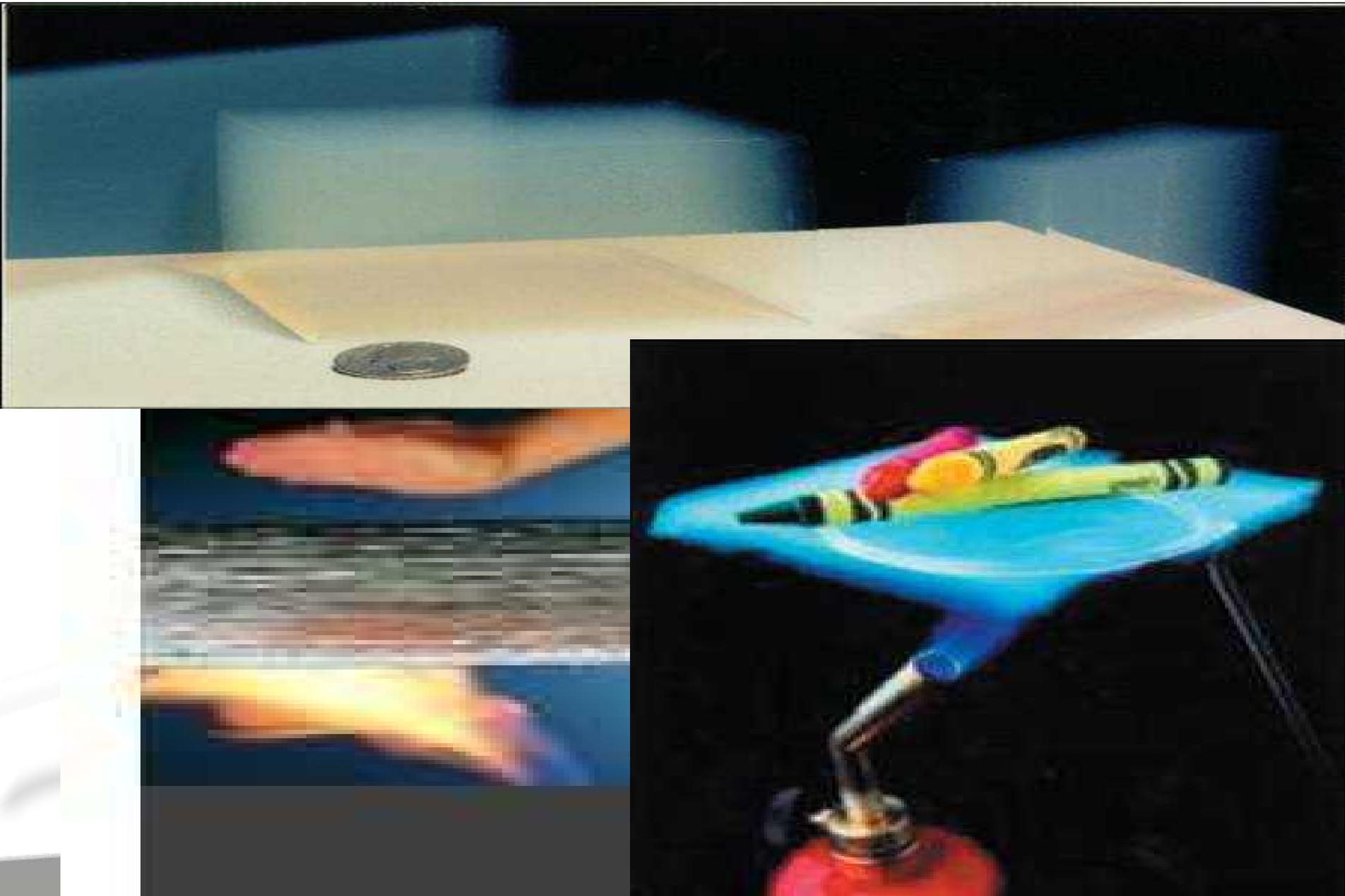
...but not only...



Numerous insulation solutions

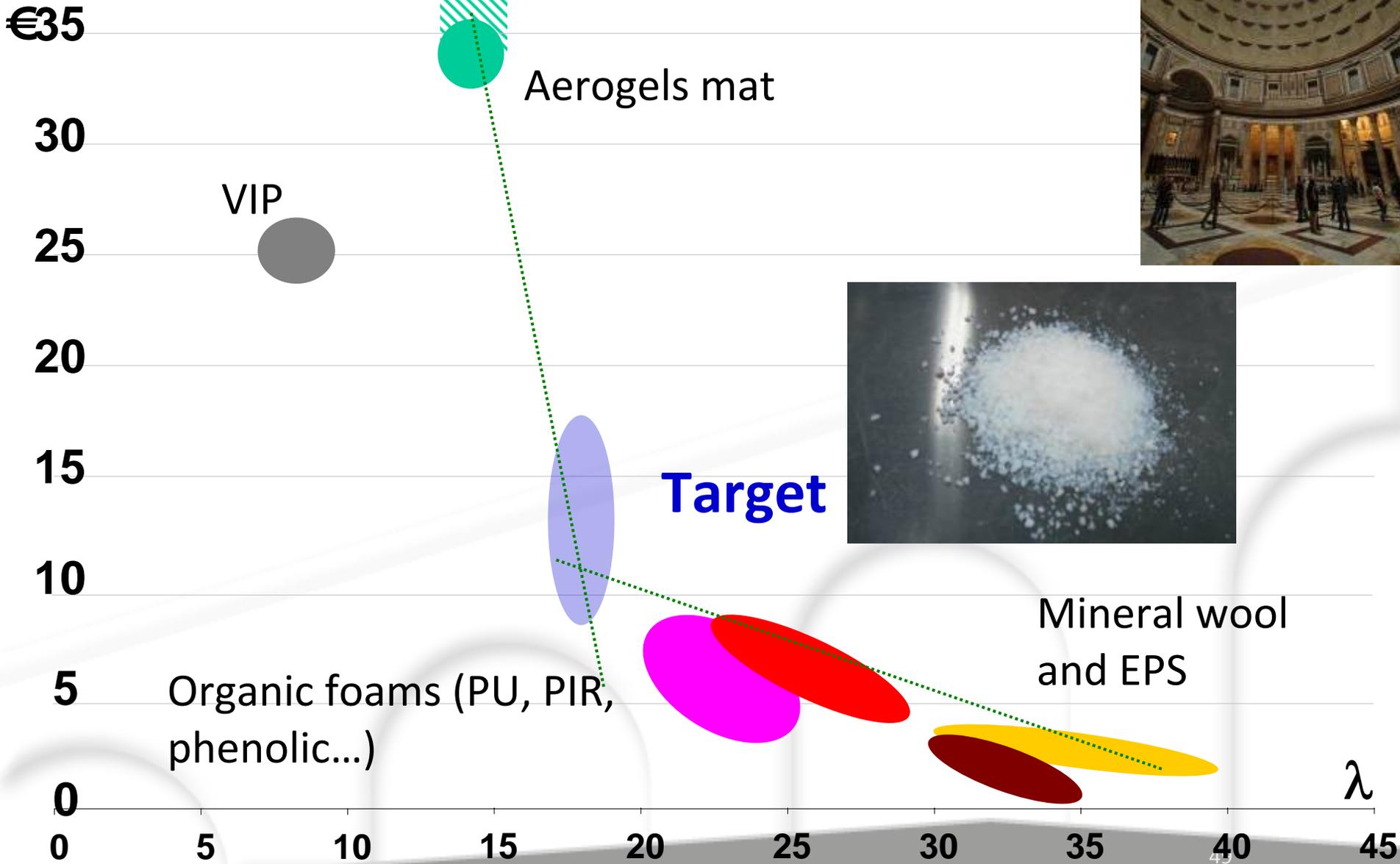


Looking to the future: super insulation



High Performance Insulating Systems

Conductivity vs. Price for 1m² / R=1



External Insulation

ETICS

- External Thermal Insulation Composite System



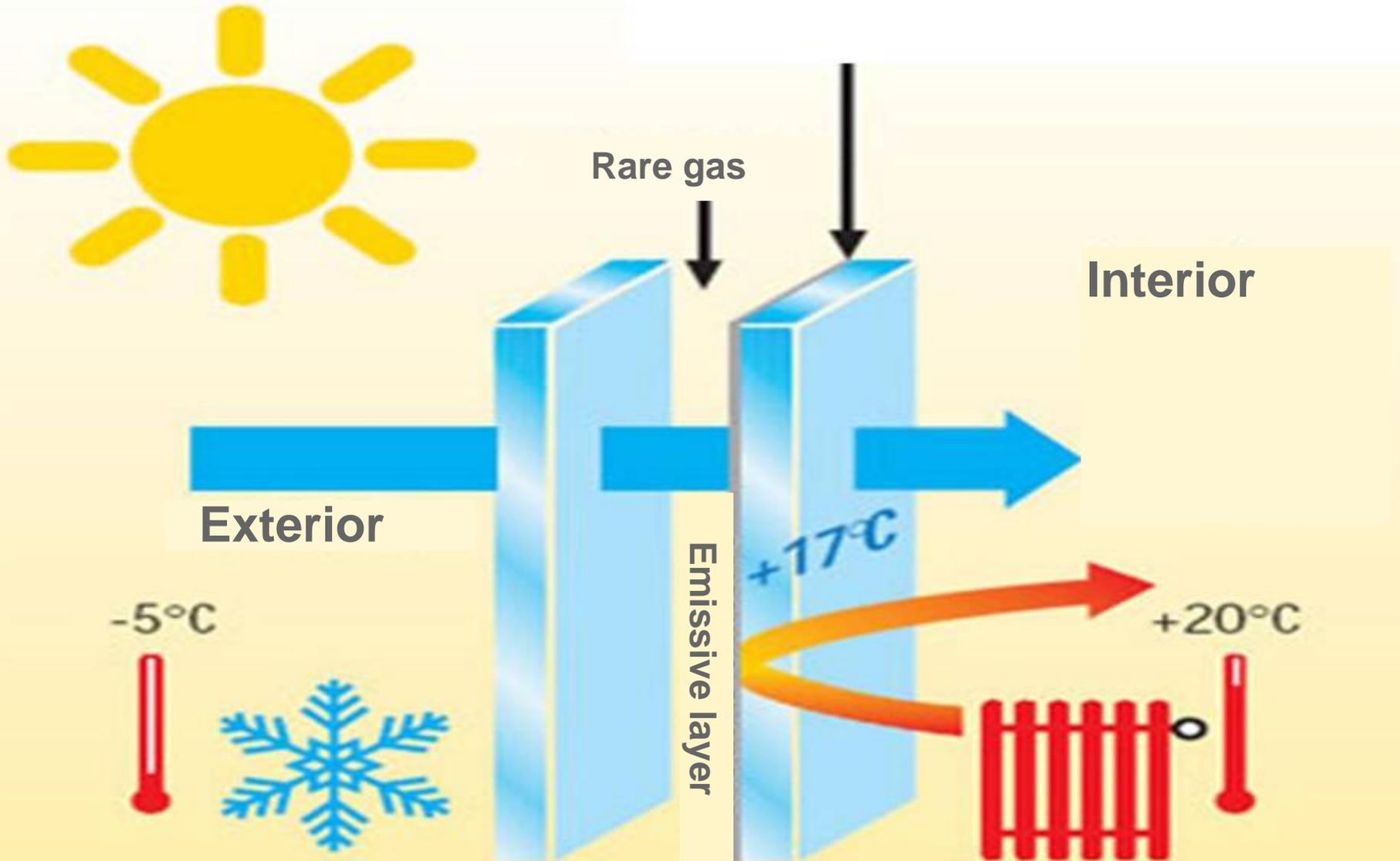
Ventilated façades



From static to active insulation

- **Glass which reflects heat**
- **Materials that react to heat**
 - Phase change materials
- **Intelligent windows**
 - Electrochromic glass

For sophisticated glazing that returns heat back into the room



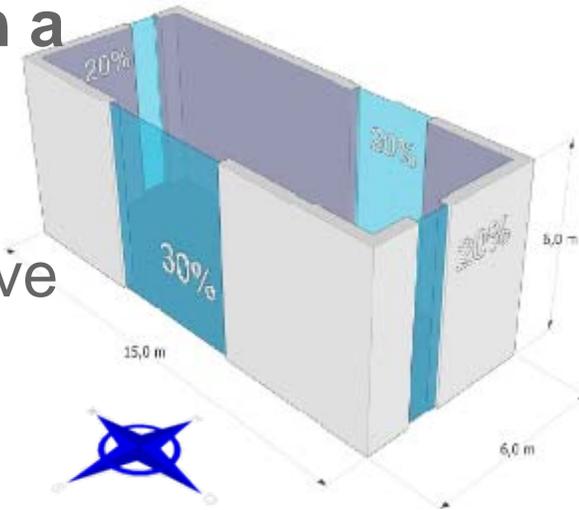
...and heats!

Triple glazing is a better performer than a wall

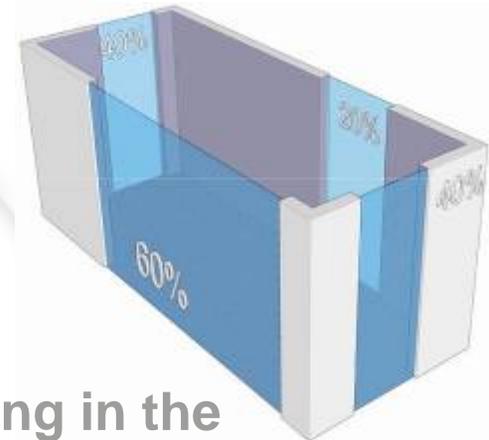
- Whatever the orientation!

It is better to **have more glazing** to improve the energy efficiency of buildings

Heat needs
11 kWh/m²/year



Heat needs
6 kWh/m²/year



	South	East/west	North	Wall
Solar Gains	+115	+69	+49	0
Thermal Insulation	- 56	- 56	- 56	- 10
Energy Balance kWh/m²	+59	+13	- 7	- 10

Triple glazing with **sgg PLANITHERM MAX** $U_g = 0.6$ et $g = 0,60$ (Salzburg) Wall: $U=0.12W/m^2K$



An extreme energy balance would lead to overheating in the summer => "4S"

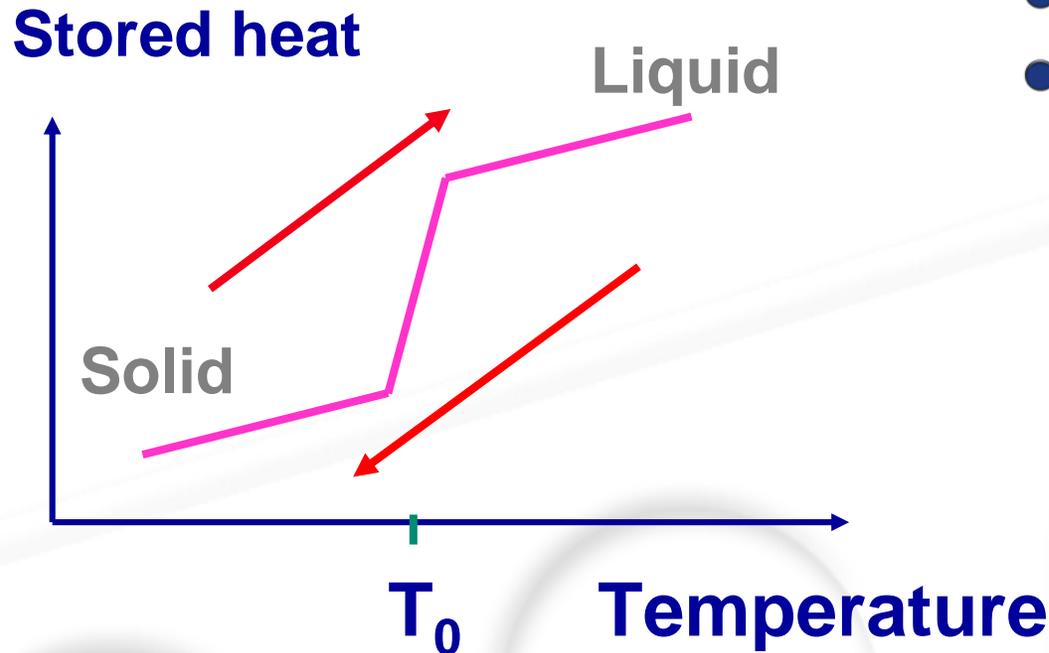
What is a phase change material?



A material that can store heat or cold

2 potential applications

- Comfort in the summer
- Energy savings



Electrochromic glass: it changes color





Electrochromic Glazing

QUANTUM^{GLASS}

INSPIRING SOLUTIONS BY SAINT-GOBAIN

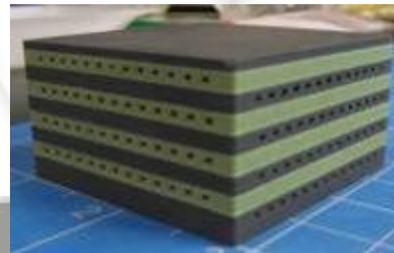
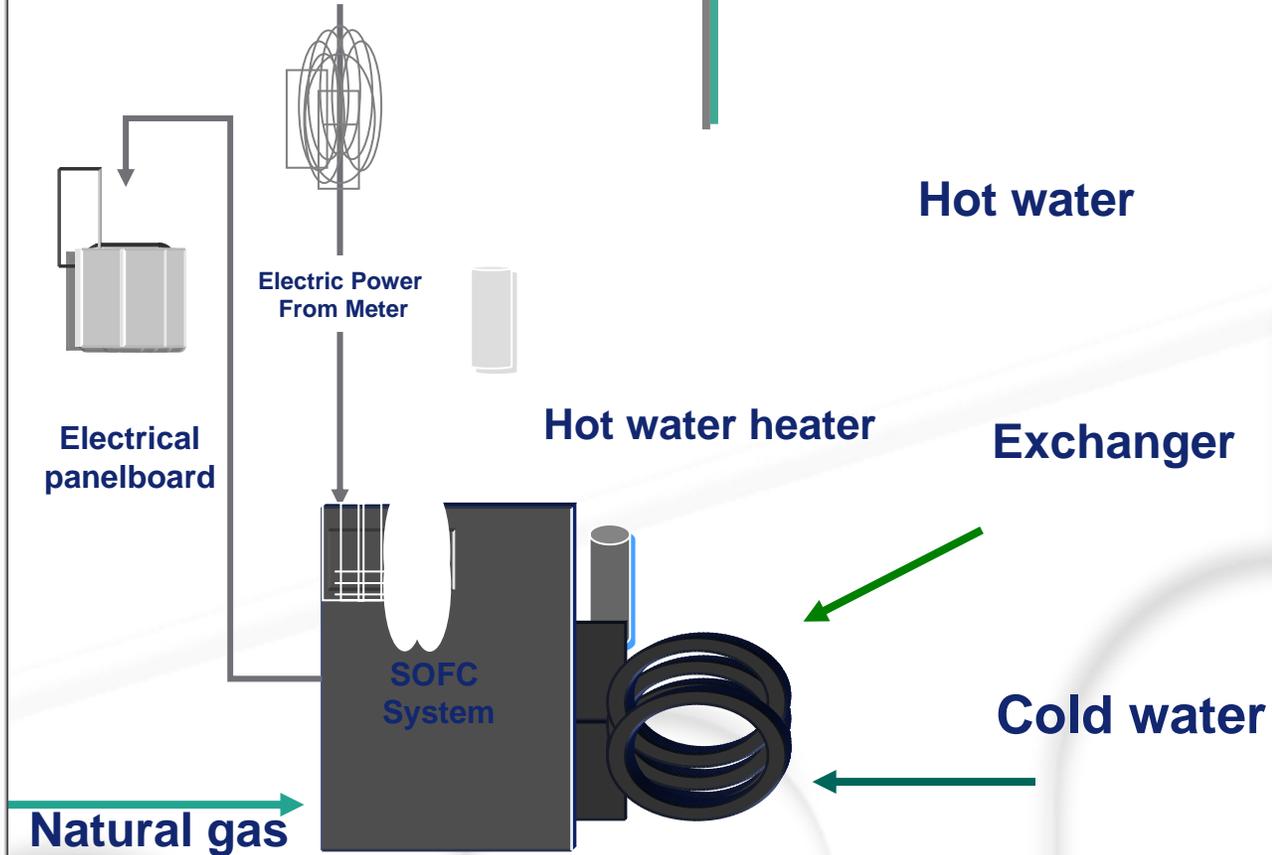
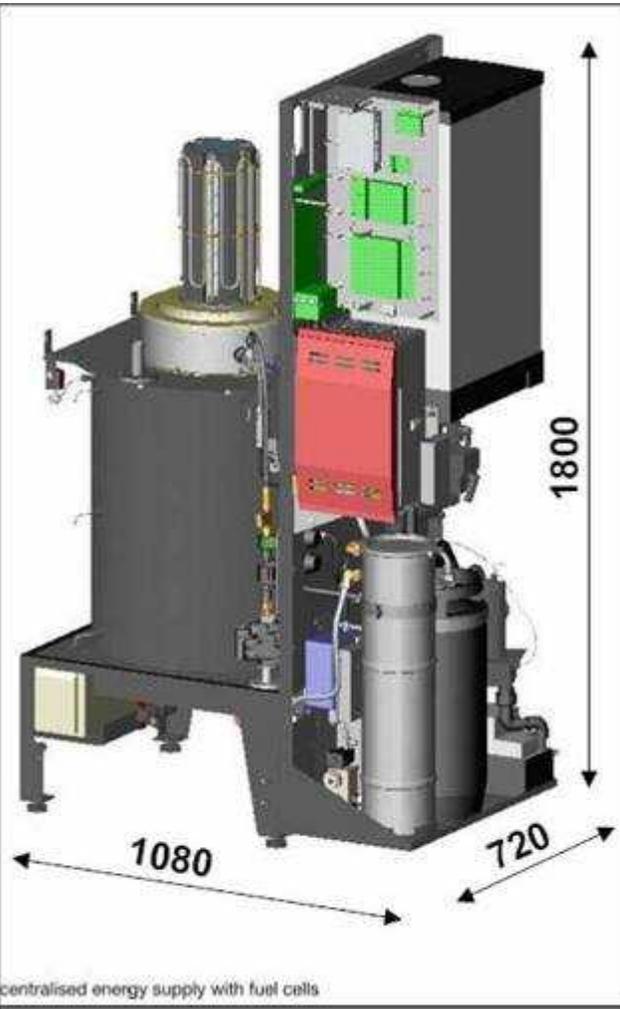
ELECTROCHROME

UNOBSTRUCTED PROTECTION


SAINT-GOBAIN

Using fossil fuel more efficiently: Fuel cell CHP

Efficiency 30% → 80%

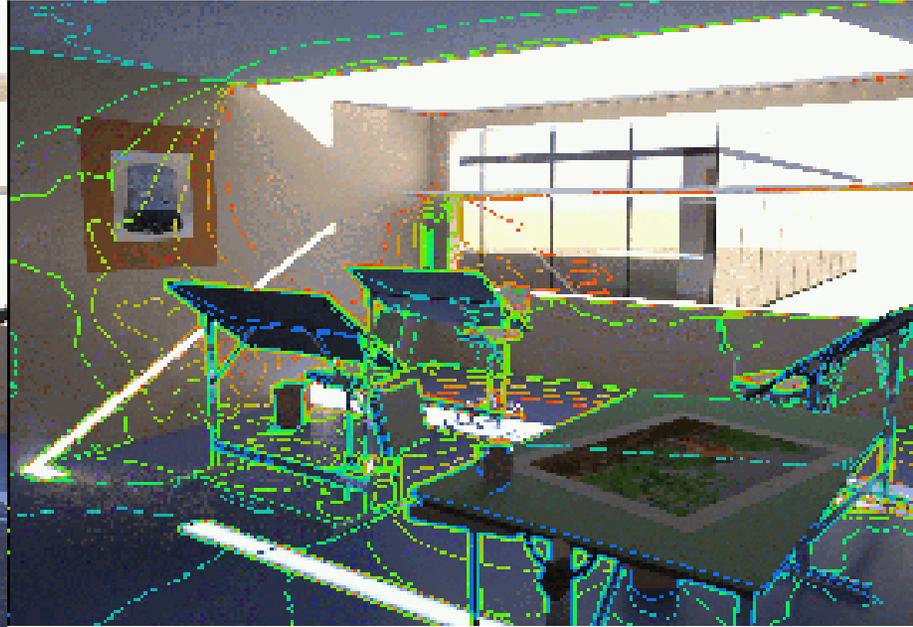


Ceramic core



Lighting

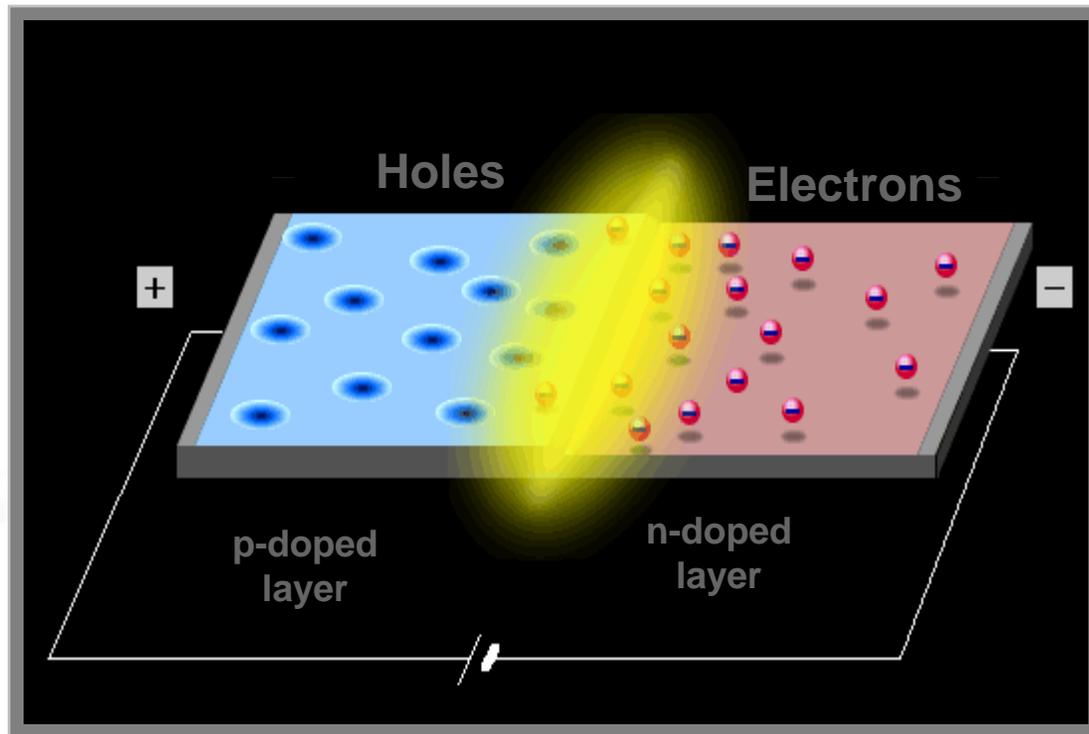
Daylighting: a better use of natural light



 Redirecting light

New technologies from electronics: Light Emitting Diodes (LED) and Organic Light Emitting Diodes (OLED)

Operating principle



LEDs and OLEDs for lighting

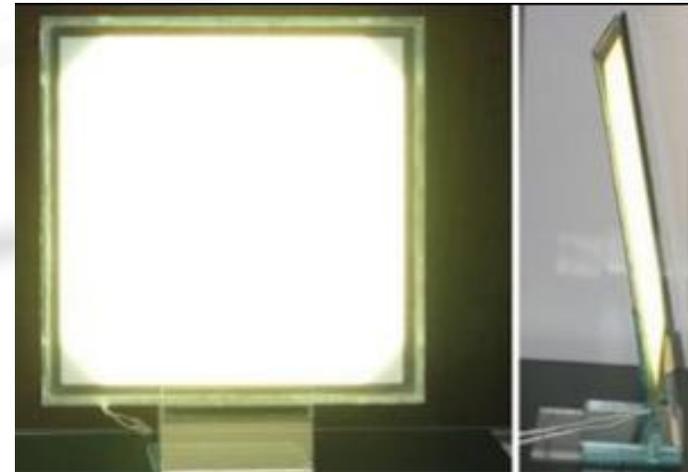
LEDs

- A well developed technology
- Mainly for point objects

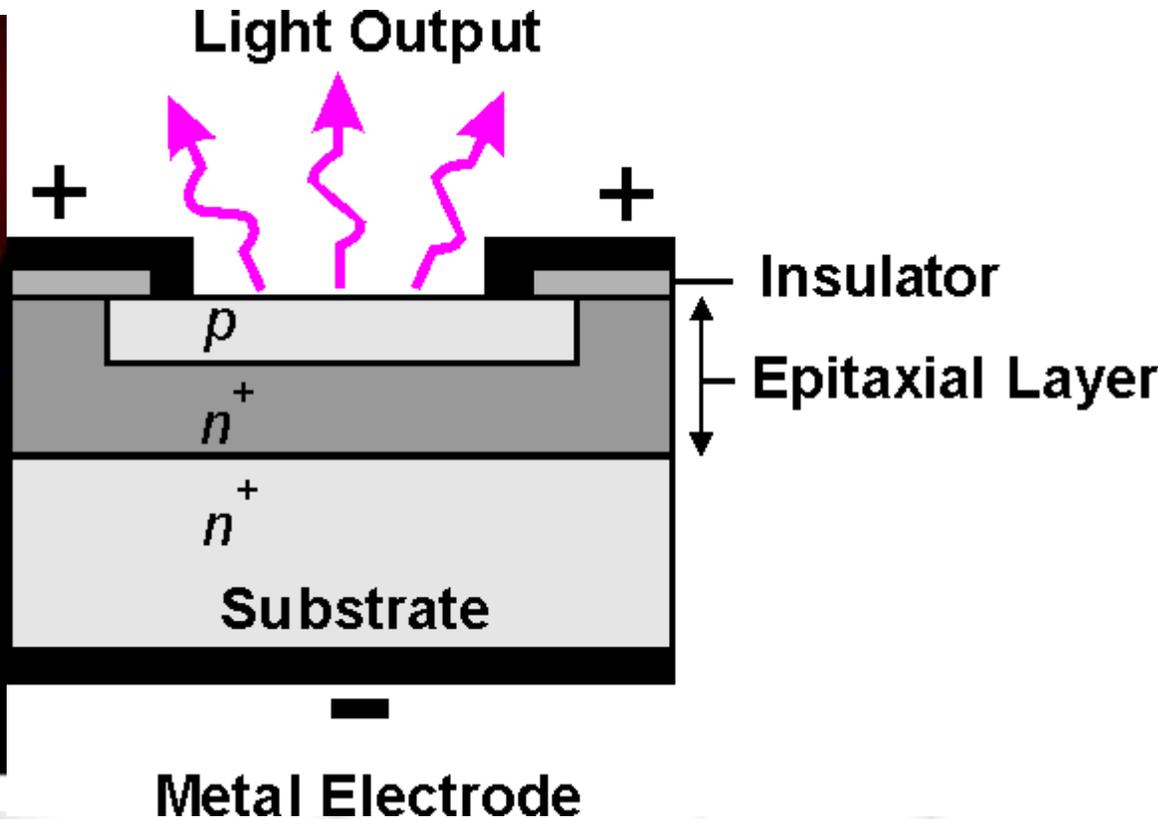
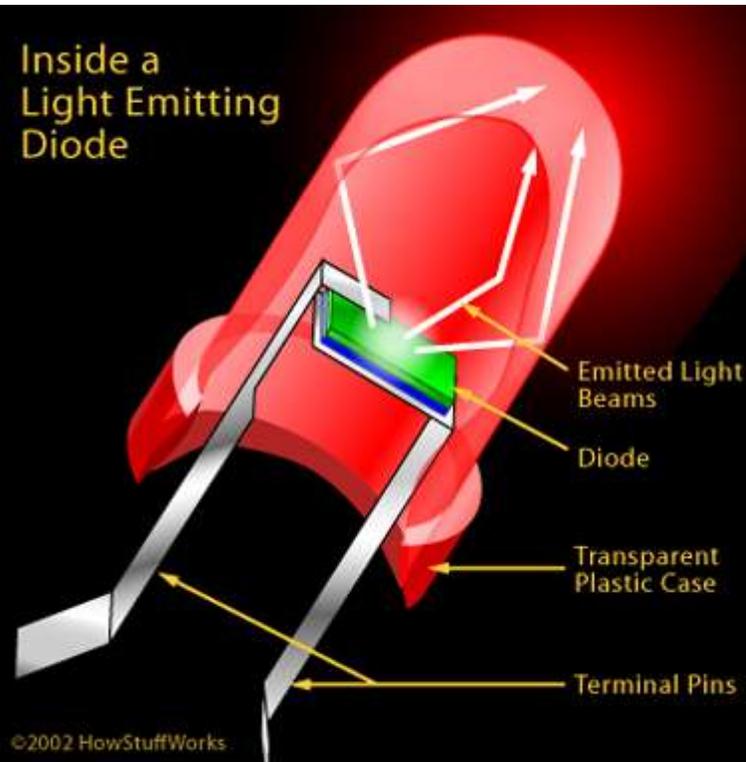


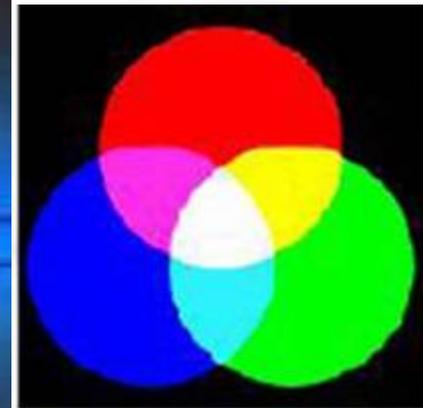
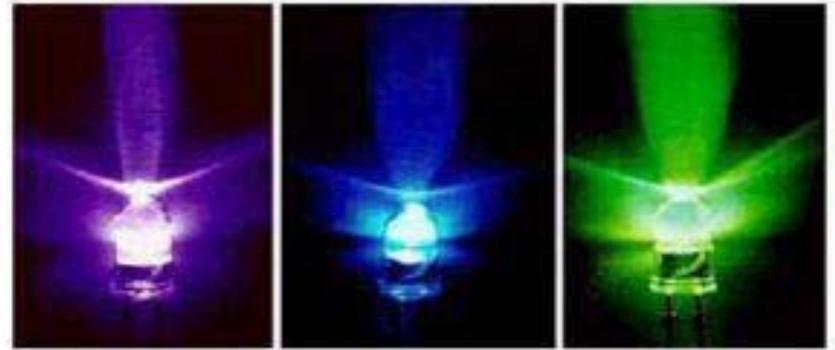
OLEDs

- Prototypes exist but the technology is just getting off the ground
- Well suited to large surfaces
- May ultimately work on flexible media



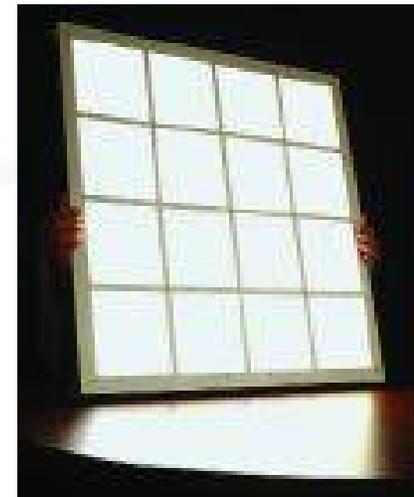
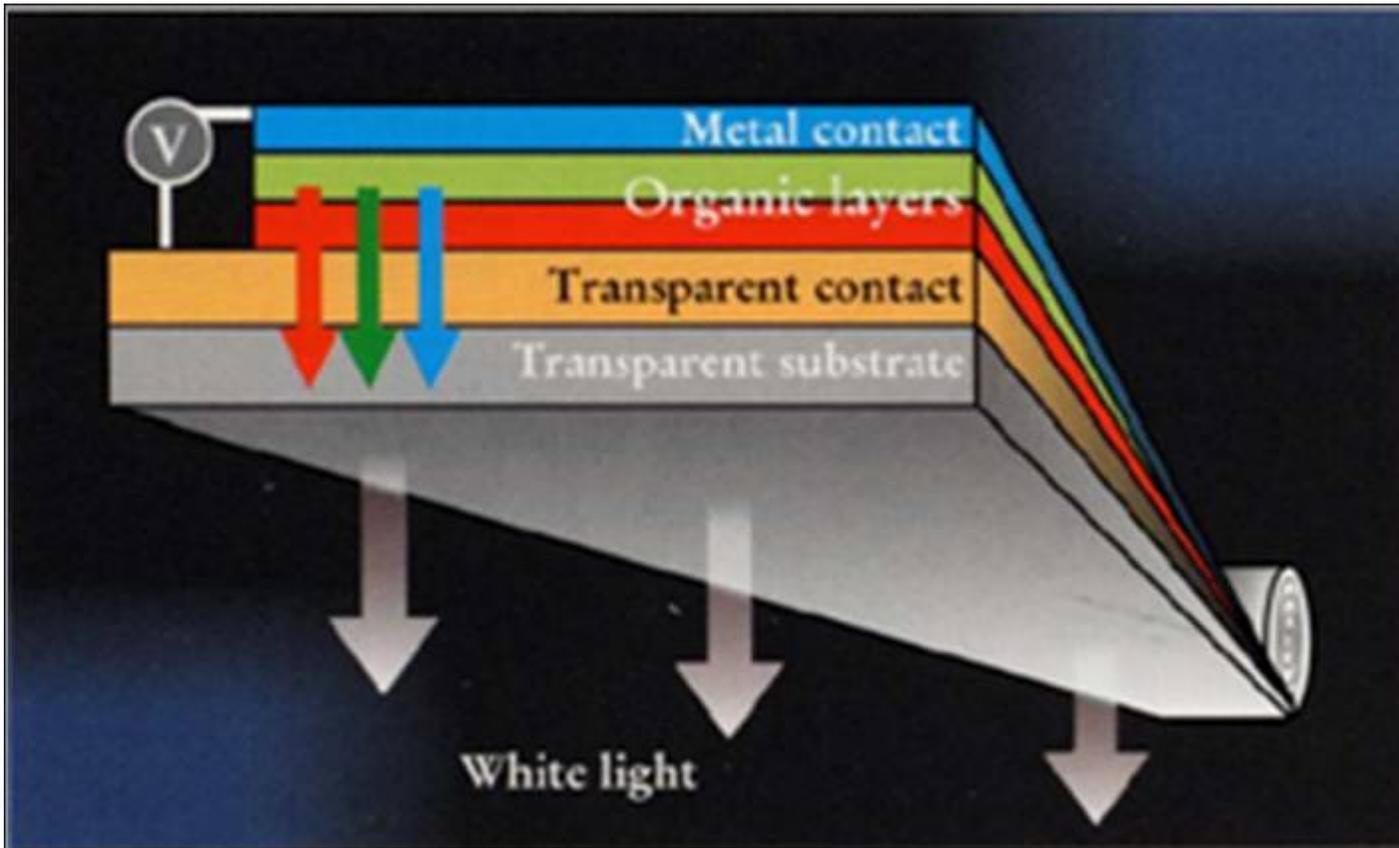
Light Emitting Diodes





OLED: Organic Light Emitting diodes

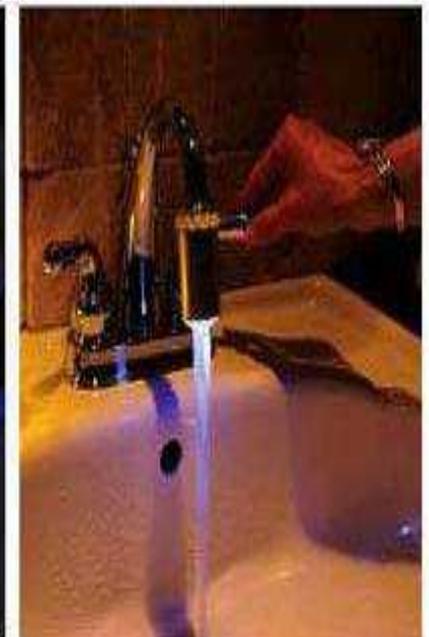
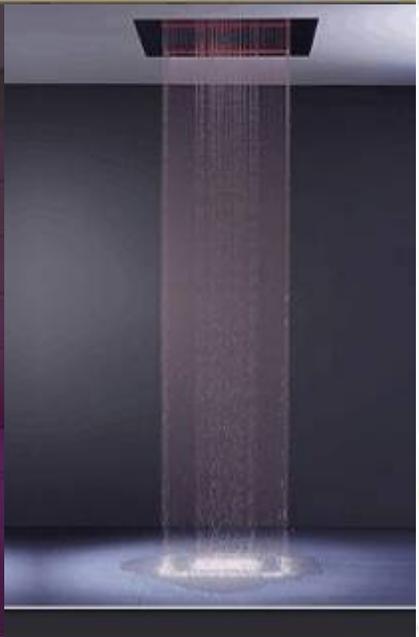
More recent



Lighted interiors



Changing ambiance









Strategic research programs to develop renewable energy sources

Biomass

- ▶ Bio-sourced materials
- ▶ Energy efficient, environmentally friendly processes

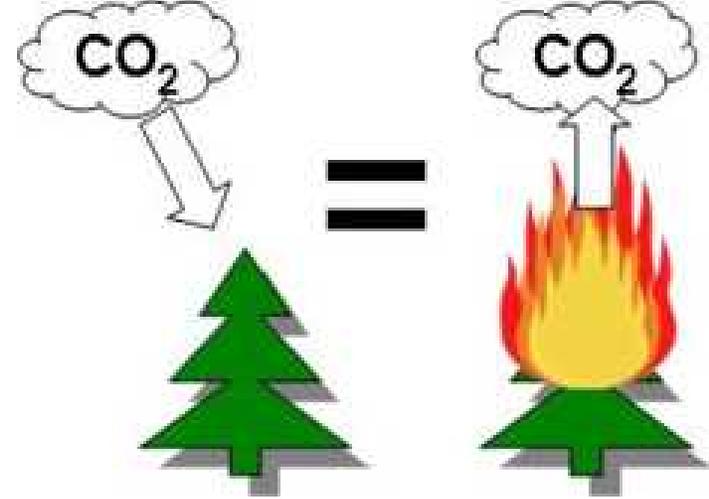
Solar

- ▶ Glass for PV cells
- ▶ Solar concentrator mirrors
- ▶ Thin film PV modules
- ▶ Building integrated photovoltaics (BIPV)

Biomass

A renewable energy

- Carbon neutral?



Opportunities for Saint-Gobain

- Second generation biofuels
 - ▶ Catalyst media for Fischer-Tropsch fuels
- Direct use
 - ▶ Cast iron and glass
- Syngas production



First generation biofuels

First generation biofuels

- **Sugar-based alcohol**

- ▶ Sugar cane
- ▶ Used directly as a fuel

- **Biodiesel: an “oil” extracted directly from oilseeds**

- ▶ Rapeseed, sunflower seeds, etc.

But raises ethical issues...

- ▶ Competition with food production



Making cast iron pipes with biomass

Charcoal instead of coke in Brazil



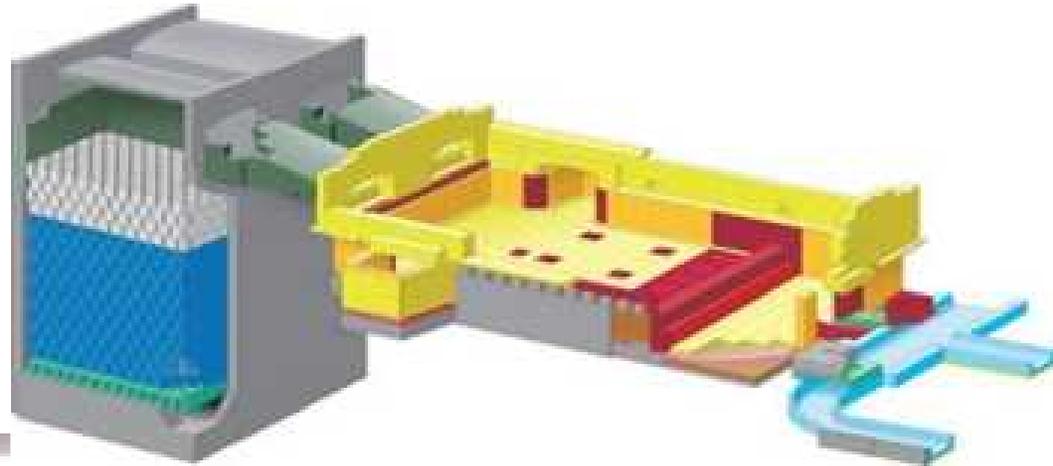
Using biomass to reduce CO₂ emissions

■ Renedo EcoBoosting project



SCM

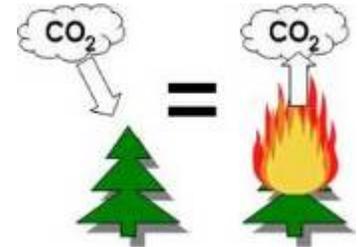
(submerged combustion melter)



Towards improved energy efficiency and environmental impact in our processes

Energy

- New methods of glass melting
 - Submerged burner
 - Flameless burners
- Reduction of the amount of water in gypsum (plasterboard)



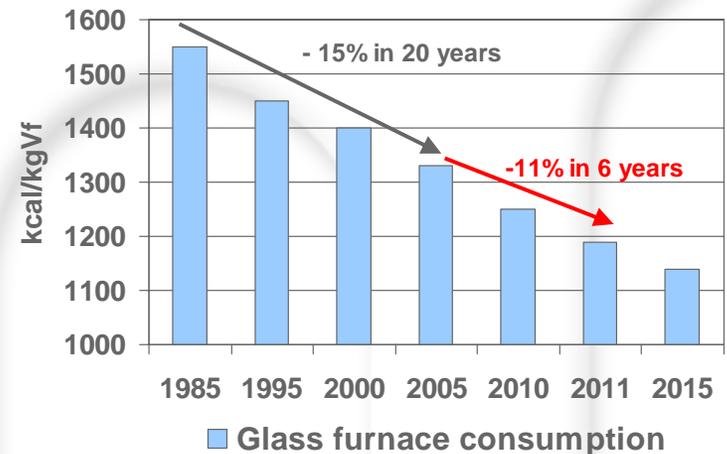
Environment (*reduce CO₂...*)

- Renewable energy: Biomass
 - Glass, Pipes,...
- Electric ovens



Tangible results already achieved

- Energy reduction in glass furnaces

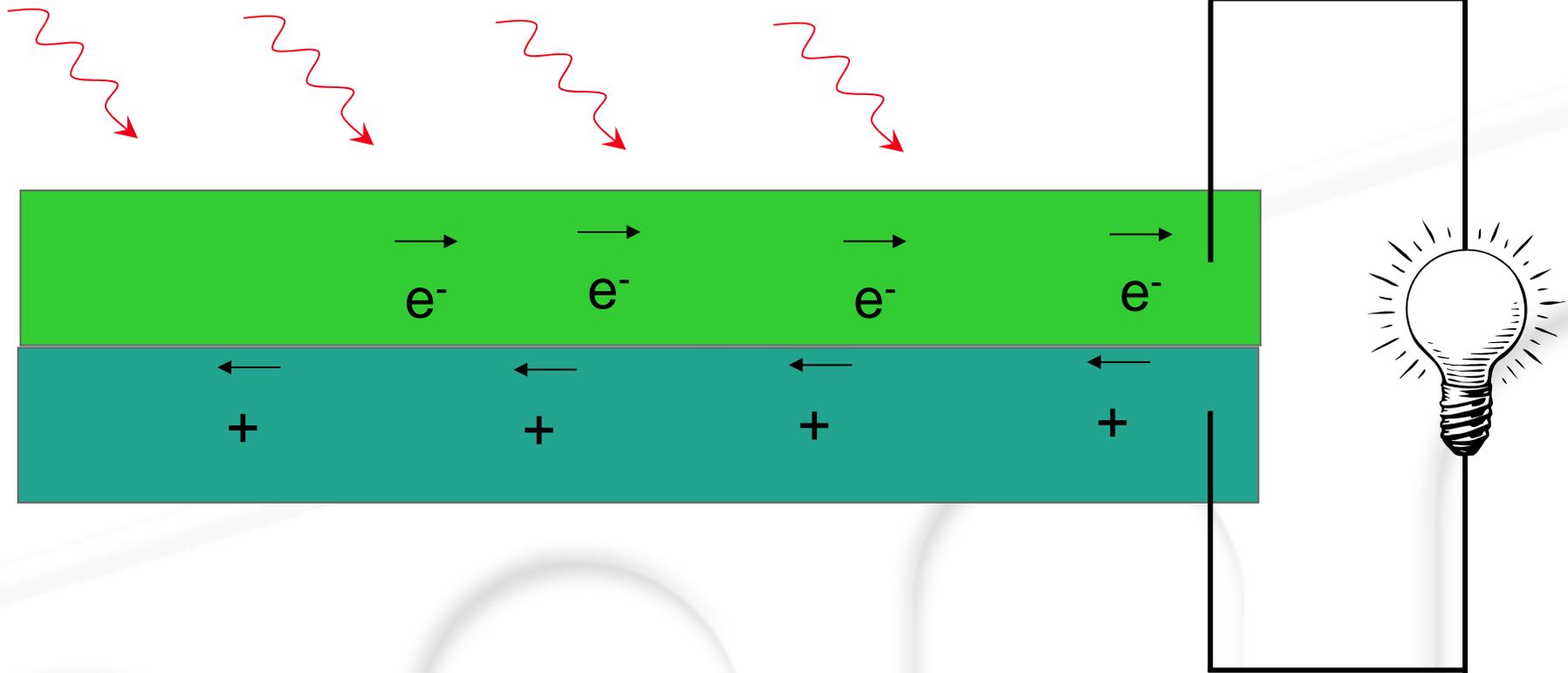
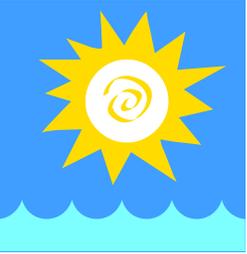


“I’d put my money on the sun and solar energy. What a source of power! I hope we don’t have to wait until oil and coal run out before we tackle that.”

Thomas Edison 1931



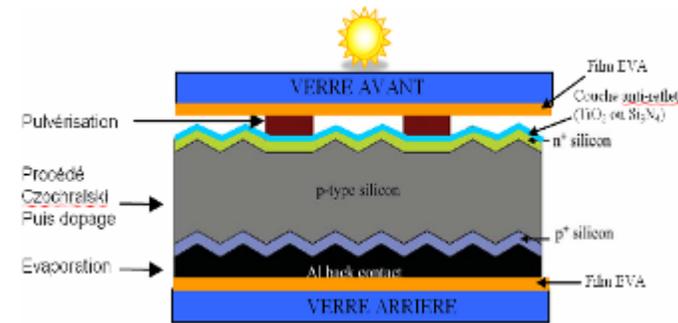
Photovoltaic effect



Photovoltaic cells

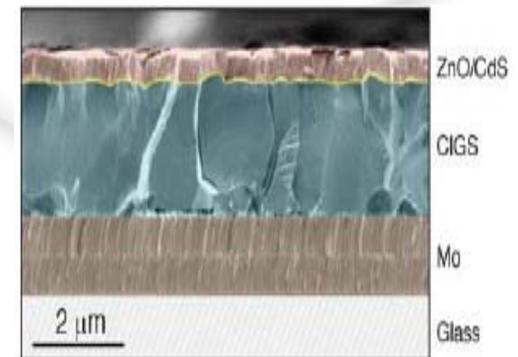
First generation: silicon cells

- Single crystal and multicrystalline



Second generation: thin film

- Amorphous silicon, CIGS, CdTe, etc.



Photovoltaics: a host of applications



**Solar farms to
generate
electricity**



**Roof-mounted
panels for
distributed
production**



**Panels for
autonomous
solutions**

A solar farm



Two major challenges

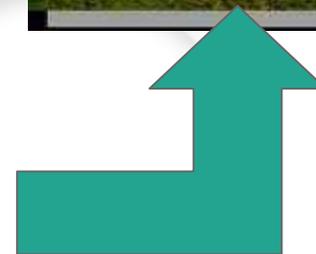
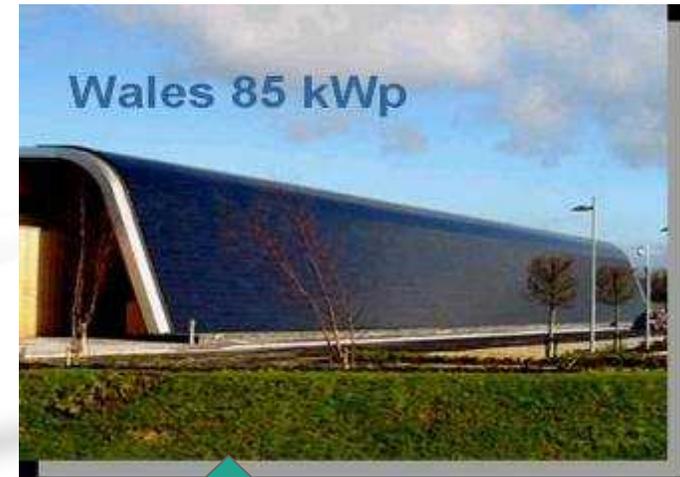
Reduce the cost of

- Modules
- Installation



Integrate panels into buildings

- On rooftops, of course
- But also in:
 - ▶ Windows
 - ▶ Walls



Solar: a large number of projects..

See Jean-Pierre Floris's presentation



Cross-business Habitat innovation to meet local market needs



Cross-business programs

1. Anti-microbial surfaces
2. Catalysis
3. Physical/chemical properties of building materials
4. Acoustics
5. Cement-based materials
6. Energy efficient building skin
7. Functional, flexible substrates
8. Fire resistance of materials

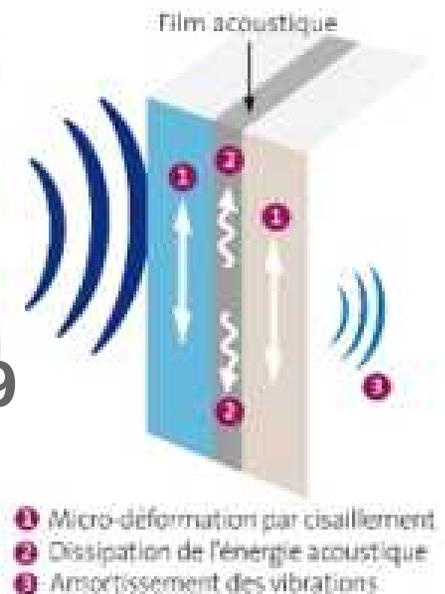
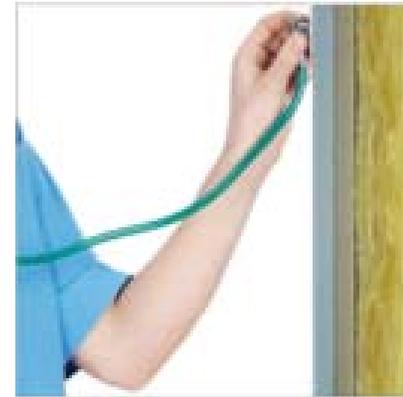
Acoustics: Duo'Tech

Plasterboard with very high noise-proofing performance

Developed by leveraging multiple competencies:

- Market needs: Placo
- Skill-set: Flat glass (CRDC)
- Glue: Weber

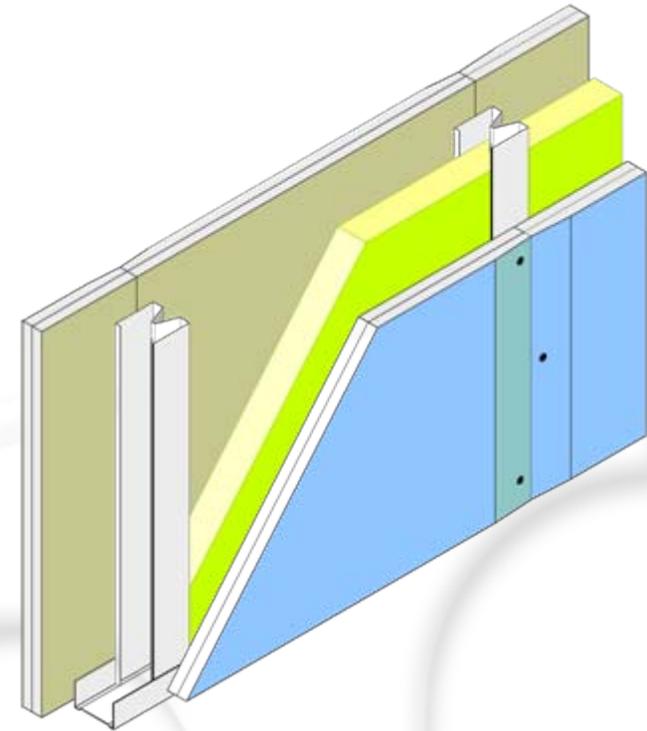
Silver medal for innovation at Batimat 2009



Placo® Duo'Tech 25

 *A revolution in plasterboard*

Plasterboard with very high noise-proofing performance



Physical/chemical properties of building materials

📍 Weber flooring for stores in China

- Developed using our ceramics capability
 - ▶ Shanghai Research Center



H&M

Energy efficiency of building envelopes

Better understanding of the role of materials / systems / building

Simulation based on our strong competency in furnace modeling

In situ tests and modeling





Open your eyes...

Contents

Introduction

- Habitat and the challenges facing our planet...

Strategic, cross-business programs in response to changing market needs

Increased resources

- Budget, patents, research centers, looking outward...

Conclusion

Increased resources

■ Evolution of resources

■ Patents

■ Methodology

- Project management
- Portfolio management

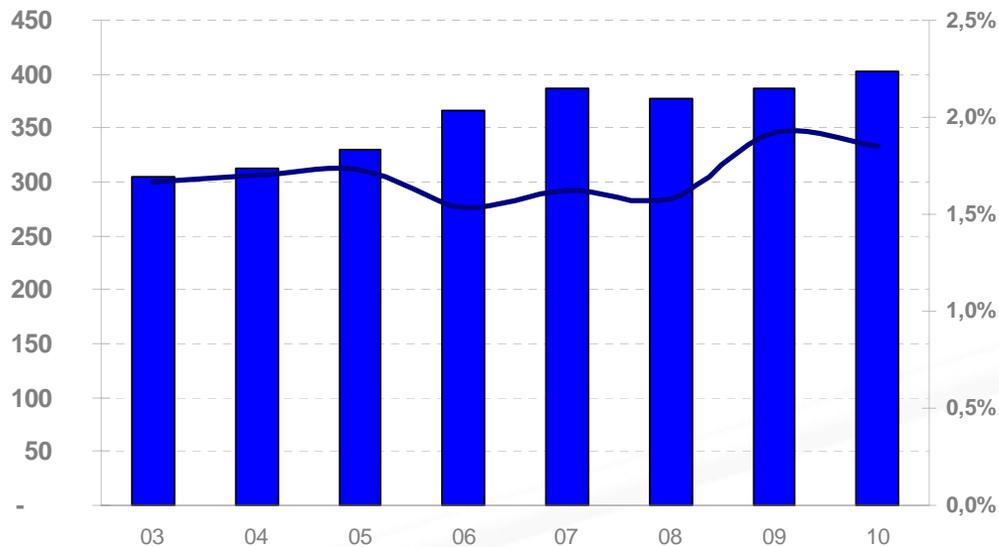
■ Evolution of the centers of research

■ An outward looking R&D

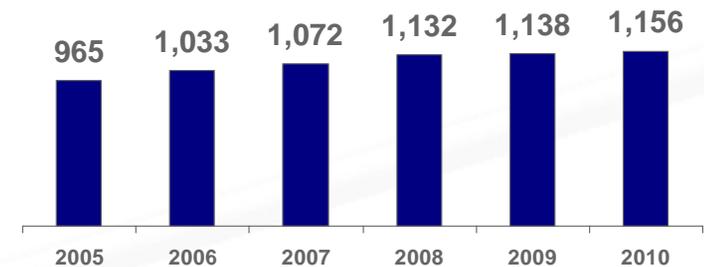
- Techno Marketing
- NOVA EV
- Saint-Gobain University Network: SUN

Increased resources...

**R&D expenses in €m and in % sales
(excluding Building Distribution)**



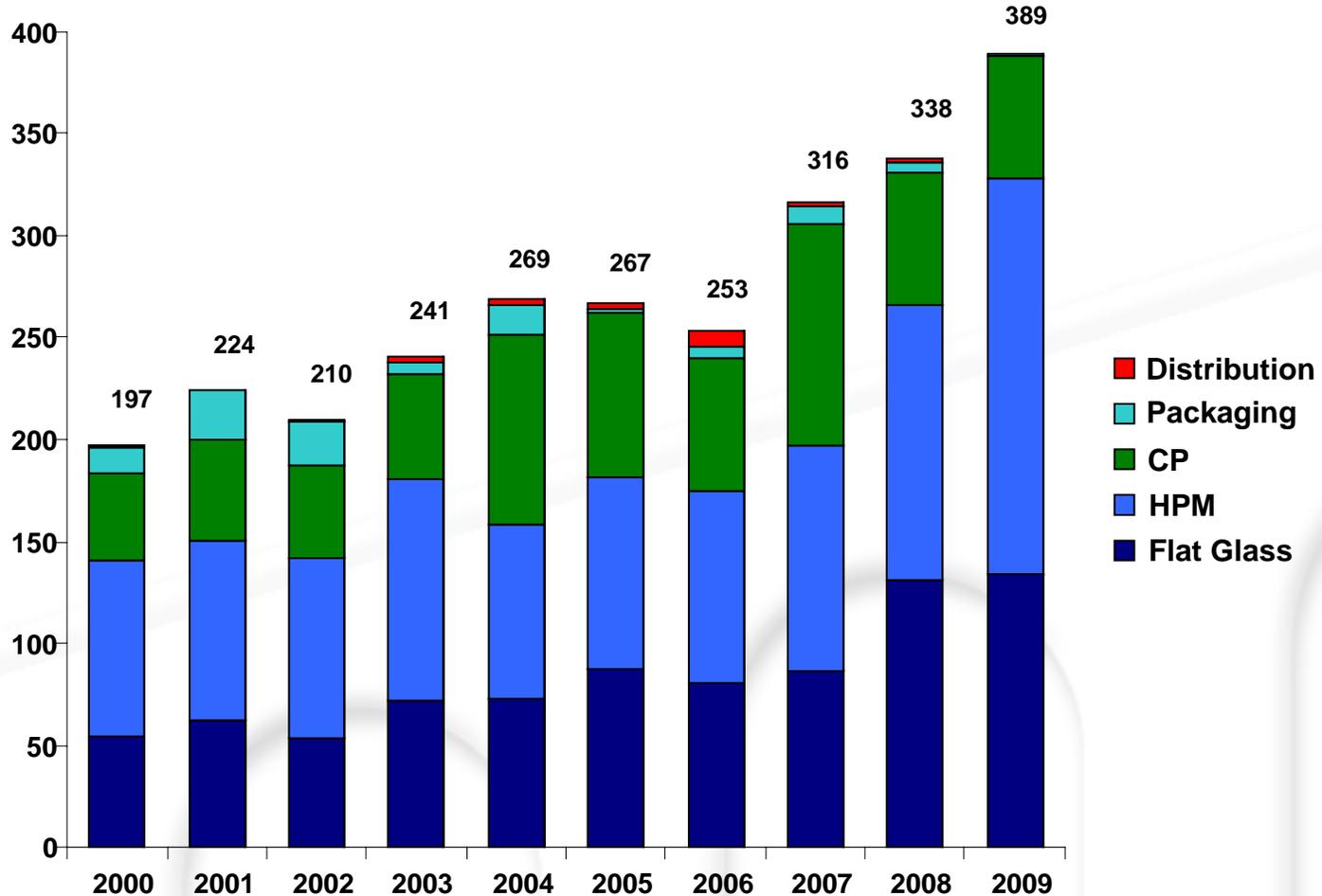
Number of scientists



**Global number:
3,500 employees**

...which have allowed us to increase the number of patents

Number of patents
(family of patents)



Four transversal research centers

Centers of interaction to favor exchanges and the emergence of common projects

Aubervilliers France



Domains

Glass; Coatings; Reactive Materials (Mortars, Polymers, Gypsum, Cement); Habitat (lighting, Thermal comfort, etc.)

Northboro United States



Domains

Ceramics; Grains&Powders; Abrasives; Plastics; Crystals; Gypsum; Exterior products; Roofing

CREE France

Domains

Ceramics
Grains&Powders
Catalysis



SGRS (Shanghai)

Domains

Ceramics
Abrasives
Polymers



An outward looking R&D

- **Techno Marketing Team**
- **Nova**
- **SUN: Saint-Gobain University Network**

At the interface between the evolution of the markets and the evolution of the technologies:

- **Develop new markets based on strong technological markets**
 - *Ex: SOFC, Solar, External Insulation, Active glazing, etc.*
- **Develop new technologies for emerging markets**
 - *Ex: Lighting, Biomass, High performance insulation, etc.*

An international team

- 15 people (USA 8, Europe 4, Asia 3)

Managed by Innovative Materials but open to all the Group

- **Transversal steering committee**
 - Corporate R&D, Marketing, planning + sectors representatives
- **To serve all the Group**

NOVA: when our innovation originates from start-ups

Objective

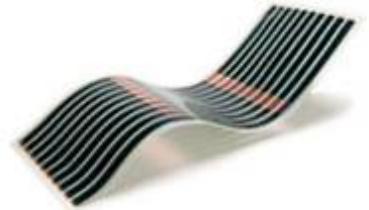
- Partnerships with **start-ups**

Diverse modes of collaboration

- Licensing, co-development
- Production agreements and distribution
- Joint ventures, equity investments

A dedicated team to

- Validate technology and market
- Identify **relevant** start-ups
- **Identify** potential collaborations
- Pass the baton to the **business** or **R&D**



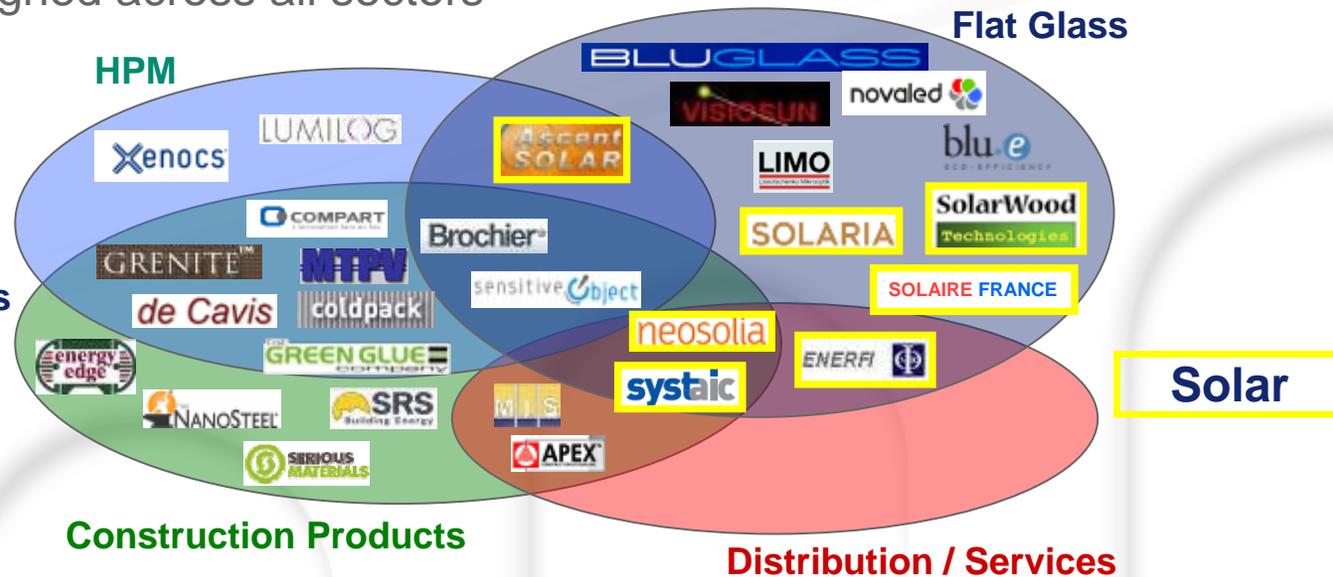
NOVA is now 4 years old

The means

- A dedicated team (6 people) spread over 3 continents
- A specific committee with 8 representative from CP and IM Sectors
- Dedicated legal support from the legal department

The results

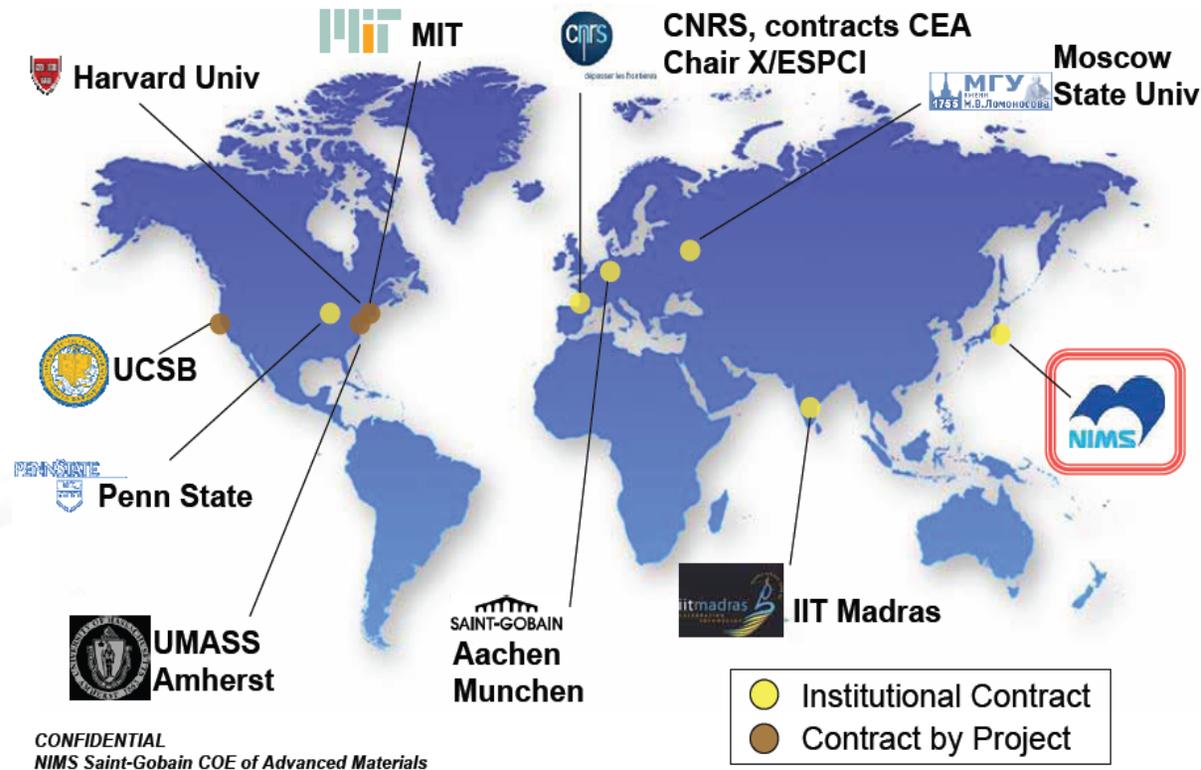
- More than **1,400** start-ups examined
- **120** start-ups analyzed in detail, with business support
- **28** contracts signed across all sectors



An academic Network of universities and institutes

Saint-Gobain University Network: SUN

- The latest scientific advances in the academic world
- Access to top level skills
- Research partnerships in emerging countries

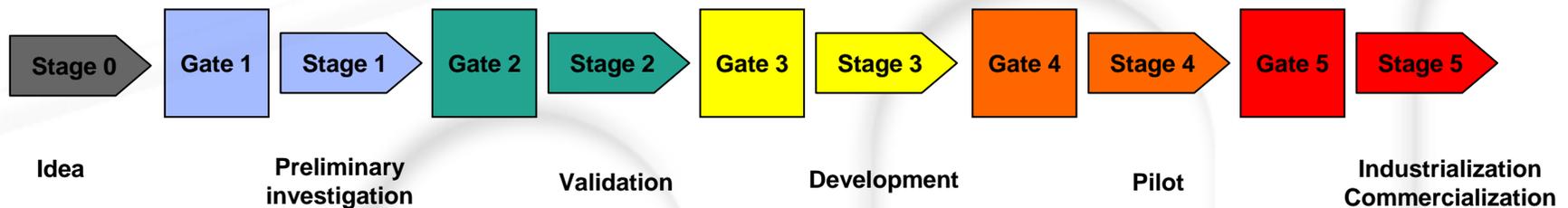


A rigorous methodology shared across all sectors

- *Saint-Gobain Gate Process: a management tool for each project*
- *Sirius: a management tool for the project portfolio*

Saint-Gobain Gate Process, a management tool for each project

- Continual **evaluation process**: the project can be stopped at any gate if the objectives, set in advance, are not met
- Steering Committee with the presence of **marketing** or relevant **industrial branches**
- Includes a **risk-analysis based** on technical, commercial, legal and Health and Safety assessments



Sirius, a management tool of the project portfolio

Sirius Objectives

- To assist in implementing the Group strategy
- To manage our R&D portfolio in an effective manner using the risk-opportunity matrix

Main steps:

Calendar per activities

Strategic planning
projects update

May - June

Consolidation of the
projects in the R&D
centers

Jul- Sept

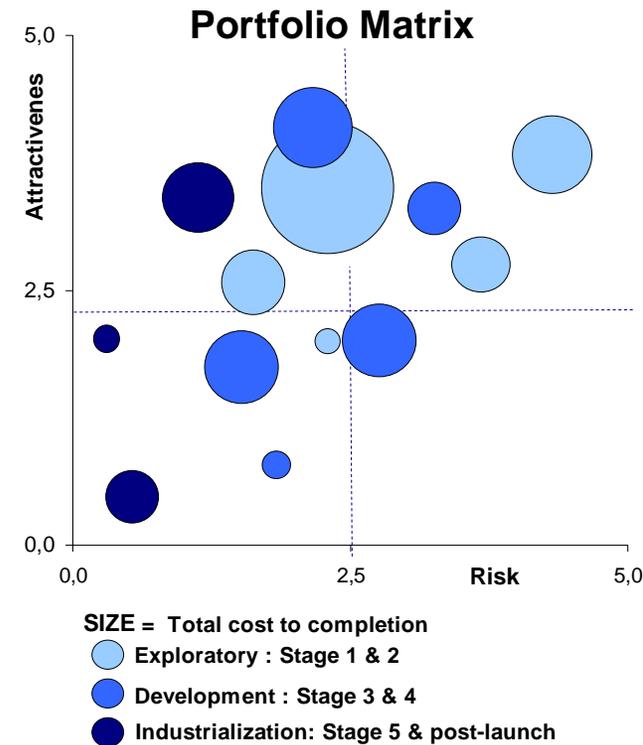
Budget

Sept - Nov

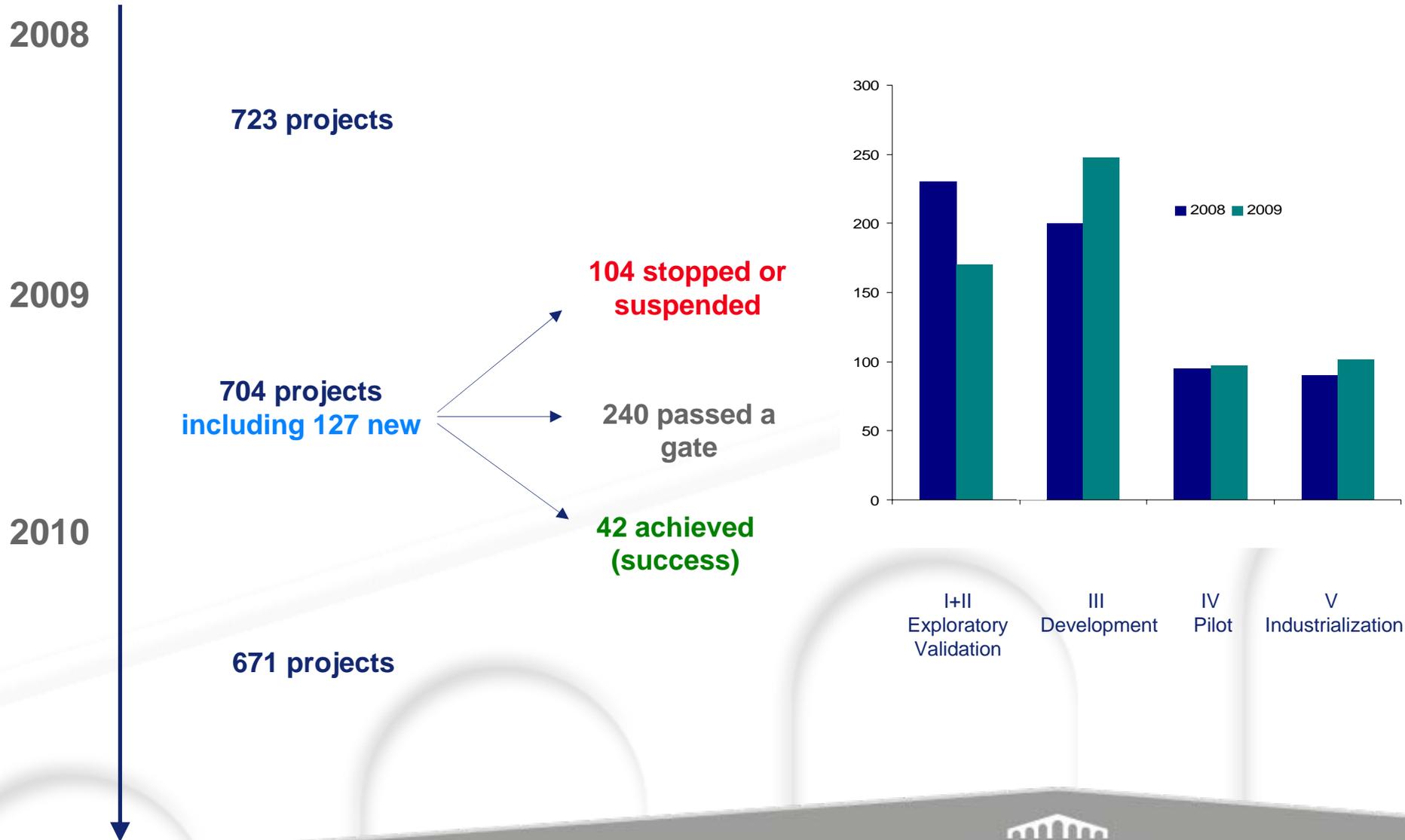
Final decision

Nov - Dec

Discussion between sectors / centers / teams



A dynamic evolution of the project portfolio



Overview

Introduction

- Habitat and the challenges facing our planet...

Strategic, cross-business programs in response to changing market needs

Increased resources

- Budget, patents, research centers, looking outward...

Conclusion

Conclusion

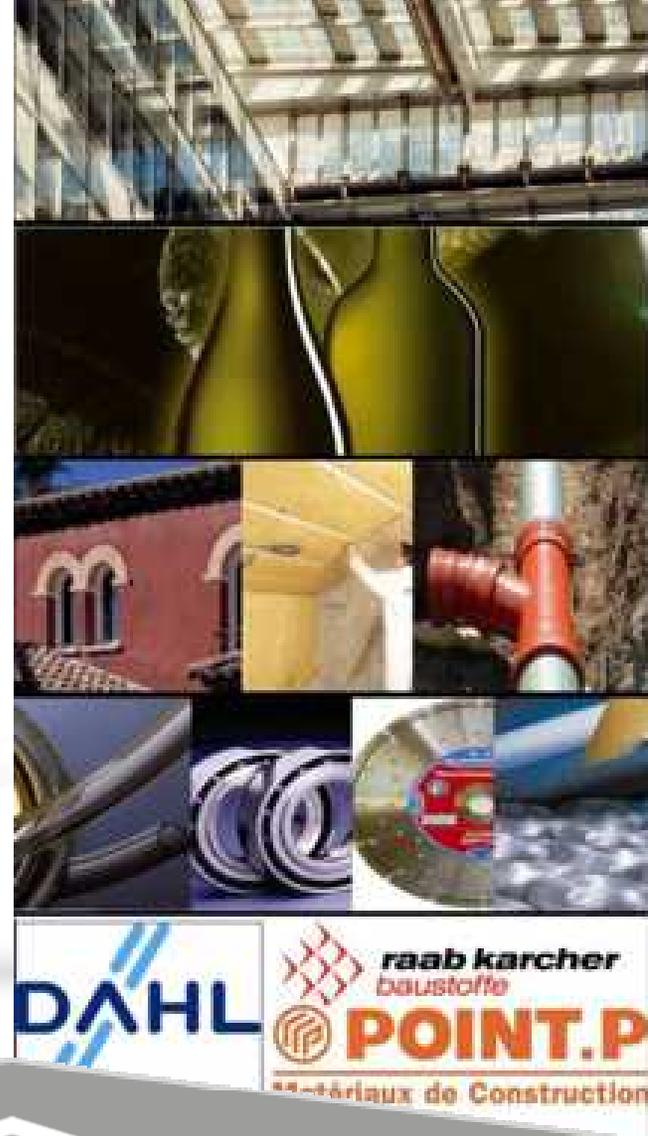
- **Unique differentiating strength to underpin our leadership**
- **A clear road-map**
- **An ambitious R&D organized to serve the innovation needs of the Habitat market**
 - **Reach 25% of new product sales in 2015**
 - **A portfolio of projects generating around €7bn of sales in 2015**
 - ▶ A profitability above Group average
 - **For €400m of R&D expenses**

Investor day

Innovation: serving the Habitat strategy

Didier Roux

Paris, 15 November 2010




SAINT-GOBAIN