

CERN

European Organization for Nuclear Research

Organisation Européenne pour la Recherche Nucléaire

## Successful transfer of NEG technology to the solar energy market

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CERN

Knowledge Transfer Group

# Outline

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*The technology development phase*

*The technology transfer phase*

*The industrialization phase*

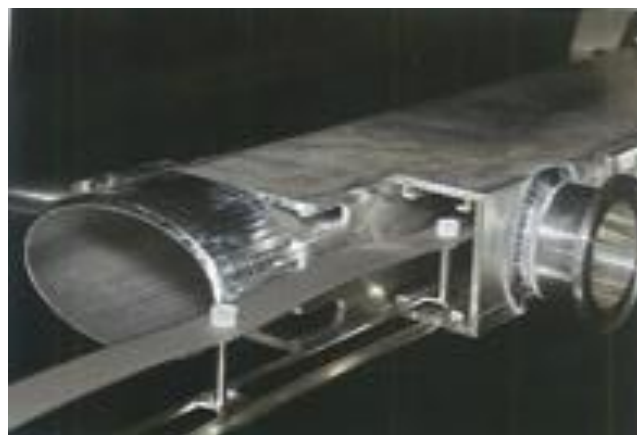
*Successful commercialization*

# The technology development phase

*70s, 80s*

*Start of Ultra-High Vacuum (UHV) research at CERN for the Intersecting Storage Rings (ISR)*

*Development of linear pumping by Non-Evaporable Getter (NEG) strips for the LEP accelerator.*



# The technology development phase

80s

*Development of Nb coated Cu RF superconducting cavities for LEP phase II.*

*By-product: the competence required to design sputtering configurations adapted to any substrate geometry and the capability of producing high purity coating.*



# The technology development phase

90s, 2000s

**Combination of NEG pumping and Nb coating techniques to produce thin film NEG coating**

**Experimental study on various elements.**

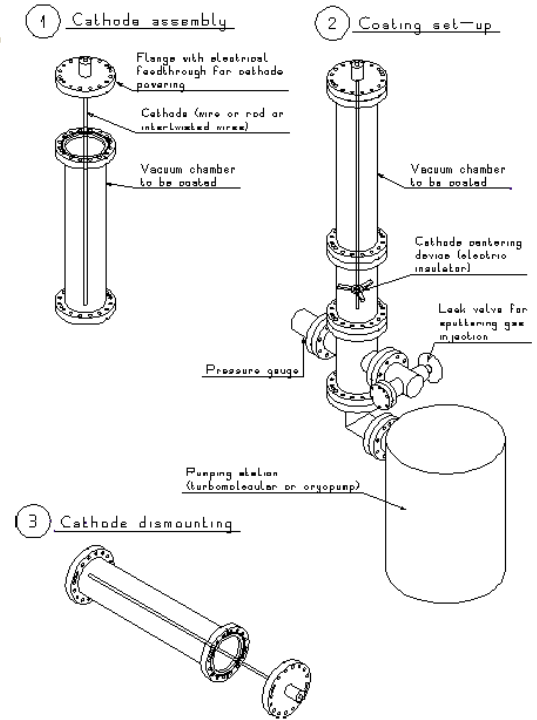
**Patent (1998):**

**WO 9749109**

**Pumping device by NEG  
& associated method**

**Inventor: Dr. Cristoforo Benvenuti**

**Thin film NEG coatings, implemented in the LHC accelerator.**



# The technology transfer phase

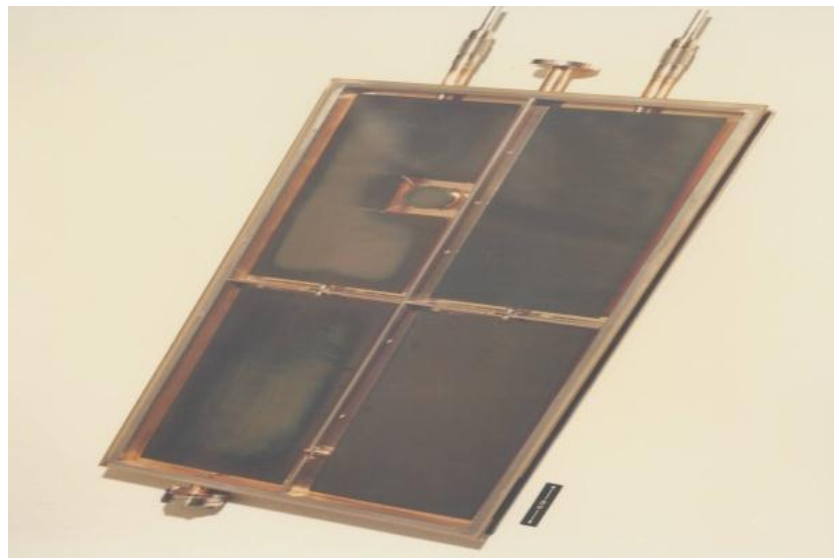
**2000s**

***The inventor develop a flat solar panel collector using NEG technology to reduce thermal losses***

***A prototype is installed on a CERN building.***

***Patent (2004):***

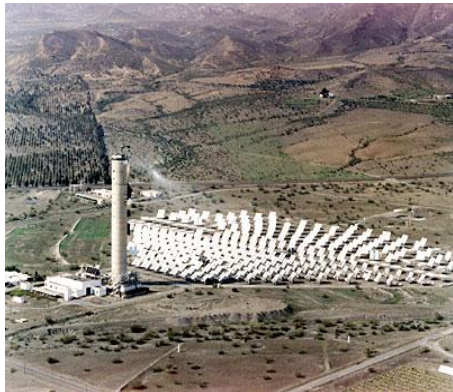
***WO 2005075900  
Evacuable flat  
solar collector and preparation  
method***



# Typology of solar panels

Thermal

Concentration



Diffused light

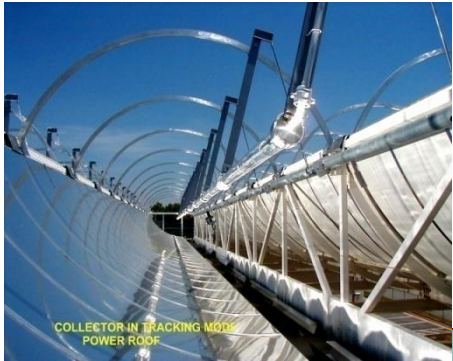
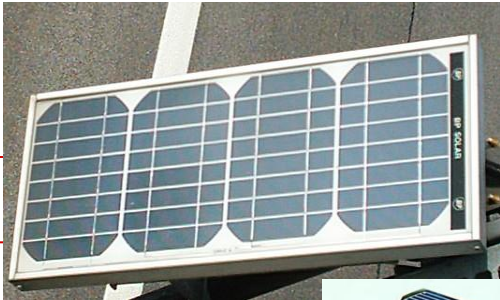
Flat panel



Evacuated tubes



Photovoltaic



CERN: Evacuated flat plate solar collector



# The technology transfer phase

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**2000s**

***CERN makes NEG licenses available to commercial companies in its Member States***

**2005**

***The inventor of the NEG and Flat Solar Panel Collector retires from CERN.***

***A Spanish automotive company Grupo Segura teams up with the inventor to create a start-up company: SRB Energy***

***SRB Energy obtains a license on the NEG and Flat Solar Panel Collector to exploit the technology in the solar energy market***

***CERN and SRB Energy sign a partnership agreement to further develop the technology***



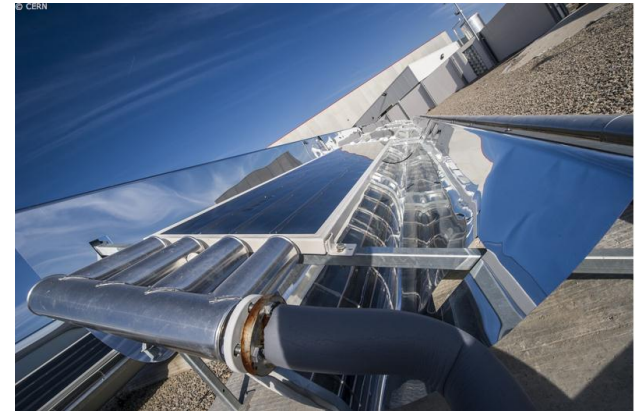
# The industrialization phase

**2006-2009**

***Development of an industrialized UHV Solar Collector with the support of CERN experts and facilities***

***5 new patents filed (co-ownership SRB/CERN)***

***Development of a production chain to manufacture the new solar panel in Valencia (Spain).***



# UHV Solar Collector characteristics

*Ultra High Vacuum*

*$10^{-9}$  Torr*

*Reaches higher temperatures than normal panels*

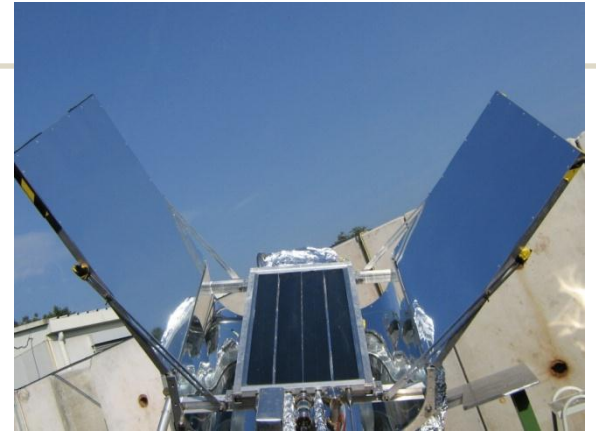
*320°C without concentration, up to 450°C with flat and cylinder mirrors*

*Take advantage of high percentage of diffused light (with concentration)*

*Suitable in regions of low direct radiation like many countries of central and north Europe*

*Long lifetime*

*Getter pumps support vacuum during 25 years*



# Solar market

0°C

90°C

250°C

400°C

**Domestic hot water and cooling**

**Industrial applications:**

**Electricity production**

**Industrial processes  
Space heating and cooling**

**Market segment of solar  
concentrated technologies**

**UHV Solar Panel in central and  
north Europe**

**UHV Solar Panel market segment**

**Possible market segment for UHV  
Solar Panel**

# Successful commercialization

2010

***Civil-engineering company opens a new solar power plant environmentally friendly "solar field" heats close to 80,000 cubic metres of bitumen to 180 degrees.***

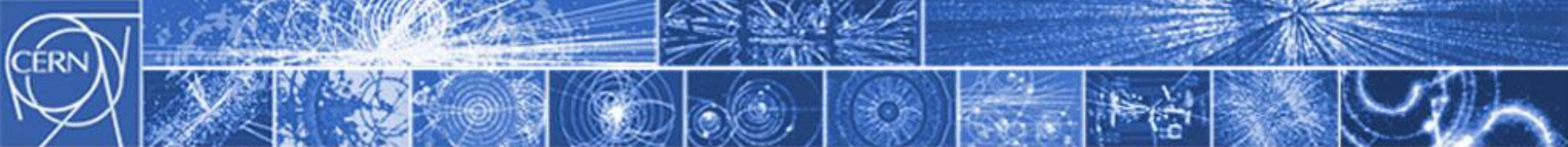


# Successful commercialization

9 March 2012

*At Geneva International Airport today SRB Energy delivered the first of the solar panels that will form one of the largest solar energy systems of Switzerland. Ultimately, some 300 high-temperature solar thermal panels will cover a surface of 1 200 square metres on the roof of the airport's main terminal building. The panels, which will be used to keep the buildings warm during the winter and cool in the summer.*





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Thank you!