Collaboration in Development of Solar Cells – Materials and Device

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Ruđer Bošković Institute

Background - Vision for PV solar future

- Economy

- Physics

PV group - science

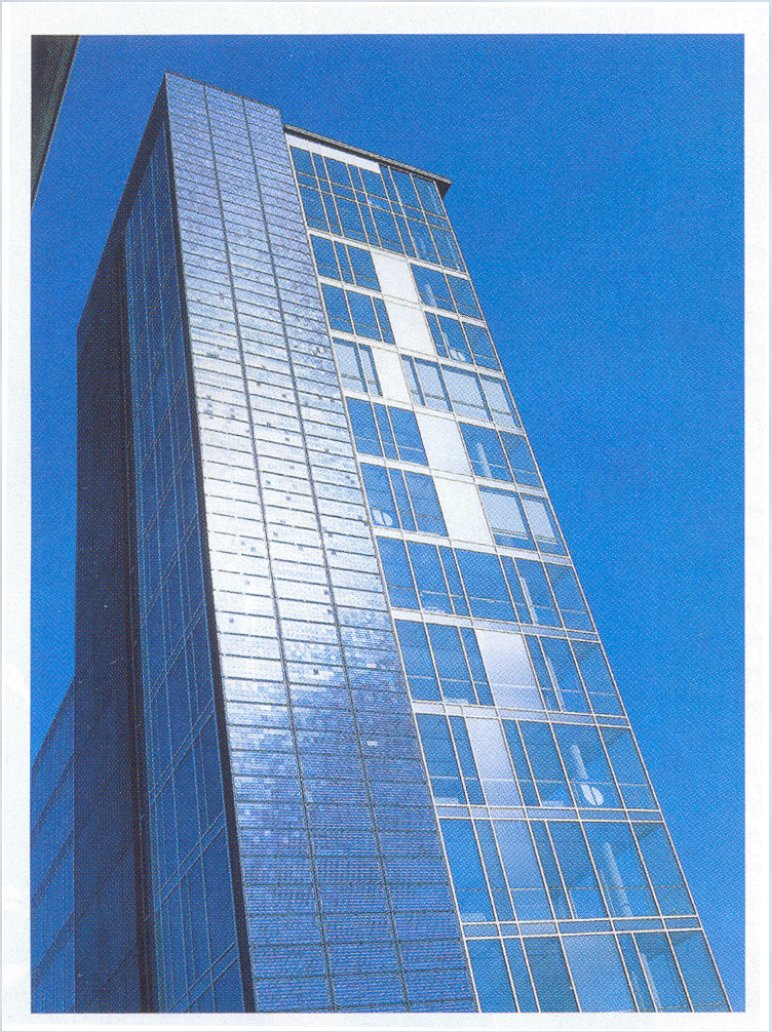
- R&D

Projects – resources, partners

- money, goals

Summary

Future? (clean, renewable,…)



Current situation and trends

Price

Solar electricity/kWh = 5-10 times conventional (has to go down)

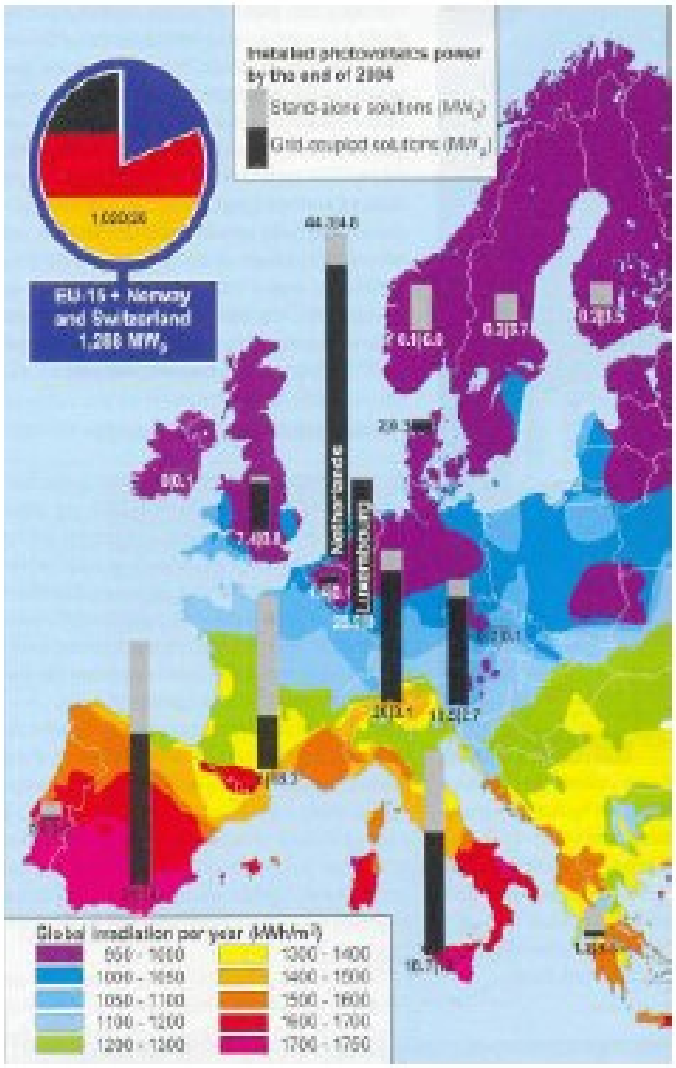
Solar PV installation = 2-5 €/Wp (target << 1€)

World production/installation

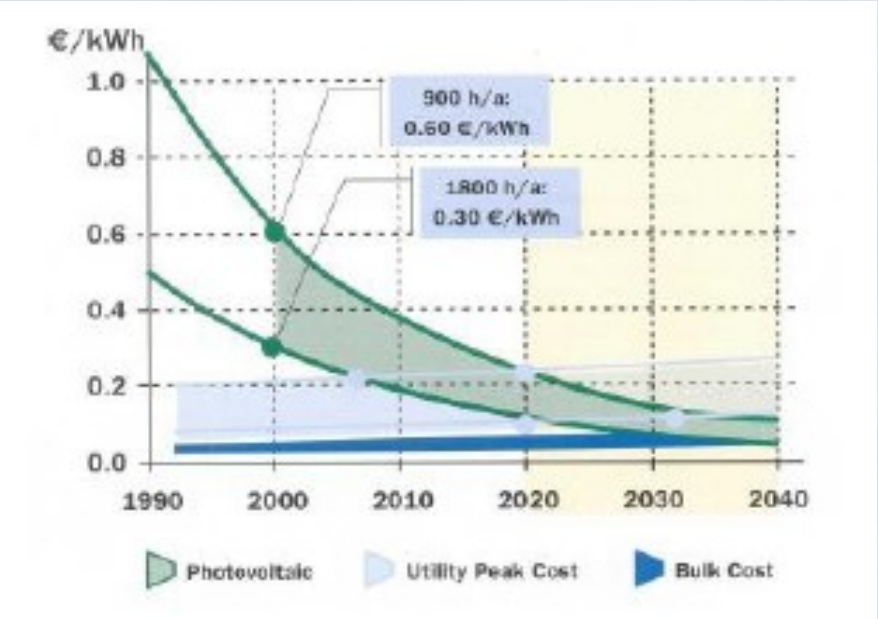
50-60% yearly increase
2GWp 2007. = 10 G€
(cumulative 10GWp)
75% governmental subsidy, 90% c-Si

Croatia/strategy

100 MW up to 2020 year ~ 40 M €/year (~ 1% needs)
250 MW up to 2030 year ~ 1000 M €, total

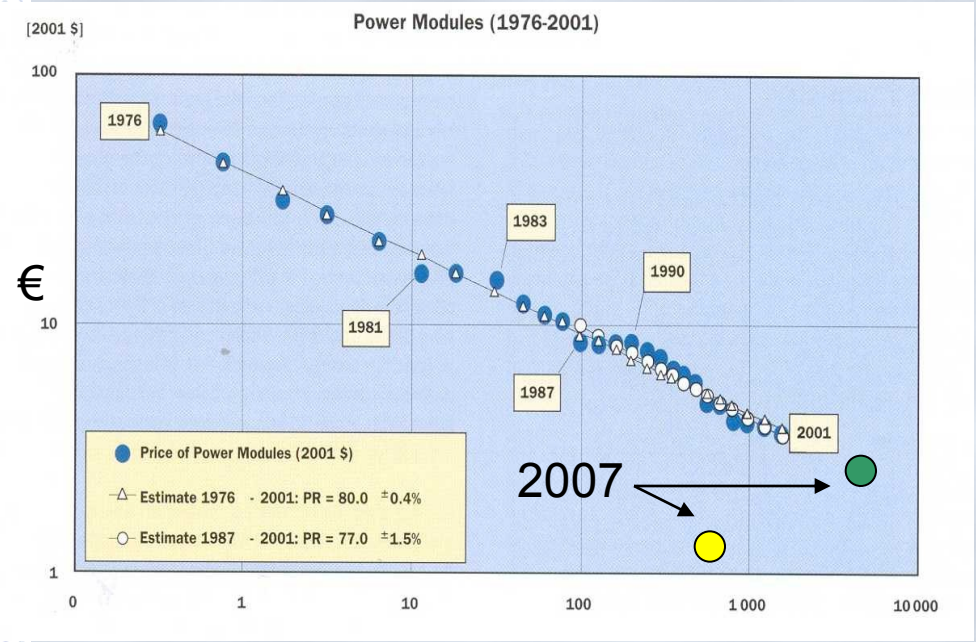


Price (only technology?)

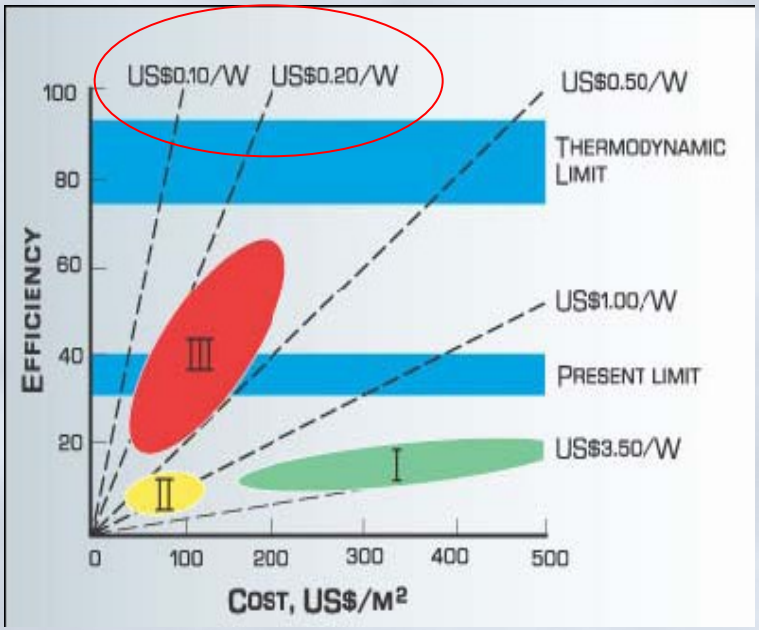


Science & economy about price

competitive



production



Learning curve

- Mono-crystal Si
- Thin film (Si)
- 3. Generation (nano-Si)

Our potential

Solar cells Split – thin film solar cells factory works from 1990

Lipik glass

Ruđer Bošković – PV group

How to use it?

Usual way of work – projects

(with partners in sci. , industry)

Problem of collaboration with industry

Industry

Leak of qualified people for

R&D (project is expected, development, R&D group)

Performing the project tasks on quality way

Administrative job (demand for people + time)

Different scale of thinking, no cash

Problem with the Institute – leak of interest – it must be part of regular activities (regular, scientific projects)

Limited resources (people, instruments, money)

Problem of collaboration with industry

Industry

Leak of qualified people

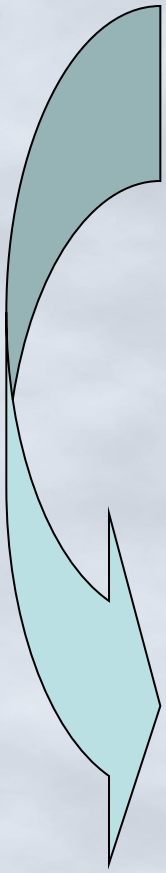
– to find the money for education on the Ruđer Bošković Institute – PhD (trough project)

Different scale and way of thinking, no cash

– lot of talk (visits scientist-factory)

- financial contribution trough labour work, experimental space, material costs…

Science – subject (R&D = extension of scientific work)



Science (nano-Si)

Correlation between deposition parameters and properties

size of particles

size distribution

matrix

optical

vibration

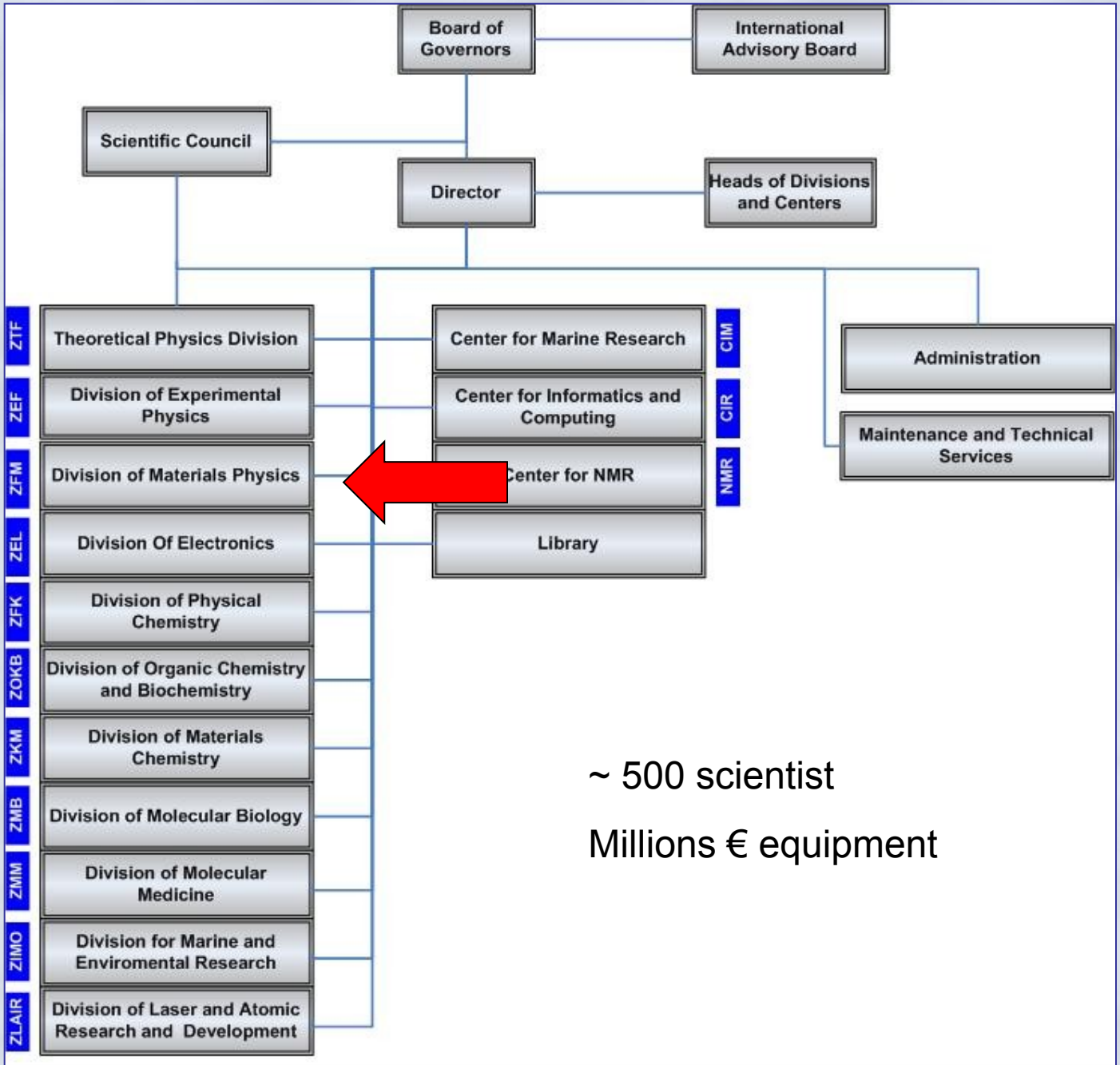
electrical properties

R&D

Integration in pv solar cell on large scale

Solar cells 3. generation?

Sci. - resources – use the IRB structure



~ 500 scientist

Millions € equipment

Close neighbourhood (people)

Materials science dept.

Semiconductor lab.
Thin film lab.
Molecular Physics lab
PV solar cells Materials lab.

26 scientists
32-36 cc papers/year
IF/article ~2 (Appl.Phys.)

PV-group "core staff"

2 seniors (Dr.D.Gracin, Dr B.Etlinger)

2 Post doc. (Dr. I Djerdj, Dr.S. Paramon)

2 PhD students (K.Juraić, D.Meljanac)

(thin flms dep., optical, el. charact.)

Collaboration in the Institute

Dr. M.Jakšić
(Nuclear methods)

Dr.A Moguš (Impedance spectroscopy, chemistry)

Collaboration in Mat.sci.dept.

Dr.A.Gajović (Raman, HRTEM)

Dr.P.Dubček (GISAXS)

Collaboration in “next door” neighbourhood (Sci)

Institute for Physics, Zagreb, Croatia

- plasma physics, laser spectroscopy (Dr.S.Milošević)

- XPS, Auger, STM (Dr. M. Milun)

- GIWAX (Solomon, Milat)

International collaboration (Mostly Sci.)

ECN-Petten, Netherlands (Dr. W.Soppe)

Academy of Science Prague (Prof. Vanaček)Chech Republic

Jožef Štefan, Ljubljana (HRTEM – Prof. M.Čeh) Slovenia

Synchrotron Trieste (Dr.S.Bernstorf) Italy

R&D partners

LPMAS

FP6

Ruđer Bošković Institute, Croatia

Institut for physics, Zagreb, Croatia

Solar cells, Split, Croatia

MANU (PMF), Skopje, Macedonia

ECN, Petten, Netherlands

Czech Academy of Science, Prague, Czech Republic

Roth&Rau, Germany

HITRA

HIT

Fraunhofer ISE

Lipik glass

FP7, Eureka

Jozef Štefan, Slovenia

Sinchrotrone Trieste, Italy

Financial sources

-Scientific (Ministry of Science and Technology)

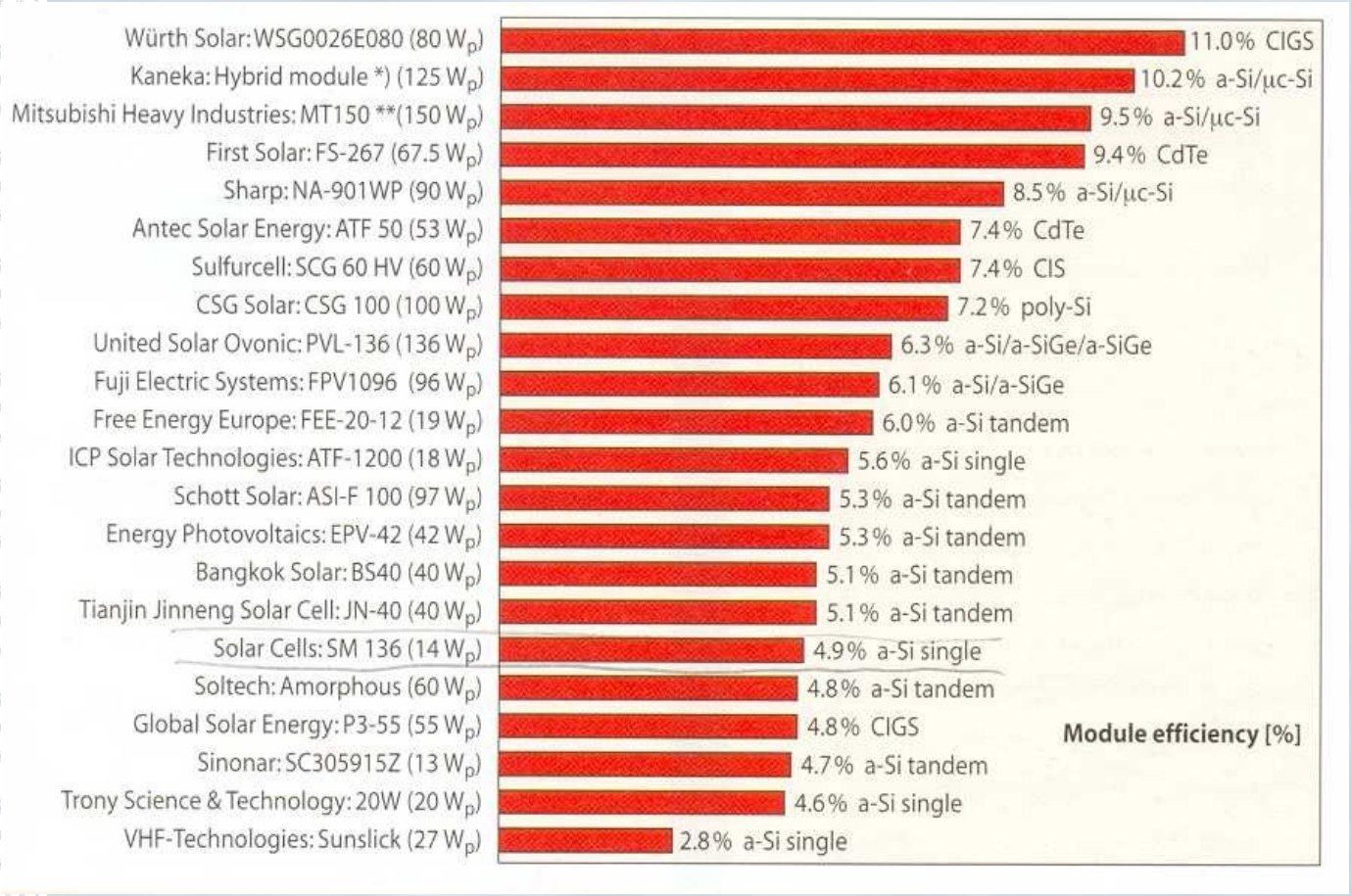
-R&D

1) HITRA (MSc&T)
   LPMAS (EU, FW6,7)

   } Amorphous/nano crystalline solar tandem cells (2002-08), (09-?)

2) Origin of structural defects in solar glass (Lipik glass-NFS, 2007-2010) (education of PhD for Lipik glass)

Projects goals



(HIT?)

LPAMS

(pilot HITRA)

Split

Actual

Next step - IP ?, investment-commercialization?

Financing of R&D projects ⟺ IP

-(EU-LPAMS) (total EU) – IP to participants inventors

-HITRA (gov.) - Ruđer Bošković Institute - IP to Ruđer

- Lipik glass, Solar cells Split (total industry),
no discussion about IP

Investment ? (Private?)

Summary

R&D activities - possible with lot of collaboration

What is missing

- IP related support insufficient

- Investment (commercialization) ?

Thank you for your attention

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