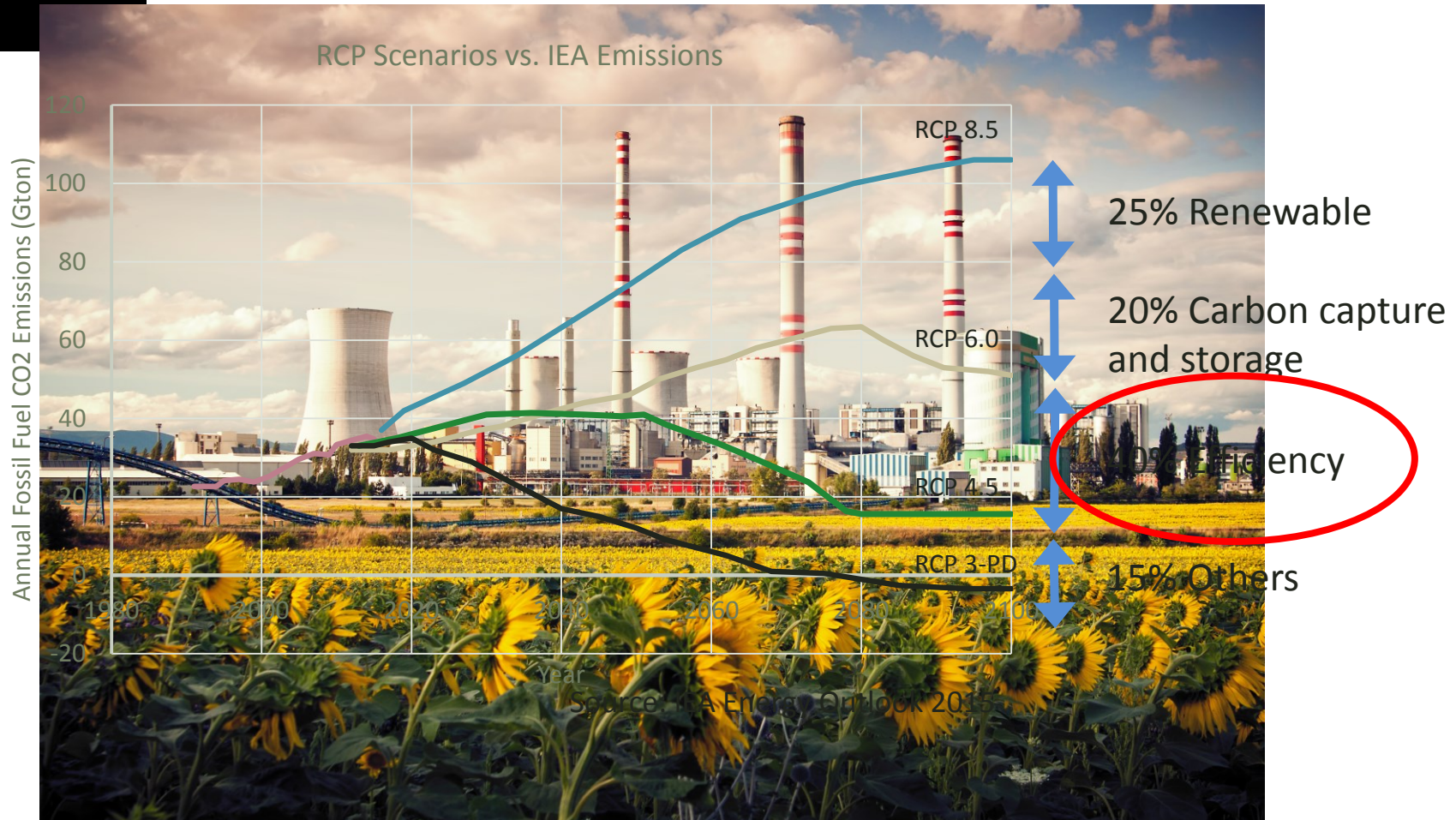
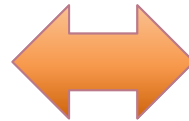


- 1 Motivation
- 2 Nanofluids
- 3 COST Association
- 4 NANOUP TAKE COST Action
- 5 Conclusions



- 90% of energy budget is related to thermal energy
- 70% of CO₂ emissions due the transport, industry and energy sectors

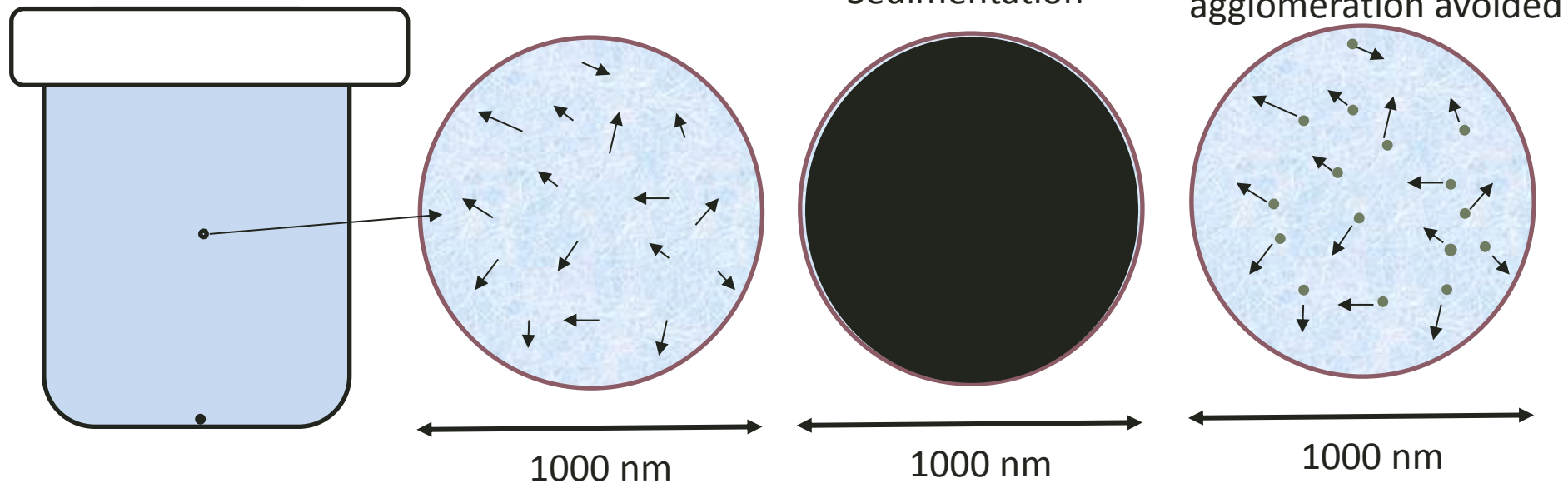
Efficiency of thermal
systems



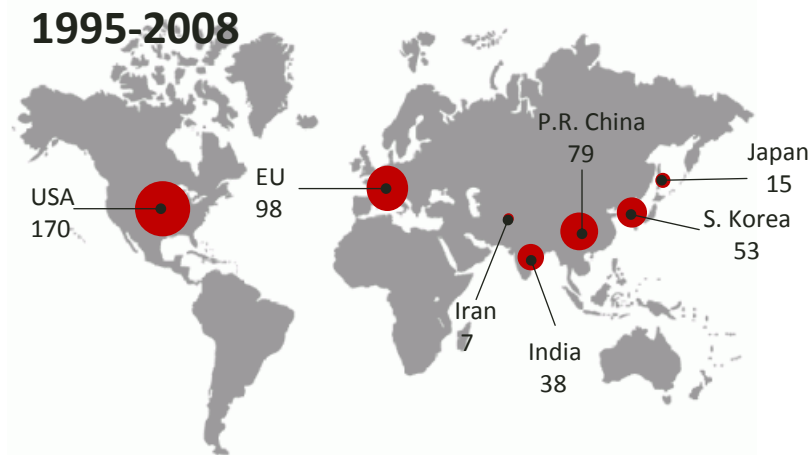
Thermal properties of
Heat Transfer Fluids (HTF)
and Thermal Energy
Storage (TES) Materials

- Heat Transfer Fluids: water, glycols, thermal oils, molten salts
- Thermal properties:
 - heat capacity (amount of energy to be transferred)
 - thermal conductivity (speed of transfer, power)

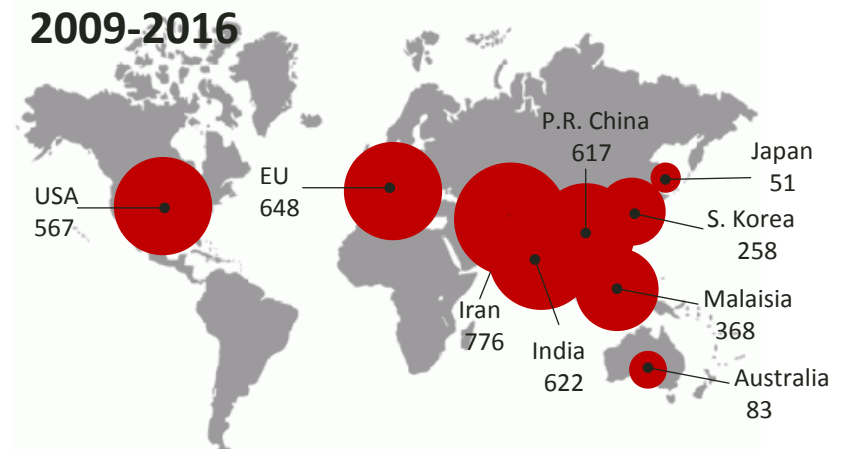
- Nanofluid = Engineered colloidal suspensions of nanoparticles (solid < 100 nm)
- Potential applications in heat transfer and others
- Proposed by S.U.S. Choi and M. Masuda in early 90's



- **Nanofluids allow to include a solid into a liquid**, transferring the solid properties (in some extend) and keeping the liquid transport properties (in some extend)
- **Nanofluids (NFs) are advanced HTF/TES with enhanced thermal properties** by the addition of **nanoparticles (NPs)**
- First application in HTF -> Increment of thermal conductivity

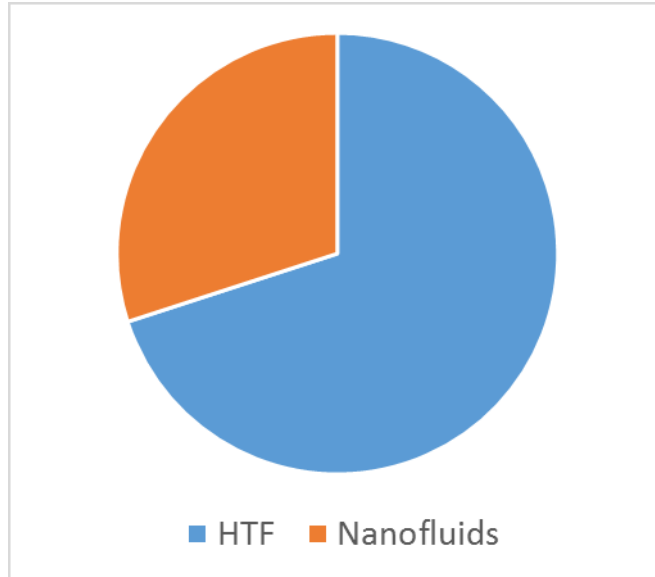


Source: ISI Web of Science

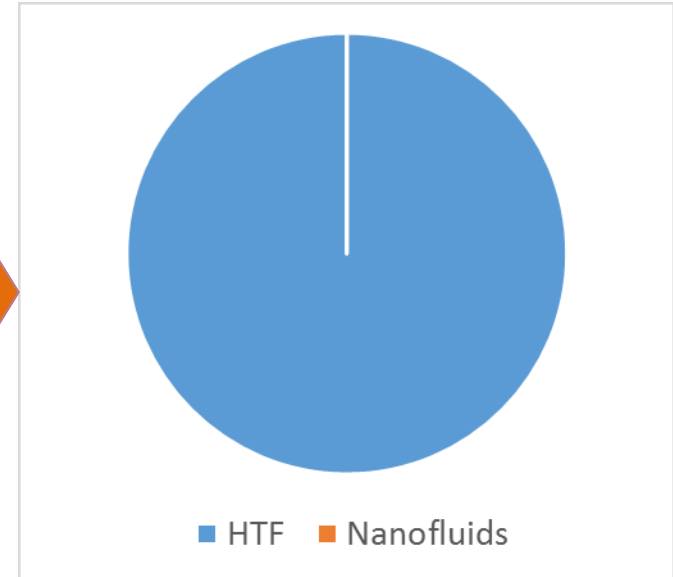
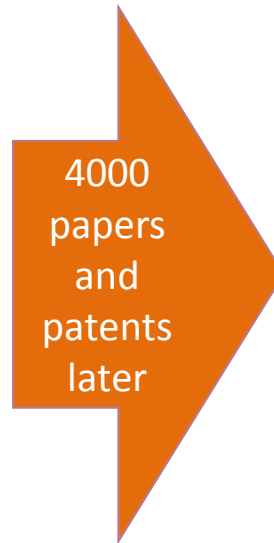


Source: ISI Web of Science

➤ Nanofluids market forecast



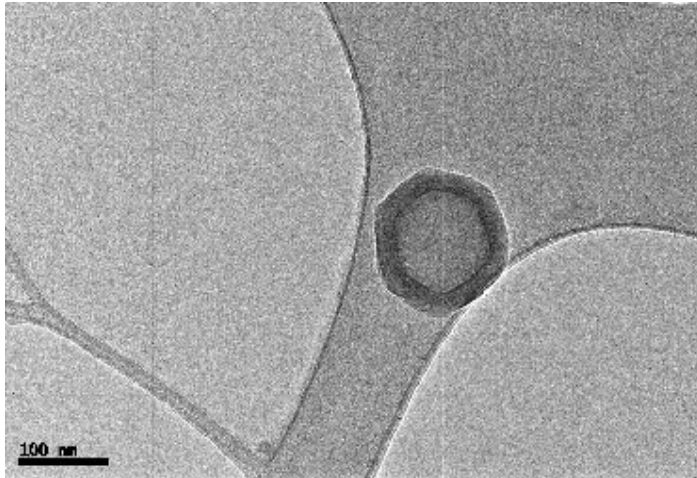
Nanofluids market share in 2015
(2007 forecast)



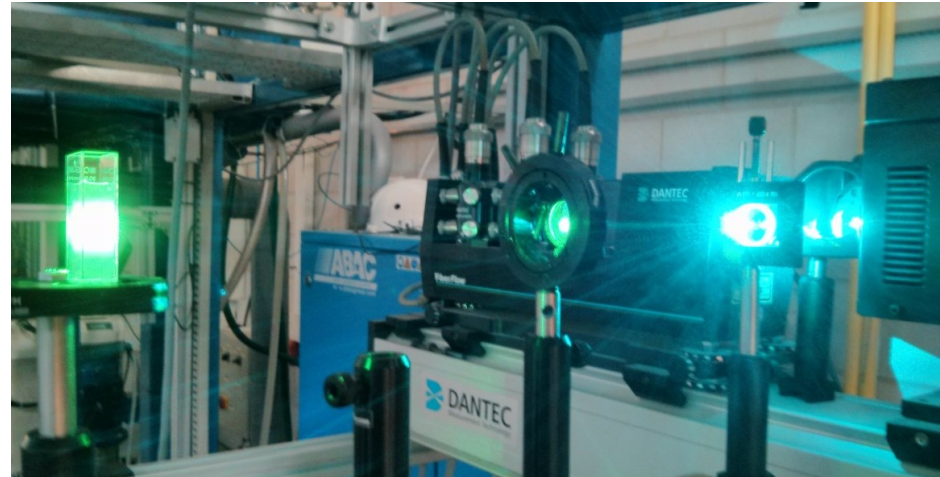
Nanofluids market share in 2015

➤ New solid properties explored in the last 5 years

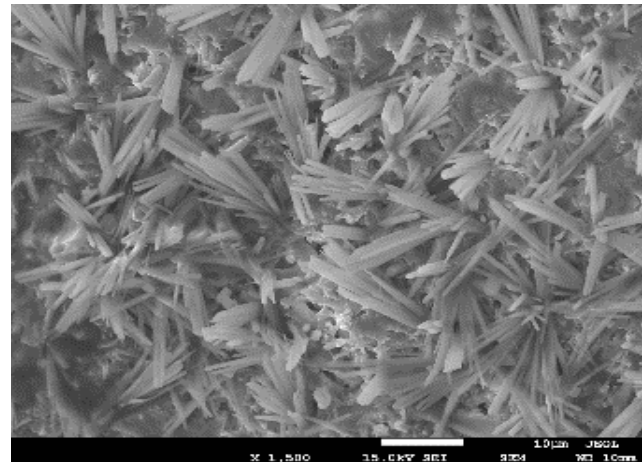
NePCM nanofluids



Solar nanofluids



Nanoparticle surface – fluid interaction

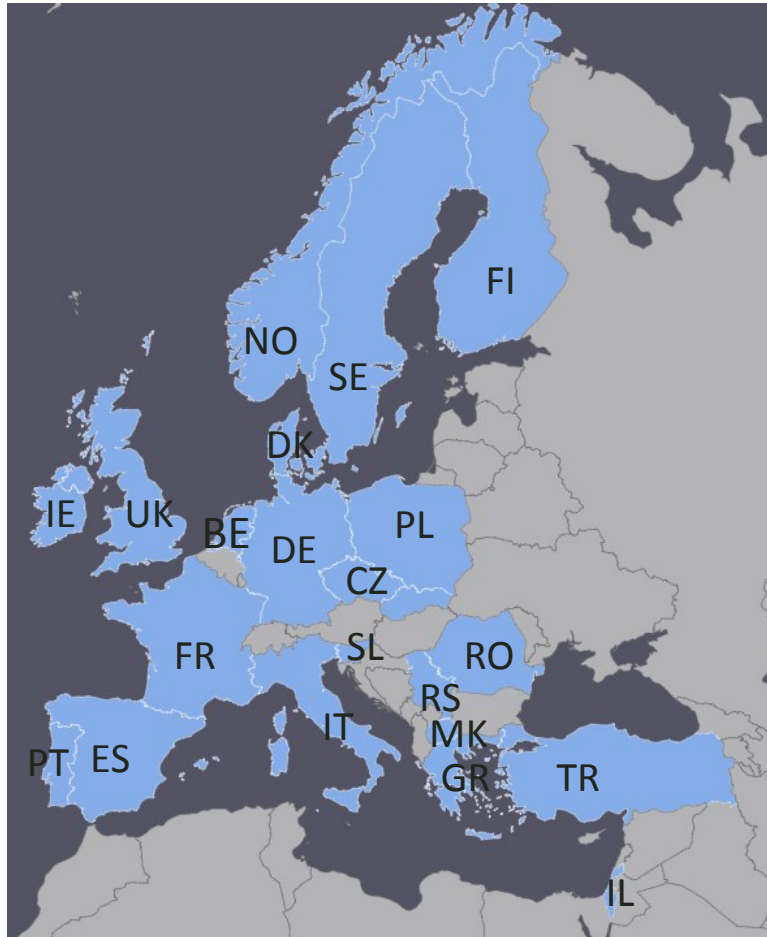


➤ What is a COST Action

- The **European Cooperation in Science and Technology (COST)** is an **intergovernmental organisation** supporting the **scientific/ technological collaboration** through **networks (COST Actions)** and supported by **H2020**
- COST is the **longest-running European framework** supporting trans-national **cooperation among researchers, engineers and scholars** across Europe
- 36 COST Member Countries+1 Cooperating State, Near Neighbor Countries (NNC), International Partner Countries (IPC), International Organizations (IO)

- NANOUP TAKE proposal presented in April 2015 (13 countries, 25 institutions)
- Approved by Committee of Senior Officials in October 2015 (success ratio 10%)
- Activities from May 2016 to April 2020
- The **objective** of **NANOUP TAKE** is to **create** a Europe-wide **network** of leading **R+D+i centres**, and of **key industries**, to **develop** and **foster** the use of **nanofluids** as **advanced HTF/TES** to increase the **efficiency** of **heat exchange and thermal storage systems**

➤ June 2016 (22 COST countries, 37 institutions)



➤ Management Committee: Max. 2 members / country

➤ Core Group Members

Chair: Prof. J. E. Julia (ES)

Vice-Chair: Prof. D. Wen (UK)

Dissemination Coord.: Prof. A. Minea (RO)

Scientific Missions Coord.: Prof. P. Estelle (FR)

Working Group Leaders and Vice-Leaders:

WG1. Prof. O. Manca (IT), Prof. Luis Lugo (ES)

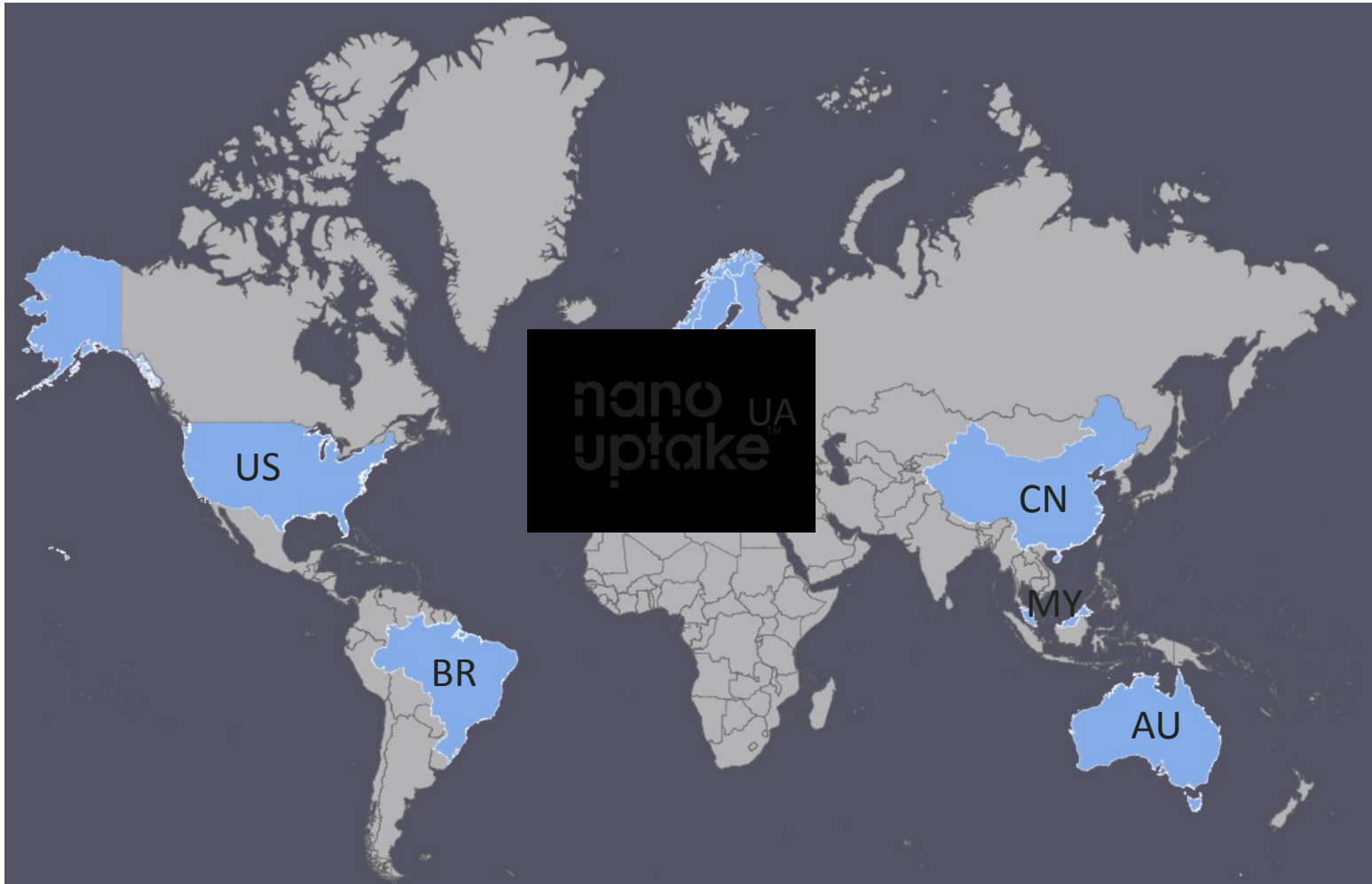
WG2. Prof. S. Murshed (PT), Prof. B. Sunden (SE)

WG3. Prof. Y. Ding (UK), Prof. C. Castro (PT)

WG4. Dr. M. Buschmann (DE), Dra. E. Sani (IT)

➤ Grant Holder: Universitat Jaume I (Castellon, Spain). Grant Holder Manager: Dra. I. Gimenez

➤ June 2016 (22 COST countries, 37 institutions) + 1 NNC + 5 IPC



➤ NANOUP TAKE Networking Activities and Participants

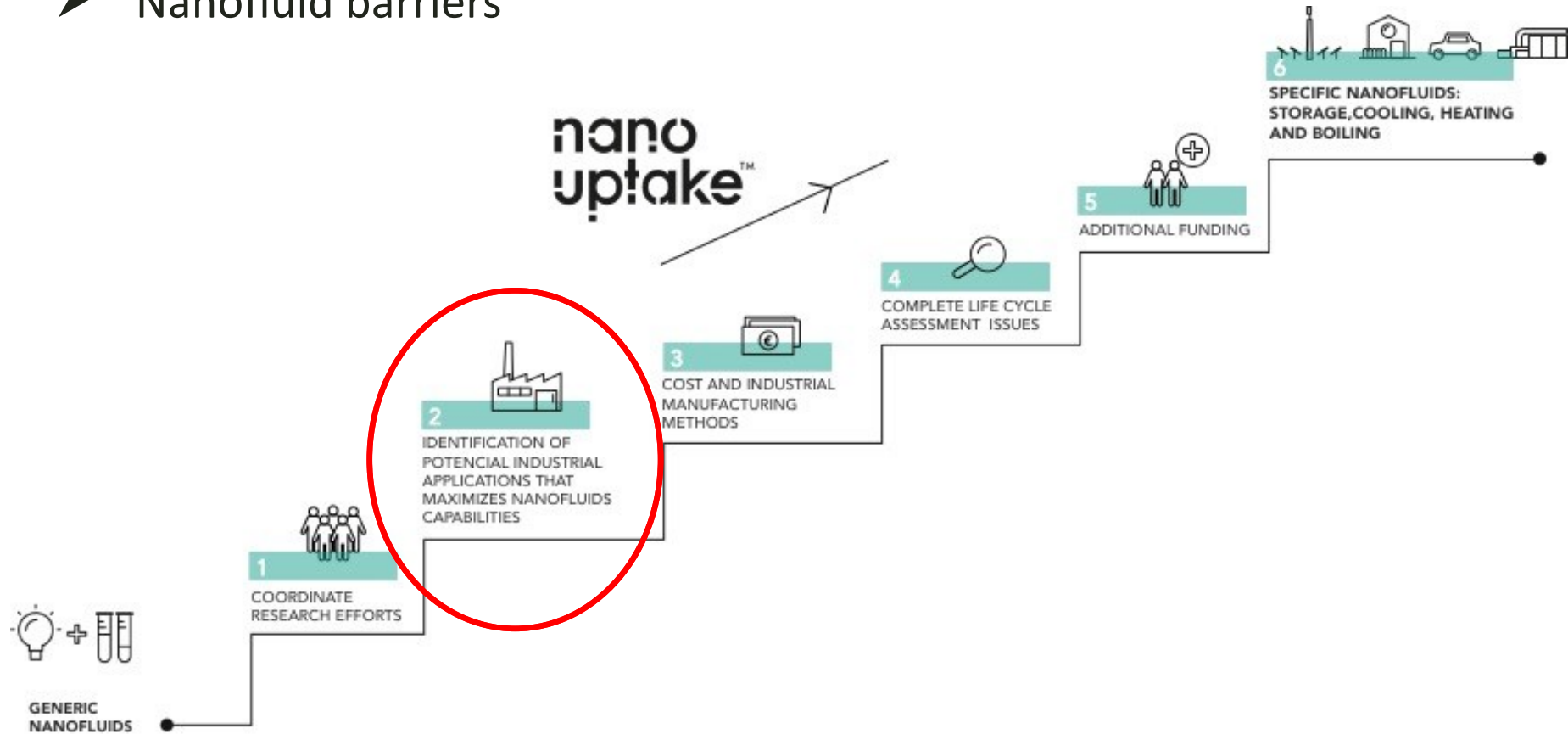
1. **Training Schools:** Once per year. Short, intensive courses with high level trainers addressed to new participant **(now open)**
2. **Short Term Scientific Missions:** Participants staff exchange between 2 weeks and 3 months **(now open)**
3. **Working Groups Activities:** Nanofluid development for specific applications. Research centers and companies involved. Meetings. dissemination, newsletters **(now open)**

Participants:

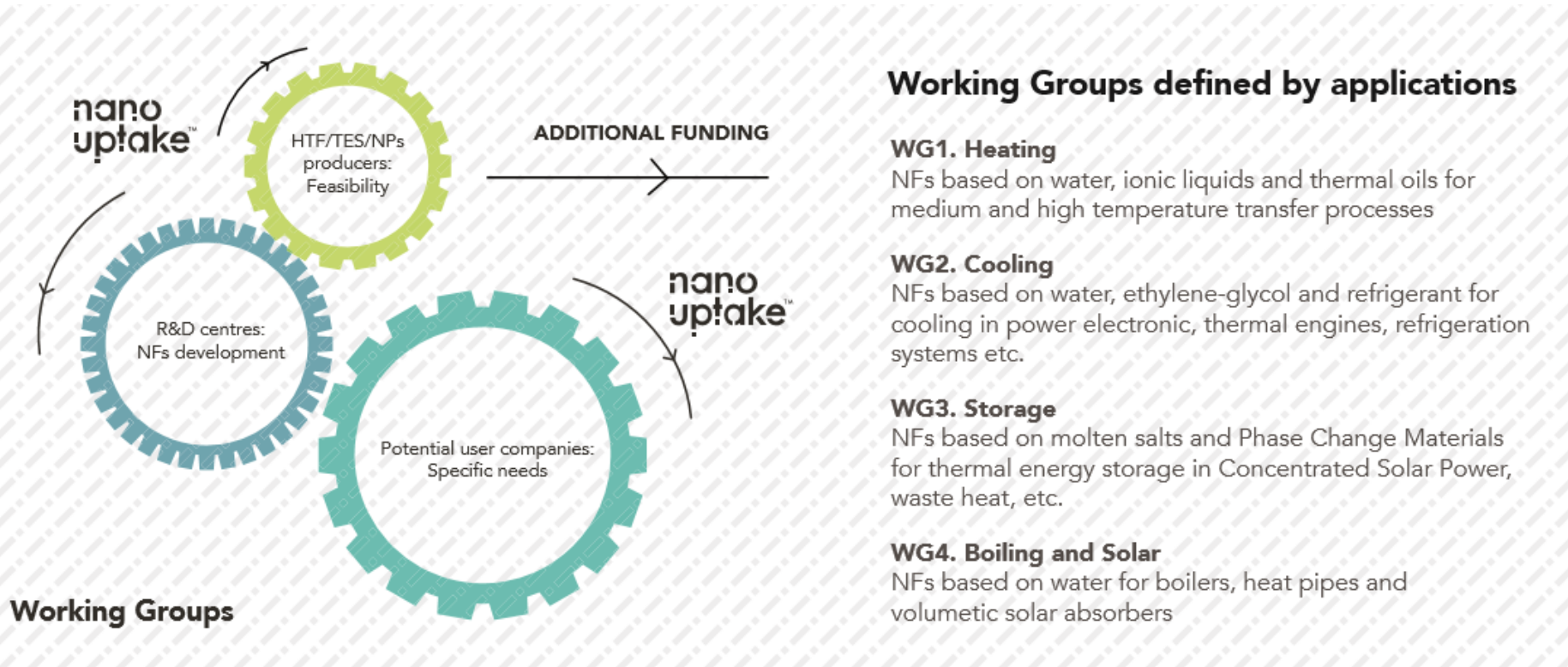
- R&D Centres
- Companies
(HTF/NP producers, Potential NF users)



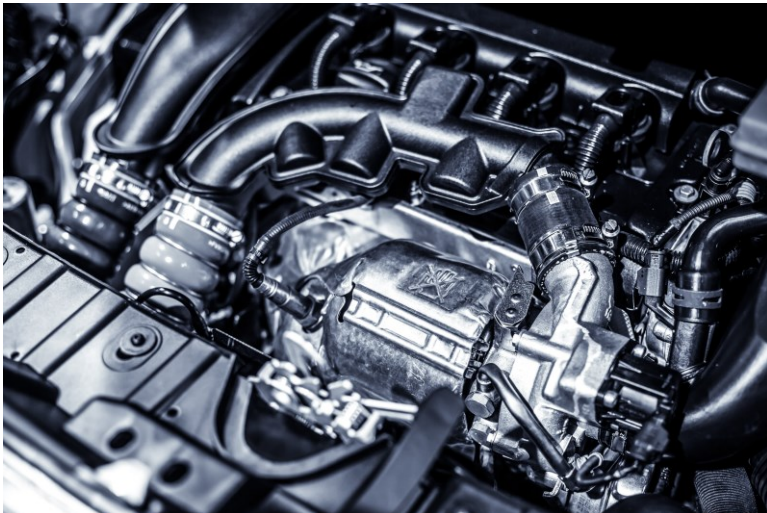
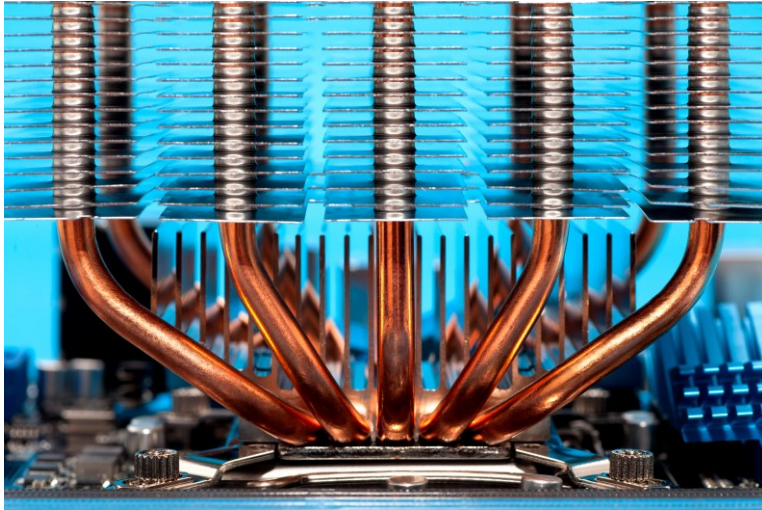
➤ Nanofluid barriers



➤ Working Groups



➤ Potential applications



➤ NANOUP TAKE EVENT #1

Location

Universitat Jaume I, Castellon de la Plana (Spain)

October 2016

	25 th	26 th	27 th	28 th
9:00	Registration	Working Groups Meetings	Training School	Training School
	Plenary Lecture			
	Coffee Break	Coffee Break		
13:00	Working Groups Meetings	Working Groups Meetings		
13:00	Lunch break	Lunch break	Lunch break	
14:30	Working Groups Meetings	Training School	Manag. Com. Meeting	Training School
	Coffee Break			
18:30	Working Groups Meetings			
21:00	Gala Dinner			

- Nanofluids can play an important role if market barriers are overcome
- NANOUP TAKE activities from 2016 to 2020
- More companies involved
- More information in www.nanouptake.eu (from 1st July)
- If you are interested send an e-mail to info@nanouptake.eu, you will receive an electronic form and you will join to the Action

THANK YOU!

INDUSTRIAL TECHNOLOGIES
2016 CREATING A SMART EUROPE
22-24 JUNE 2016, RAI Amsterdam

We cannot solve our problems with the same thinking
we used when we created them. A. Einstein