

# **Materials as key enablers for innovation in PV**

**EMIRI - Energy Materials Industrial Research Initiative**

**European PV Technology Platform General Assembly  
Amsterdam, 19<sup>th</sup> June 2012**

**Peter Rigby**

# Agenda

- The opportunity and the need for European industrial driven research and innovation
- EMIRI value proposition
- Rationale for EMIRI
- The SET Plan Materials Roadmap
- Structure of EMIRI
- Milestones / targets / action plan

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## Value Added Materials importance as an industrial sector

Advanced Value Added Materials (VAM) is a traditional European strength with a very high market potential (Circa 1 trillion € by 2050).

Energy and Environment represent the two key materials sectors in terms of growth potential and absolute value (>50%)

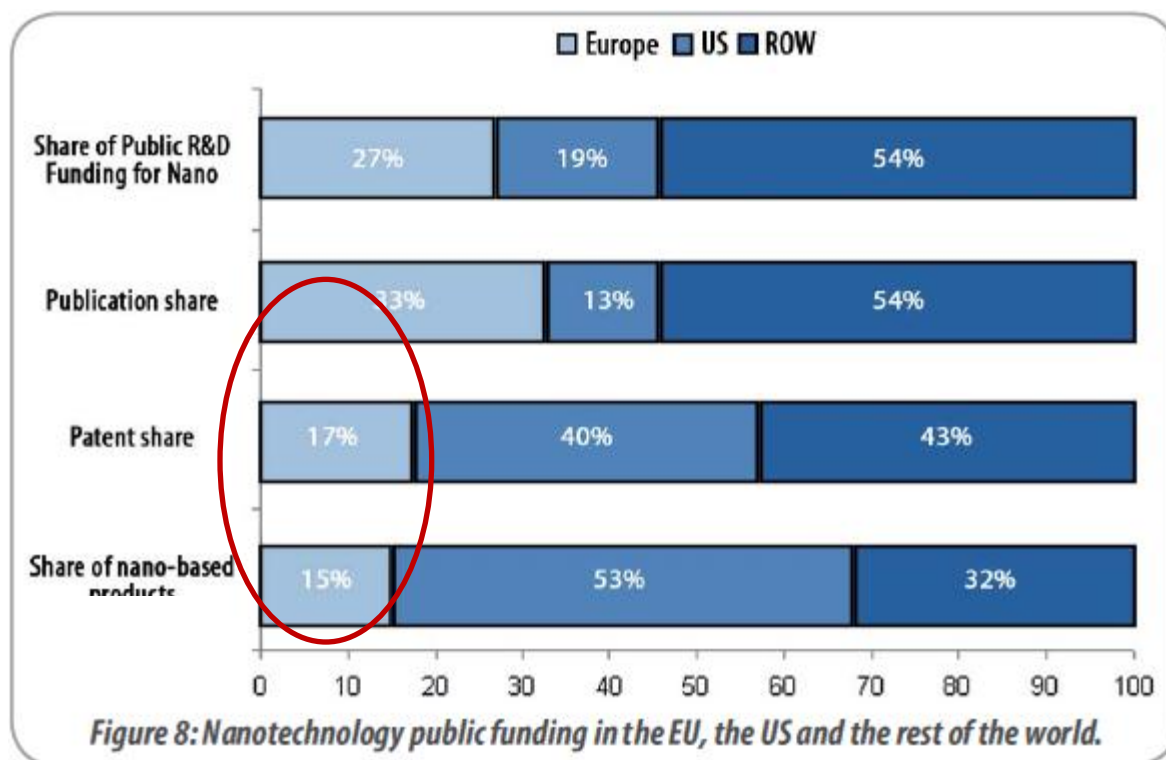
Europe must ensure that the advanced materials sector continues to be a key industrial capability for the foreseeable future. We will only achieve this by using all our collective resources in the same direction

**Table 1: VAMs market share by sector**

	2008	2015	2020	2030	2050
Energy	7,1	14,3	18,9	37,0	175,7
Transport	9,6	13,1	15,8	24,3	52,6
Environment	24,6	38,2	48,0	86,8	352,2
Health	27,0	32,1	37,4	55,0	115,2
ICT	29,6	38,8	46,6	70,7	152,2
Others / Cross-cutting	3,6	13,5	19,3	42,2	250,8
<b>Total projected value of identified VAMs markets</b>	<b>101,7</b>	<b>150,0</b>	<b>186,1</b>	<b>316,0</b>	<b>1098,6</b>
Source: Oxford Research AS. Unit: billion euro.					

Source: [http://ec.europa.eu/research/industrial\\_technologies/pdf/technology-market-perspective\\_en.pdf](http://ec.europa.eu/research/industrial_technologies/pdf/technology-market-perspective_en.pdf)

Europe is excellent in science and funding, but lags the rest of the world, and the USA in particular, in bringing added value products to market



Source KET HLEG report – June 2011

*However, crossing the valley of death is one of the key challenges. Getting to the other side requires a strategy of fully integrating:*

- *Technological research*
- *Product development*
- *Competitive manufacturing*

*Necessitating a high level of industry involvement and commitment along the full development path*



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## EMIRI's value proposition

EMIRI is an 'industrially' driven association comprising leading companies and R&D stakeholders representing the full economic value chain throughout Europe

- providing guidance, focus, direction and commitment to succeed in
- commercialising value added materials programmes for
- strategic low carbon energy applications fully in line with the SET Plan Materials Road Map



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## Society's Grand Challenges:

➤ **Climate change**

➤ **Affordable and reliable energy**



**SET Plan**

## Society's Grand Challenges:

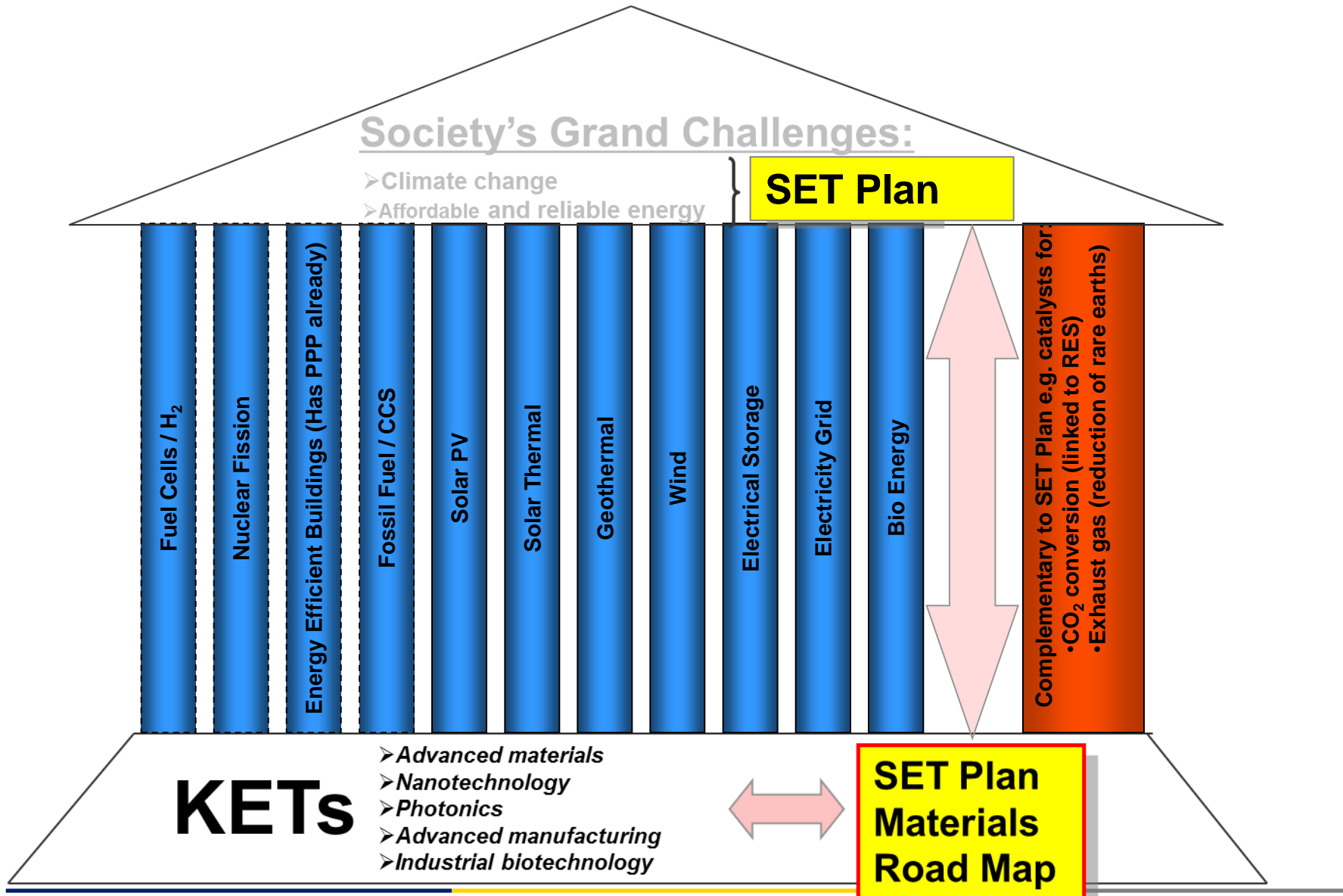
- Climate change
- Affordable and reliable energy

**SET Plan**

1. Fuel Cells
2. Nuclear fission
3. Energy Efficient Buildings
4. Fossil fuels / CCS
5. Solar PV
6. Solar Thermal
7. Geothermal
8. Wind
9. Electrical storage
10. Electrical grid / distribution
11. Bio Energy

**SET Plan  
Materials Road Map - 2011**

<http://setis.ec.europa.eu/activities/materials-roadmap>



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## The SET Plan is an exciting concept for the following reasons:

- Identifies some essential challenges for society and an integrated vision for solutions
- Encourages European research and industry actors to work together more effectively as a coherent whole, better able to compete in a highly aggressive global environment
- Use of resources at a European scale to avoid unnecessary duplication of intellectual efforts and infrastructure to go beyond critical mass for cutting edge research and innovation programmes
- The SET Plan Materials Road map highlights the necessity and desirability for a cross cutting enabling capability organised on a European scale for advanced energy materials applications

Note the many synergies between applications for different materials families.

Organising materials research and development on a cross-cutting basis makes sense in order to be more effective and further enhance the level of excellence and strength of the sector.

	Wind energy	Photovoltaic	Concentrated Solar Power	Geothermal energy	Electricity storage	Electricity grids	Bioenergy	Carbon capture and storage	Hydrogen and fuel cells	Nuclear fission	Buildings
<b>Structural materials</b>											
Fibre reinforced materials	Y		Y		Y			Y	Y		
High temperature, low temperature and corrosion resistant materials	Y		Y	Y	Y		Y	Y	Y	Y	
Structural steel components and related joining techniques	Y		Y	Y	Y		Y	Y		Y	Y
Advanced concretes	Y		Y				Y			Y	Y
<b>Functional materials</b>											
Separation membranes			Y				Y	Y	Y		Y
Catalyst and electrolytes				Y			Y	Y	Y		
Solid catalyst, sorbents and O2 carriers				Y			Y	Y	Y		
High temperature superconducting materials	Y				Y						
High temperature heat storage materials			Y		Y			Y			
(High temperature) insulating materials			Y	Y		Y		Y		Y	Y
Materials for power electronics	Y	Y		Y		Y					
Heat transfer fluids			Y	Y						Y	
<b>Manufacturing techniques</b>											
Coatings and coating techniques	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y
Condition monitoring techniques	Y	Y		Y	Y		Y	Y	Y	Y	

Source: SET Plan Materials Road Map, 2011

## Set Plan Materials Roadmap for PV

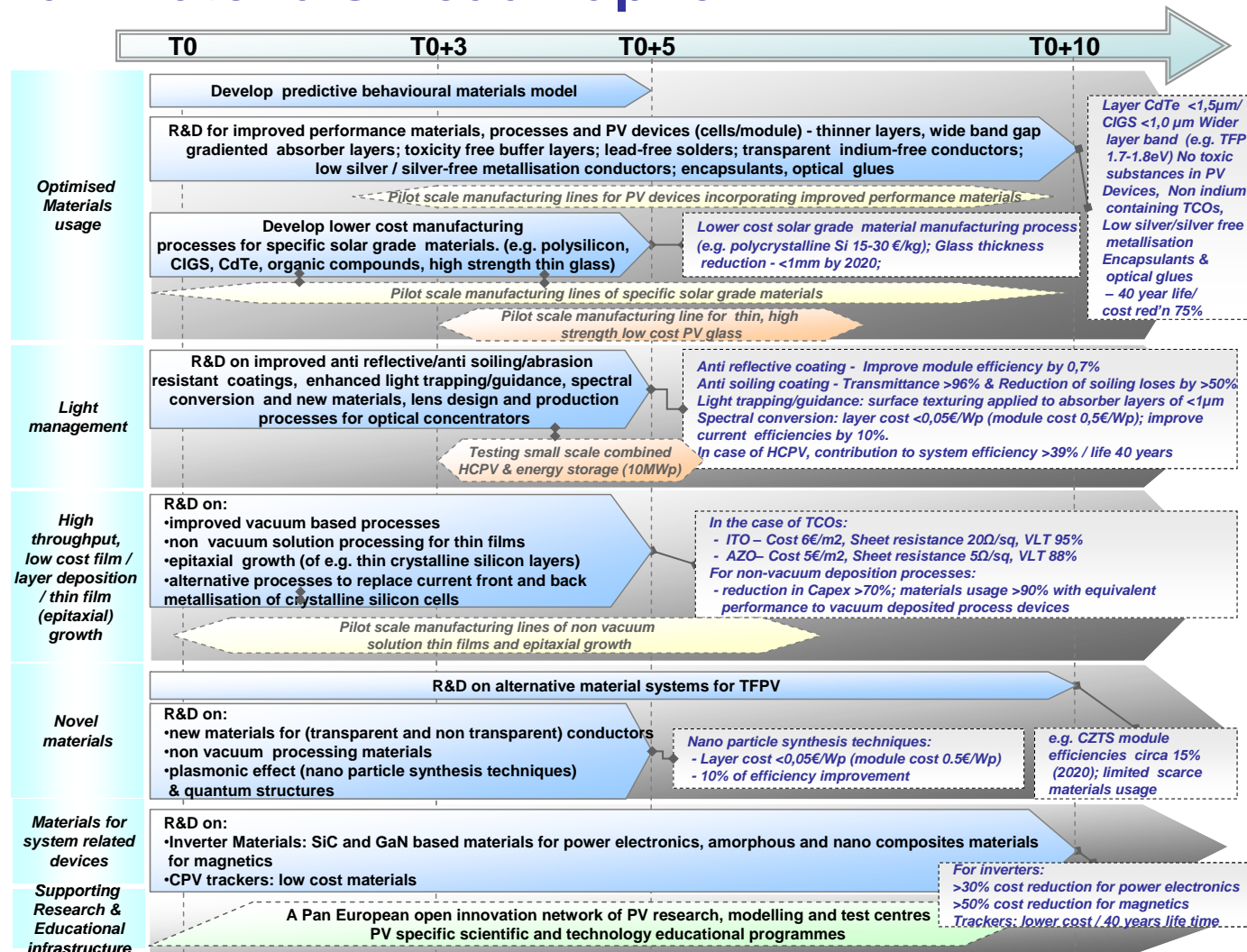
The PV chapter was the work of 10 experts including EPTP WG 3's SRA input and covers the following aspects for PV:

- Optimised materials usage
- Light Management
- High throughput / low cost thin film deposition / growth
- Novel Materials
- Materials for system related devices
- Supporting research and educational infrastructure

<http://setis.ec.europa.eu/activities/materials-roadmap>



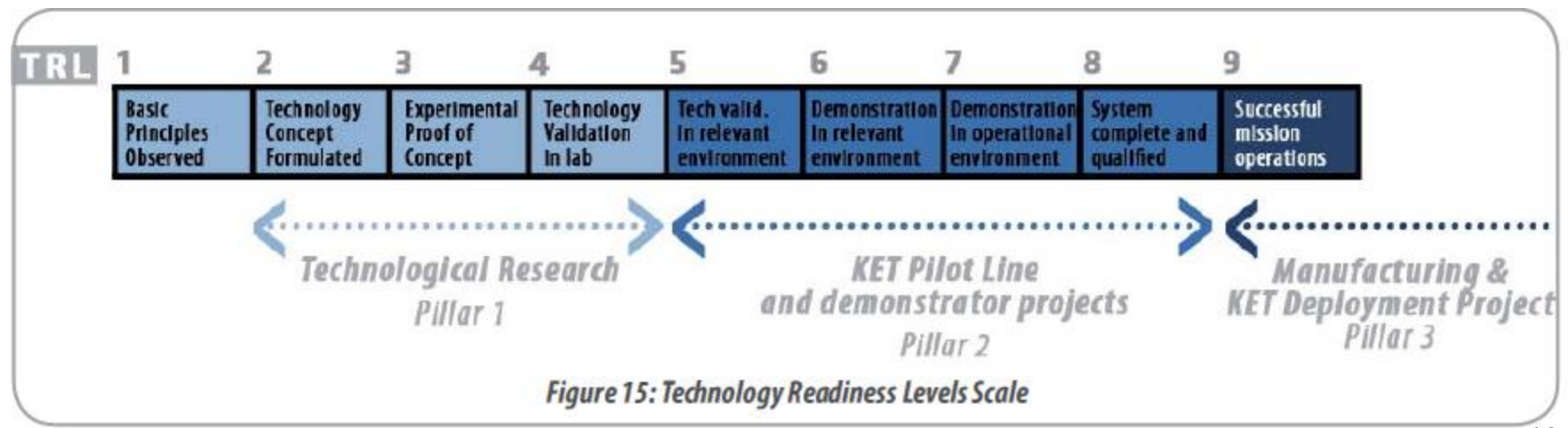
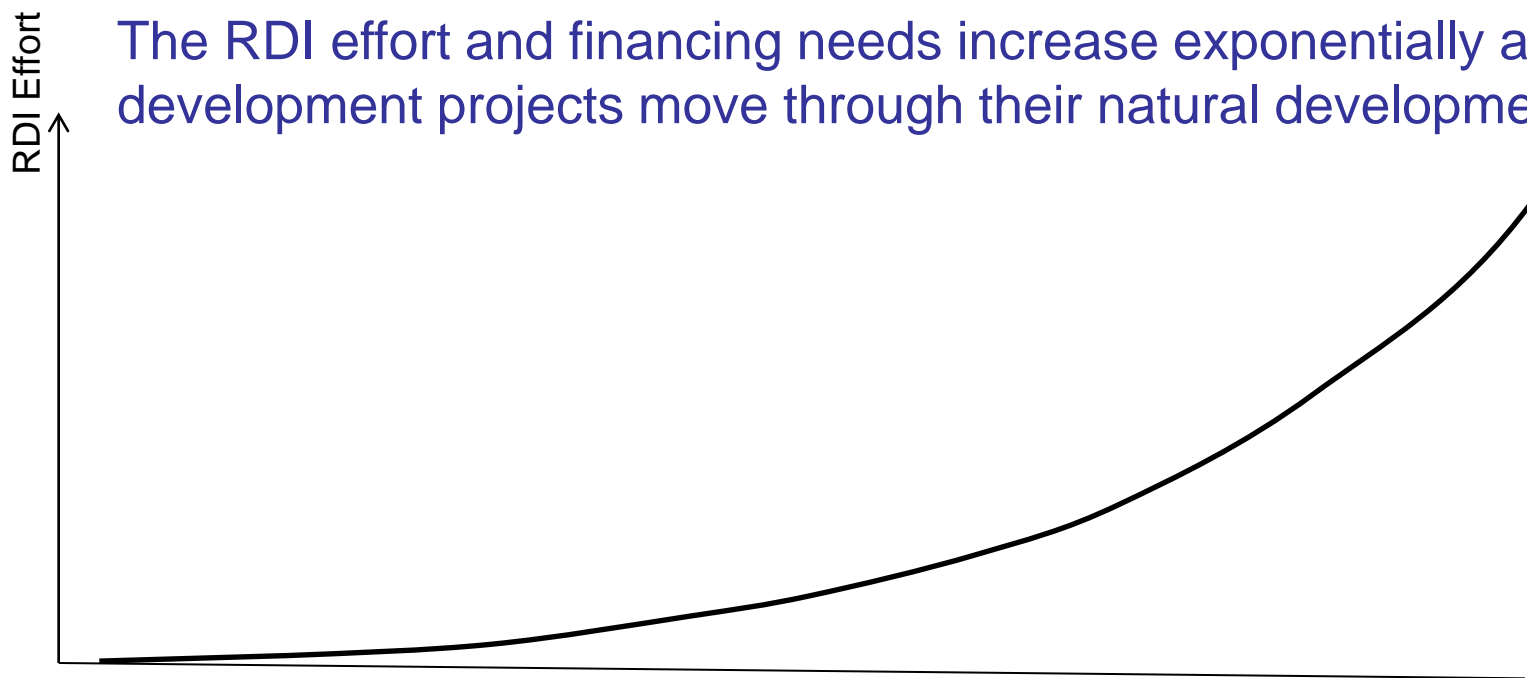
# Set Plan Materials Roadmap for PV



## Agenda

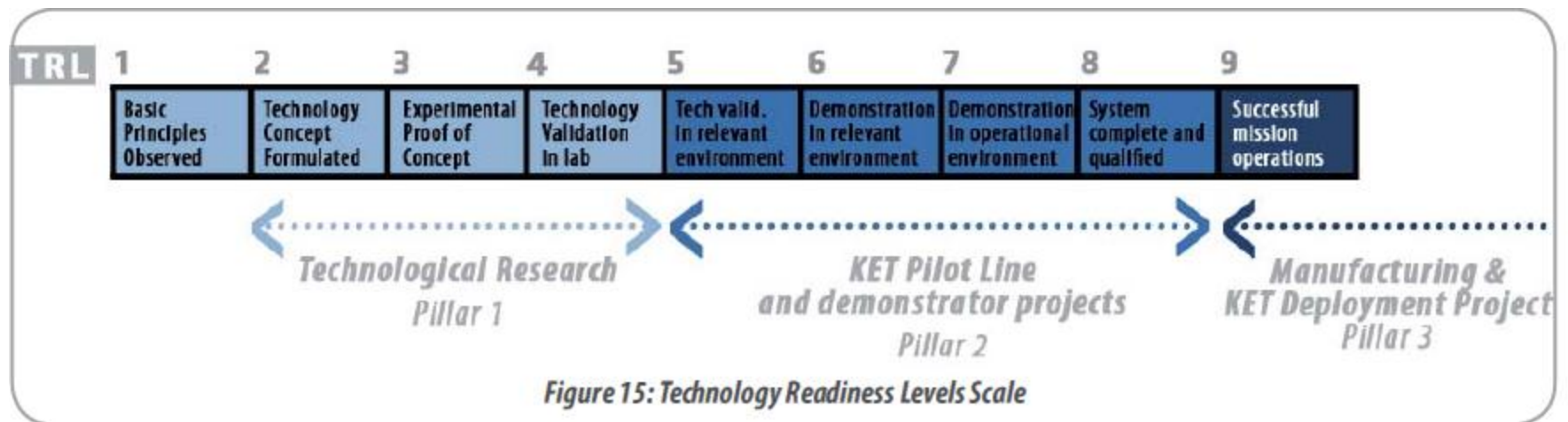
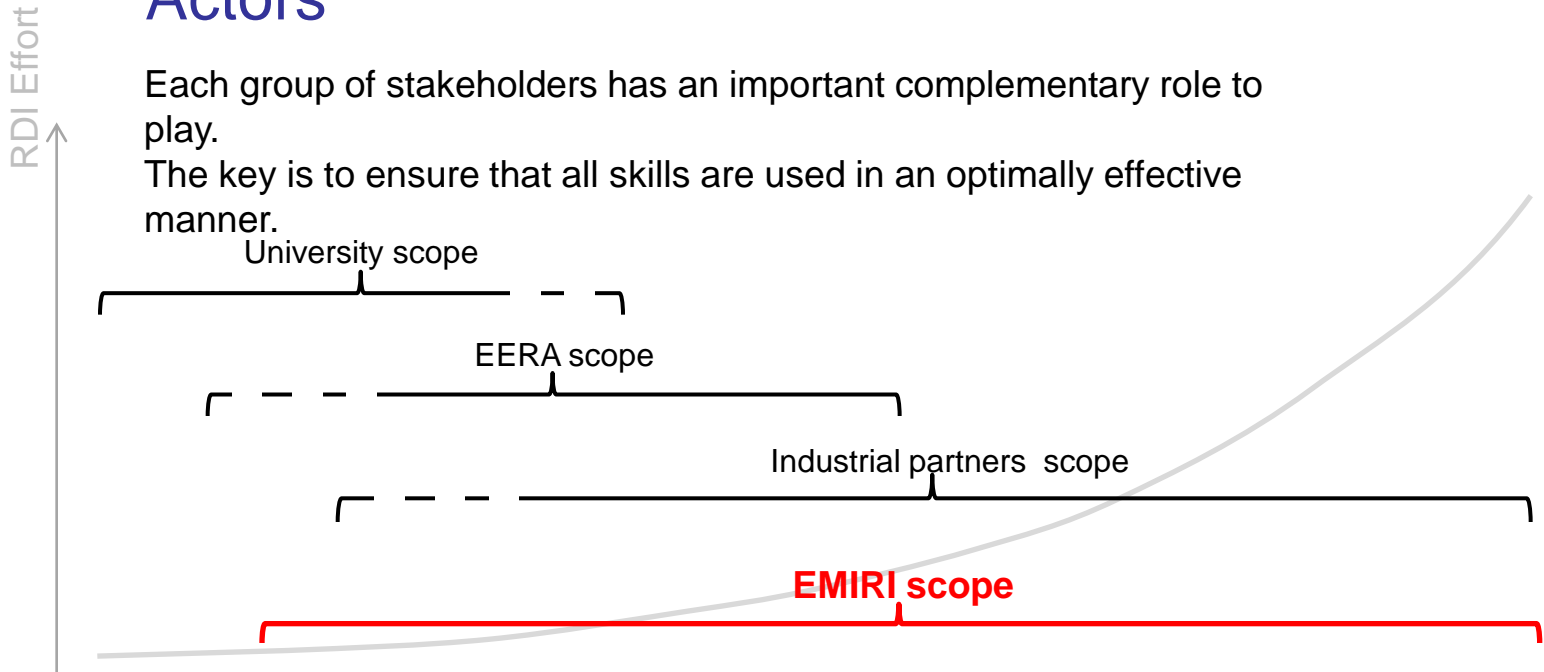
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The RDI effort and financing needs increase exponentially as development projects move through their natural development cycle



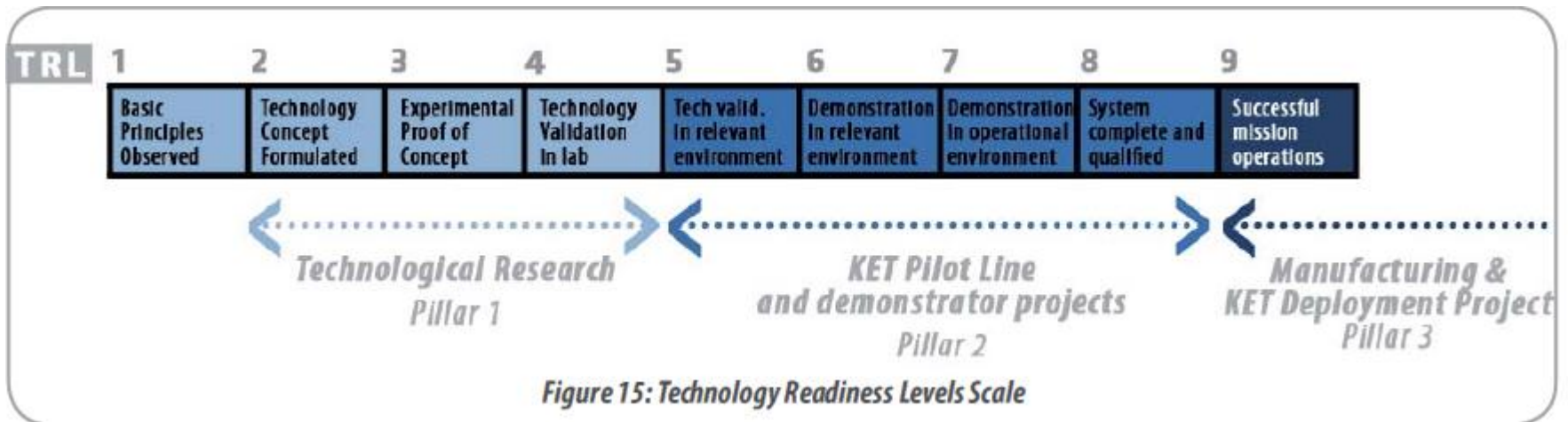
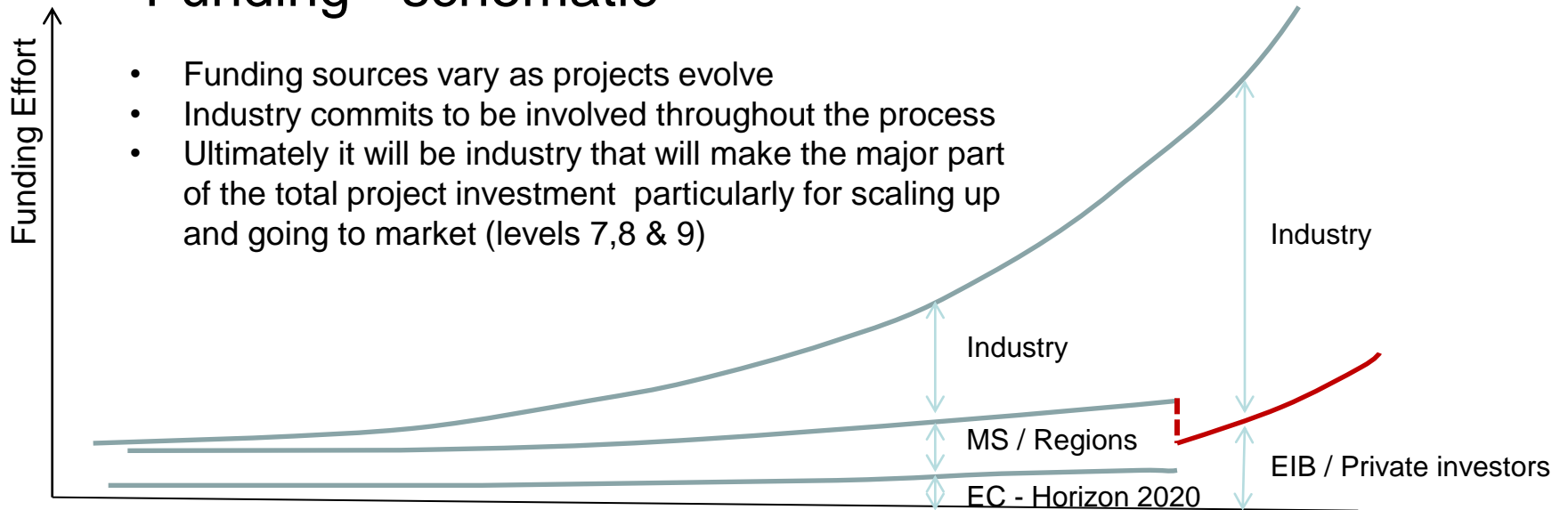
# Actors

Each group of stakeholders has an important complementary role to play.  
 The key is to ensure that all skills are used in an optimally effective manner.

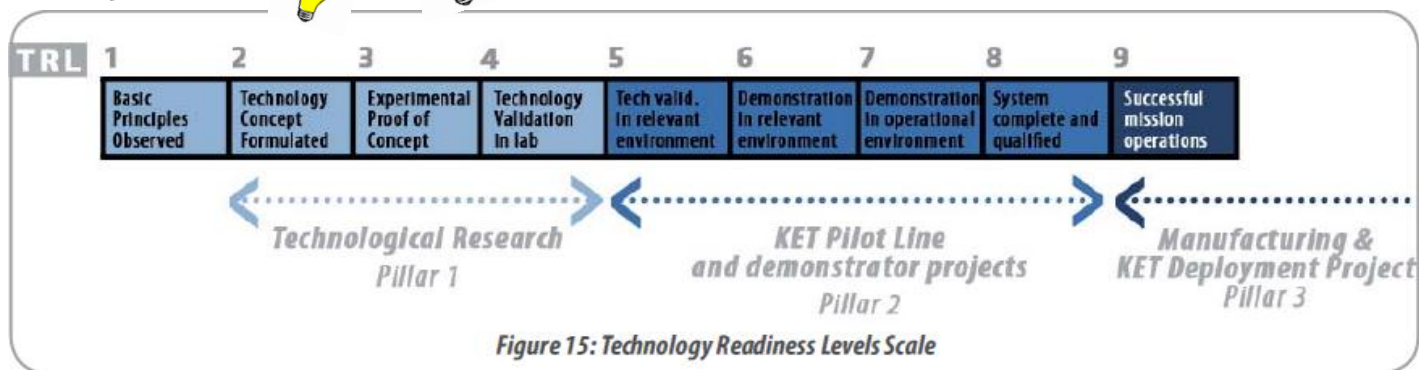
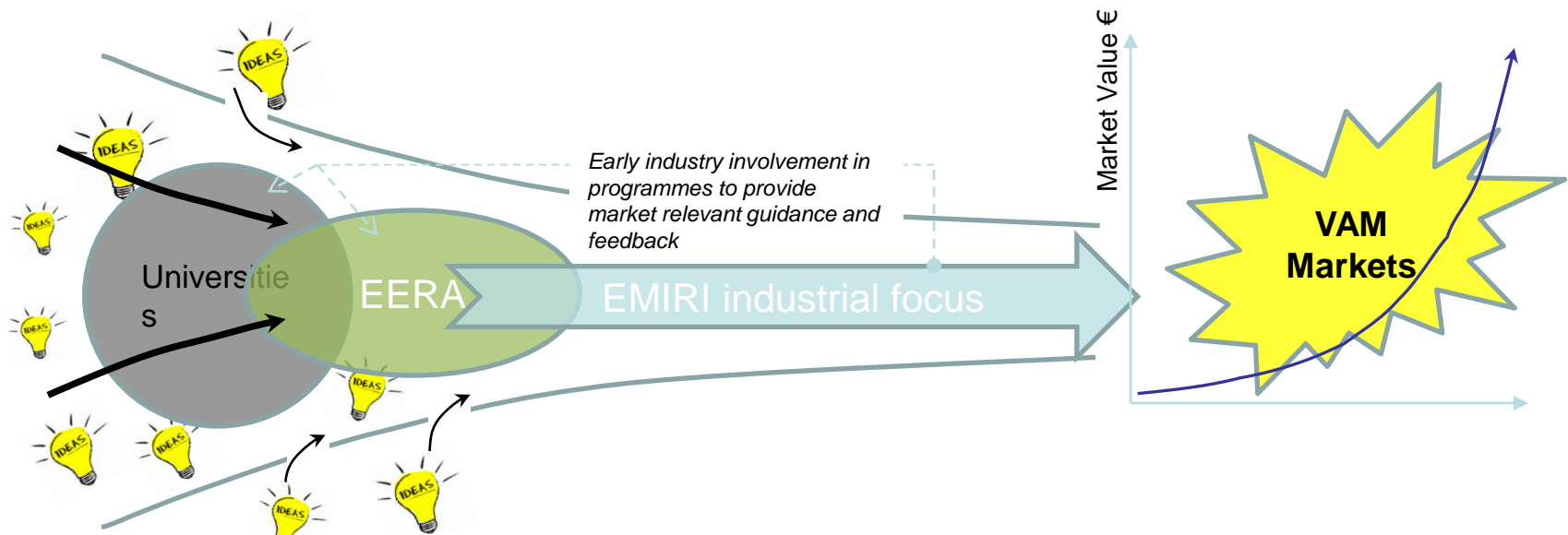


# Funding - schematic

- Funding sources vary as projects evolve
- Industry commits to be involved throughout the process
- Ultimately it will be industry that will make the major part of the total project investment particularly for scaling up and going to market (levels 7,8 & 9)

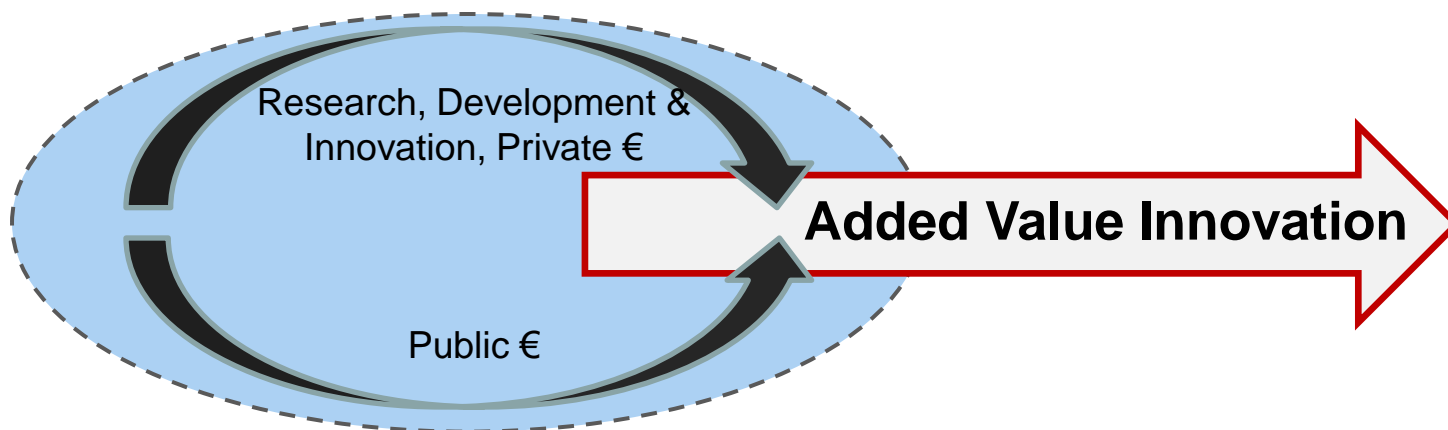


**EMIRI's value proposition** is to be an industrially driven pragmatic implementation mechanism that provides guidance, focus, direction and commitment to achieve commercially successful value added materials programmes for low carbon energy applications



## The *EMIRI partnership* is an implementation mechanism to bring added value innovation in the SET Plan energy materials roadmap

Industry together with the research community in partnership with public authorities will be able to define research priorities and implementation in line with market needs and long term public industrial policy goals

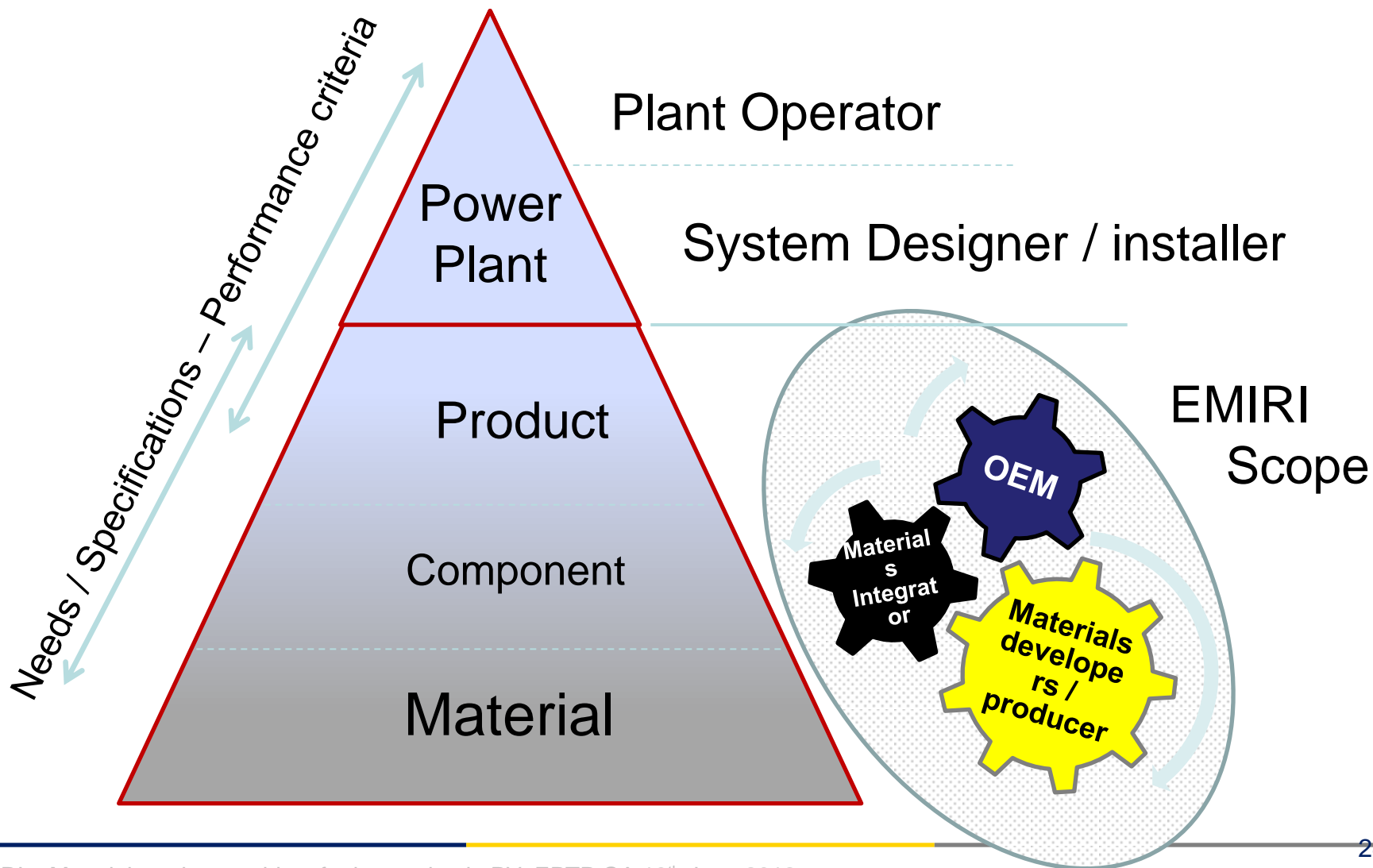


The public authorities ideally need to devise a clear simple to use European wide strategic funding mechanism that will invest in a common vision and allow pooling of resources for optimal return on public funding investment by:

- Avoiding needless duplication of RDI
- Permit critical mass investment and deployment for strategically critical areas



# The value chain **hierarchy** requires fully integrated involvement





## Founding Members of EMIRI

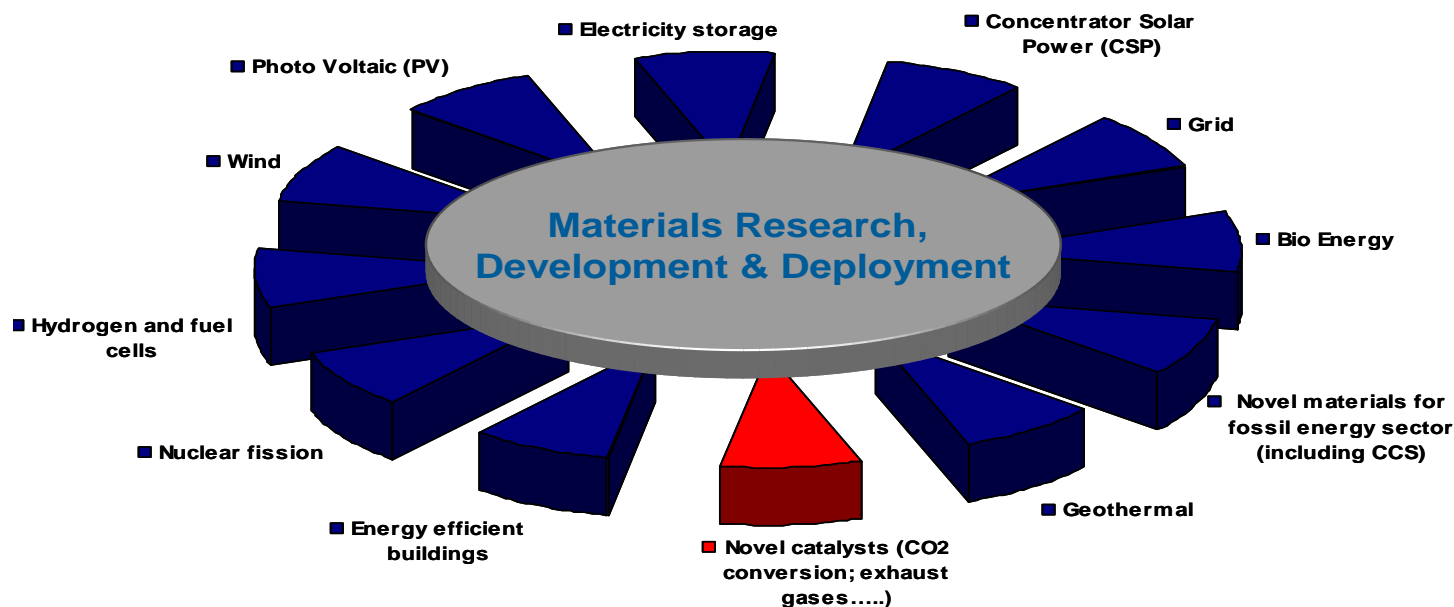
EMIRI Founding members			
#	Company	Country	Category
1	ESTEP	EU Association	EU Association
2	EUMAT	EU Association	EU Association
3	3M	EU / USA	Industry
4	AGC	Belgium / Japan	Industry
5	AreclorMittal	Belgium	Industry
6	Arkema	France	Industry
7	Bekaert	Belgium	Industry
8	Bosch	Germany	Industry
9	Dow Corning	EU / USA	Industry
10	HC Starck	Germany	Industry
11	Heraeus	Germany	Industry
12	Plansee	Austria	Industry
13	SAFT	France	Industry
14	SGL Carbon	Germany	Industry
15	Siemens	Germany	Industry
16	Solvay-Rhodia	Belgium / France	Industry
17	Umicore	Belgium	Industry
18	Voest Alpine	Austria	Industry
19	CEA Litton	France	Research - Institute
20	Cranfield University	UK	Research - University
21	CSM	Italy	Research - Institute
22	ECN	Netherlands	Research - Institute
23	IK4 Tekniker	Spain	Research - Institute
24	IMEC	Belgium	Research - Institute
25	ITMA	Spain	Research - Institute
26	SINTEF	Norway	Research - Institute
27	Tecnalia	Spain	Research - Institute
28	TNO	Netherlands	Research - Institute
29	University of Liege	Belgium	Research - University
30	VTT	Finland	Research - Institute

The 30 founding members comprise a good balance between leading materials oriented industry and research organisations.

10 different EU countries are so far represented.

<b>Austria</b>	<b>2</b>	<b>EU Association</b>
<b>Belgium</b>	<b>5</b>	<b>3</b>
<b>Belgium / Japan</b>	<b>1</b>	
<b>Belgium / France</b>	<b>1</b>	<b>Industry</b>
<b>EU / USA</b>	<b>2</b>	<b>15</b>
<b>Finland</b>	<b>1</b>	
<b>France</b>	<b>2</b>	<b>Research - Institute</b>
<b>Germany</b>	<b>5</b>	<b>10</b>
<b>Italy</b>	<b>1</b>	
<b>Netherlands</b>	<b>2</b>	<b>Research - University</b>
<b>Norway</b>	<b>1</b>	<b>2</b>
<b>Spain</b>	<b>3</b>	
<b>UK</b>	<b>1</b>	

EMIRI will broaden its membership base by sector and by position in the value chain so as to effectively represent the advanced materials sector for all SET Plan energy chapters including PV



## Membership Categories

3 categories with interest in performing research into advanced materials for energy applications:

1. Industrial organisations
2. Research organisations
3. Associations

EMIRI will be organised so that an industry driven agenda is ensured

Open membership – Organisations with research activities in Europe in advanced materials for energy applications are eligible for membership

## Key Messages

1. Europe has a world class materials industry able to compete on a global scene that merits further support.
2. Early inclusion of industry in an R&D programme provides a better guarantee of having a final material/product fit for market and deployment.
3. EMIRI is industry driven, EU in scope and will bring scientific and industrial leadership and employment as well as participating in resolving two of society's key future challenges of climate change and access to sustainable affordable energy.
4. EMIRI is inclusive, i.e. EMIRI will be working with all relevant stakeholders to ensure a full value chain approach and transparency.
5. **EMIRI's favoured route is for a contractual PPP type structure.**

# Thank you for your attention

For further information please contact:

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