

The Leading Engine for Innovation and Entrepreneurship in Sustainable Energy

## *Considerations for an 'Innovation Readiness Level' along with the 'Technology and Manufacturing Readiness Level' indicators*

*...a KIC InnoEnergy attempt*

April 23<sup>rd</sup> -24<sup>th</sup> 2014, IEA Committee on Energy Research and Technology - Modelling and Analyses in R&D Priority-Setting and Innovation, Paris

**Celine Jullien**

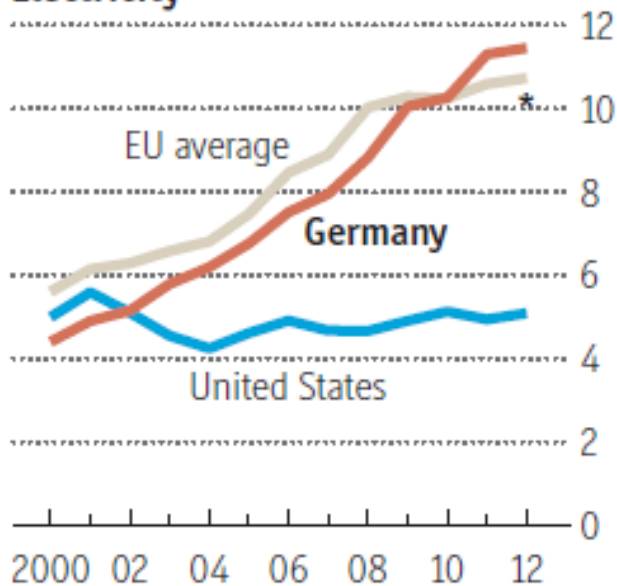


1. ***Once upon a time*** KIC InnoEnergy S.E.
2. **KIC InnoEnergy Approach: Aligned Process, Methods and Tools at *Project, Portfolio,* and *Thematic Field* Levels**
3. **From *Thematic Field* to *Industry* Level: KIC InnoEnergy contribution to the SET Plan Integrated Roadmap**

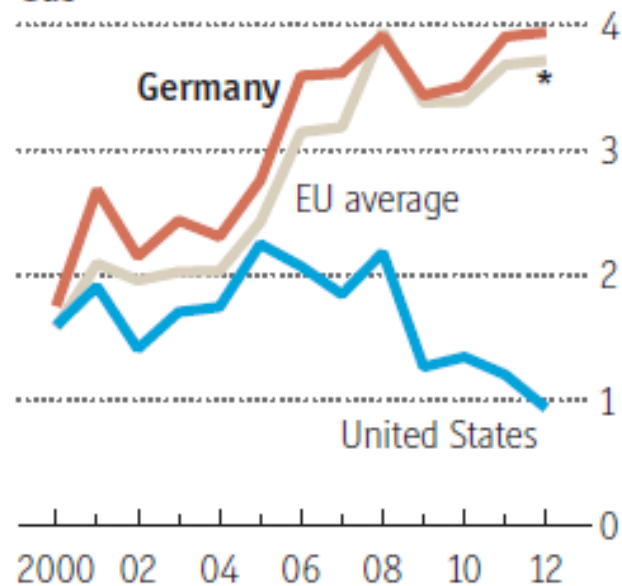
## Europe's handicap

Industrial energy prices, € cents per kWh

### Electricity



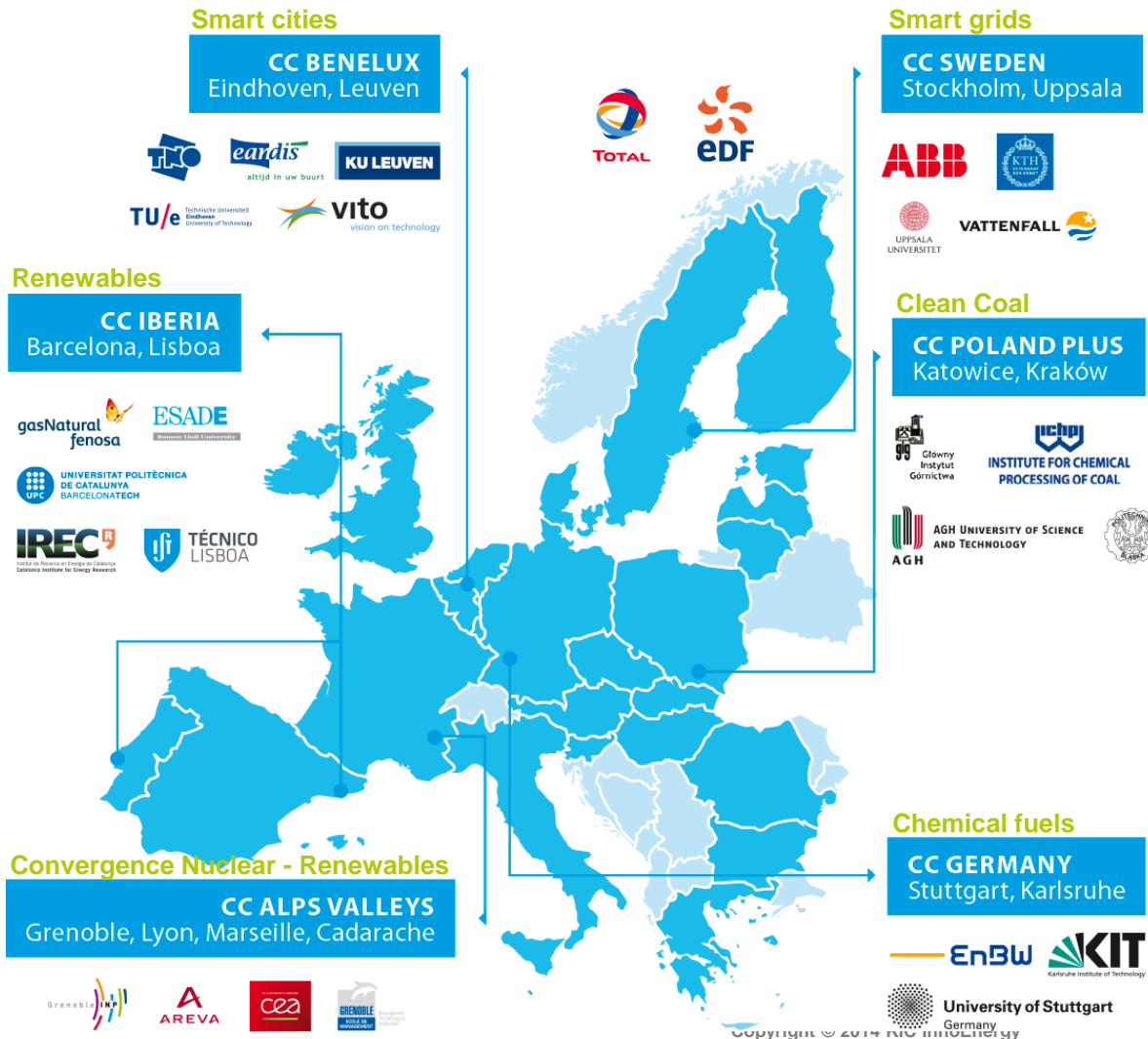
### Gas



Source: Enerdata/McKinsey

\*Estimate

## The leading engine for innovation and entrepreneurship in Sustainable Europe



### Sustainability by addressing :

The reduction of the cost in the energy value chain

The increase of security

The reduction of CO<sub>2</sub> and other green house gas emissions

## Industrial companies



## Research centres



## Universities



## Business schools



A strong and complementary network of **149 partners** (and increasing) including Industry and Education partners, Research Centers and others, all collaborating at different levels.

Strong presence of Industry partners legitimizes the activities and the objectives of KIC InnoEnergy

	Formal Partners	Associate partners	Project partners	Total
<b>Industries</b>	9	11	53	<b>73</b>
<b>Universities</b>	12	4	11	<b>27</b>
<b>Research Centers</b>	6	4	15	<b>25</b>
<b>Others</b>	-	6	18	<b>24</b>
	<b>27</b>	<b>25</b>	<b>97</b>	<b>149</b>

## Examples





# KIC InnoEnergy Lines of Business

Game changers

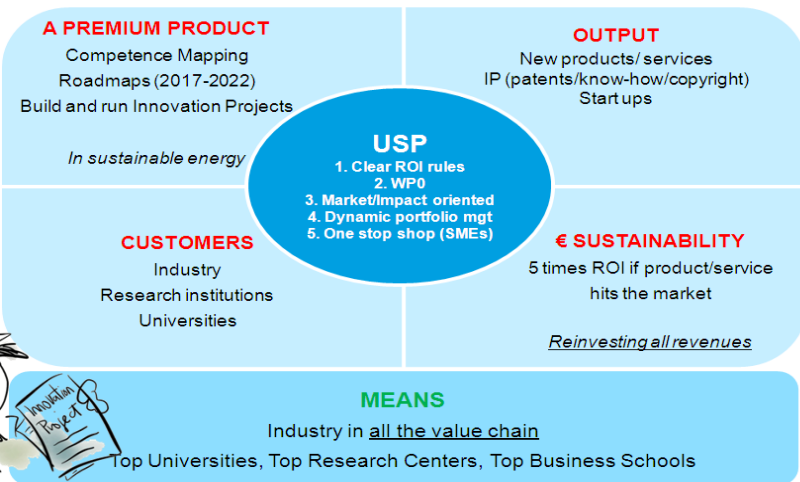


## Innovation Projects

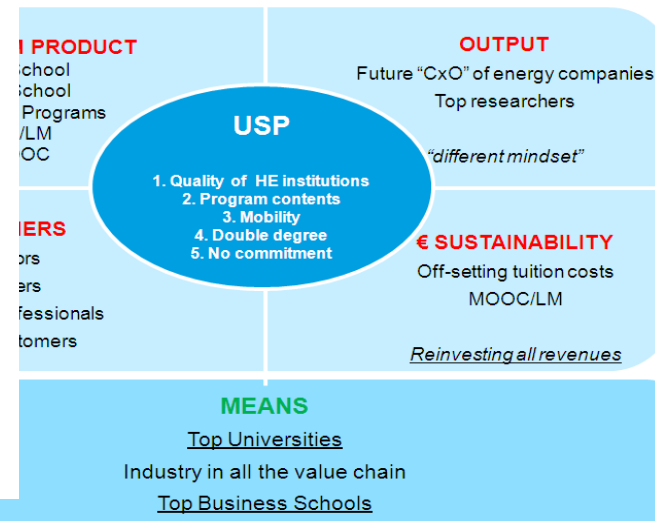
## Business Creation

## Education

### Transforming knowledge into money



### Creating the game changers of the future



Google of Energy, future ABB



Disruptive product & services

2009

2011

2012

2013

2014

7

# KIC InnoEnergy Ways forward

Game changers



**Innovation Projects**

**Business Creation**

**Education**

**Creating the culture of ROI  
Structuring it legally since day 1  
(BCS, TS, PA, IP Rules, ROI, ..)**

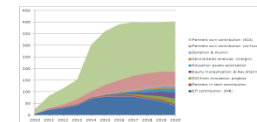
**The KT disseminated extensively:**  
18 EIT awareness days  
21 meetings with future KICs  
Magrenov (FP7) awarded to guide a KIC like structure in Magreb



Google of Energy, future ABB



Disruptive product & services



Sustainability (financial, operations)

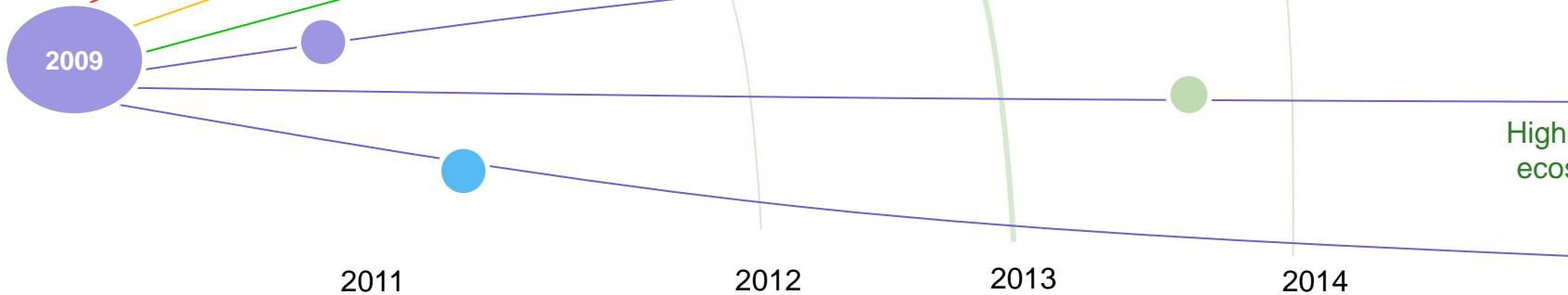
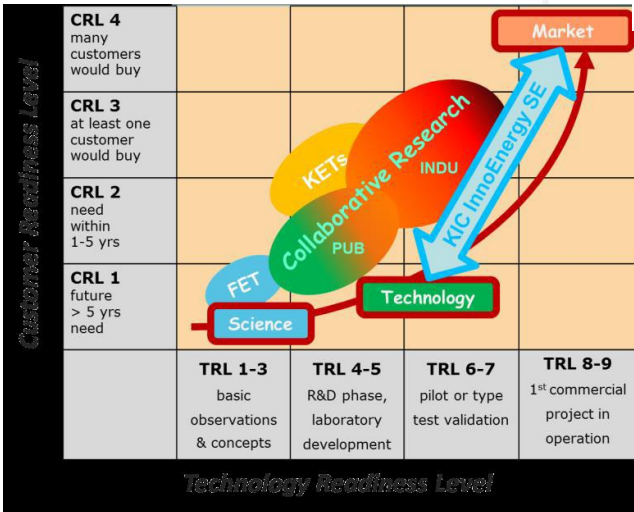


High performance ecosystem & KT



Synergies with EU

**Position in the TRL-CRL  
EU value chain**





# KIC InnoEnergy Achievements

Game changers



**Innovation Projects**

**Business Creation**

**Education**

**16**  
new products and  
services  
**30**  
patents filled-out

**18**  
stat-ups created  
**400**  
business ideas  
screened since 2011

**458**  
Students  
enrolled in our  
EIT labelled MS,  
exec, PhD.  
school

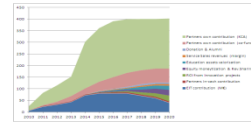


Google  
of Energy,  
future ABB

**EUR 400 million business plan**



Disruptive  
product  
& services



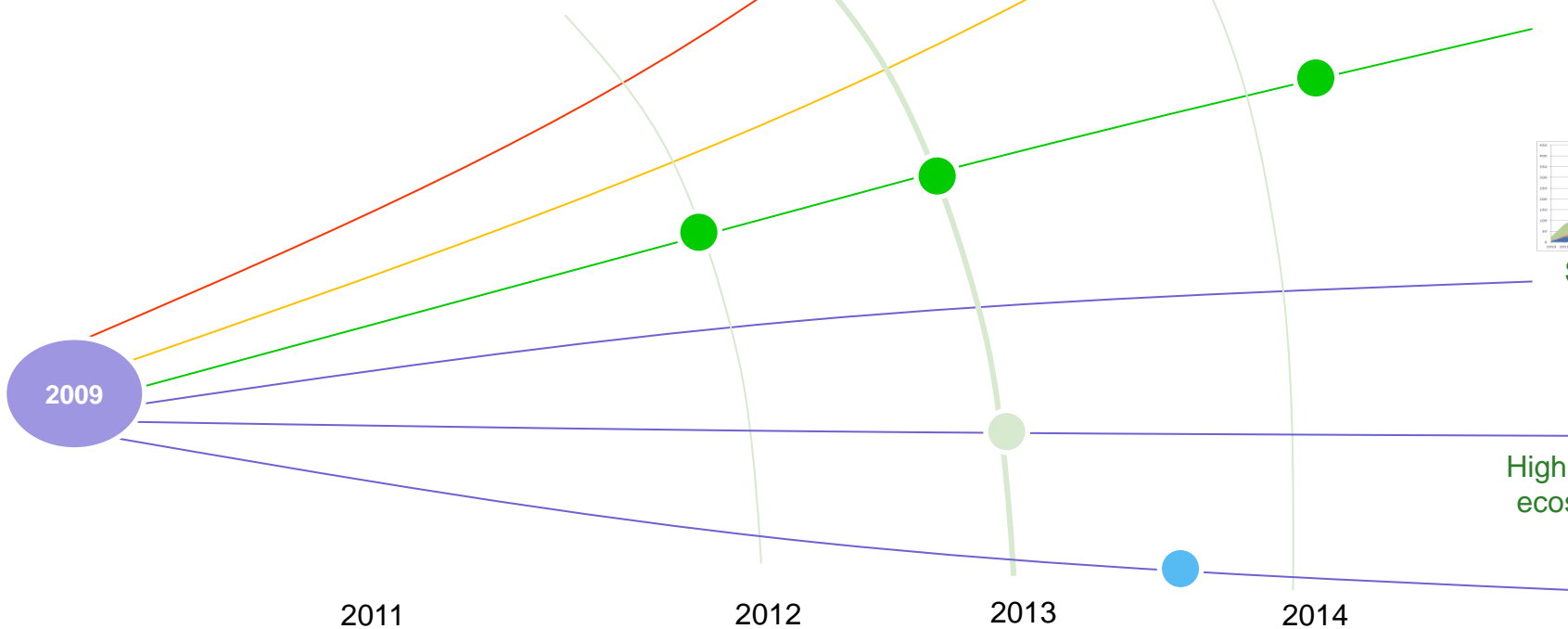
Sustainability  
(financial,  
operations)



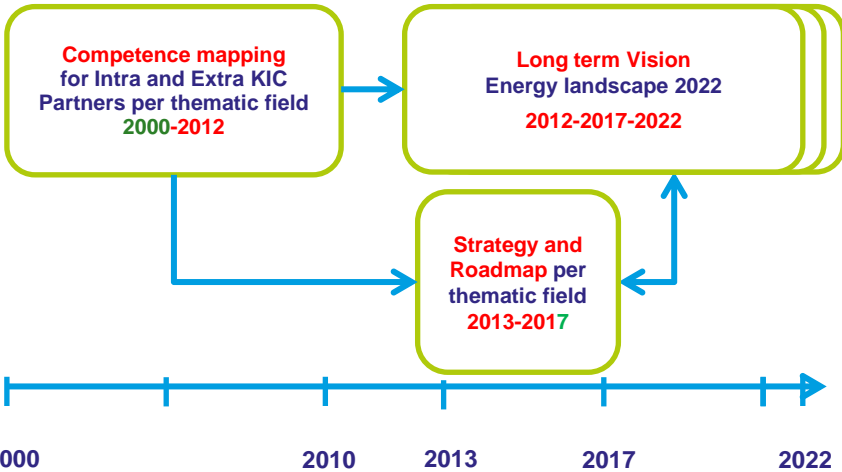
High performance  
ecosystem & KT



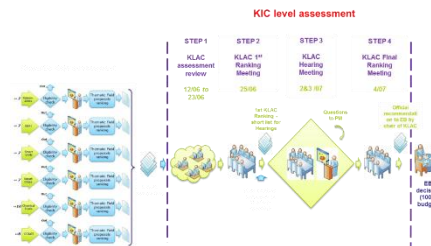
Synergies with EU



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## Assessment Process



## KIC InnoEnergy IRL tool®



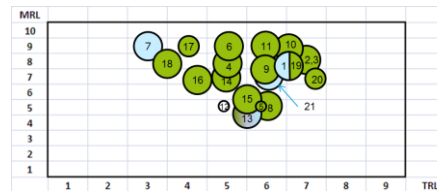
## Innovation Project Monitoring and Support



Impact

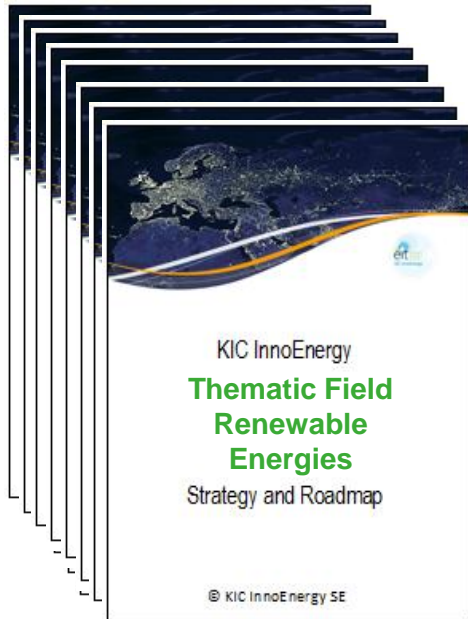
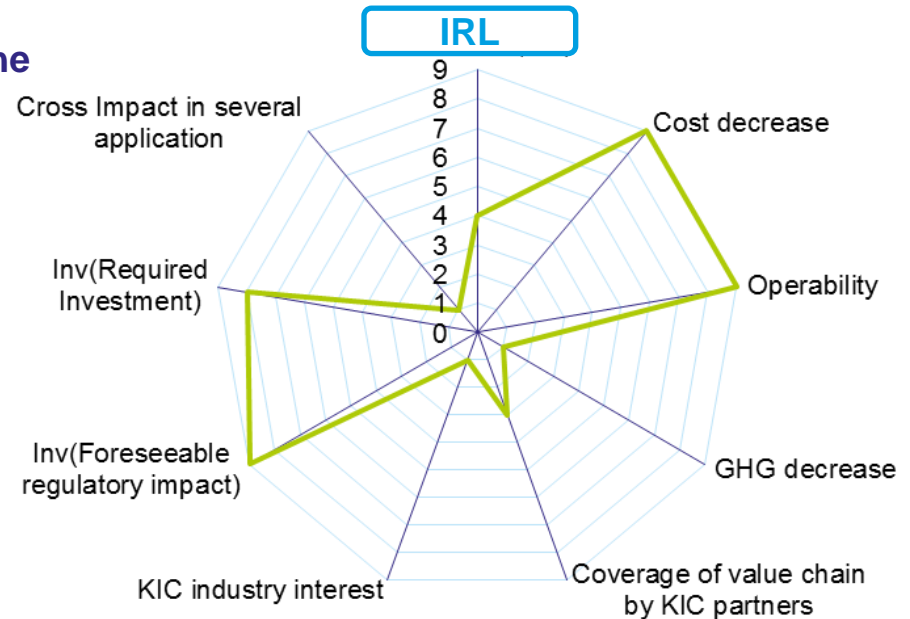


## Portfolio Management Criteria



## 110 Priority Technologies

- ✓ Shortest **Time to market** (for the technology involved)
- ✓ **Highest impact** in: Energy cost decrease, Increase of operability, decrease of GHG effects
- ✓ **Leadership and competence of KIC partners** in the said topic and technology
- ✓ Declared **KIC industry interest** and commitment
- ✓ Foreseeable **regulatory impact**
- ✓ **Required investment** to develop the innovations
- ✓ **Cross impact** in several applications
- ✓ **IRL**



Energy from Chemical Fuels
Clean coal and Gas technologies
Renewable energy
Sustainable Nuclear and renewable energy convergence. Energy efficiency
Smart and Intelligent Buildings and cities
Smart grids and electric storage

## Challenges, Timing and Targets per priority technologies

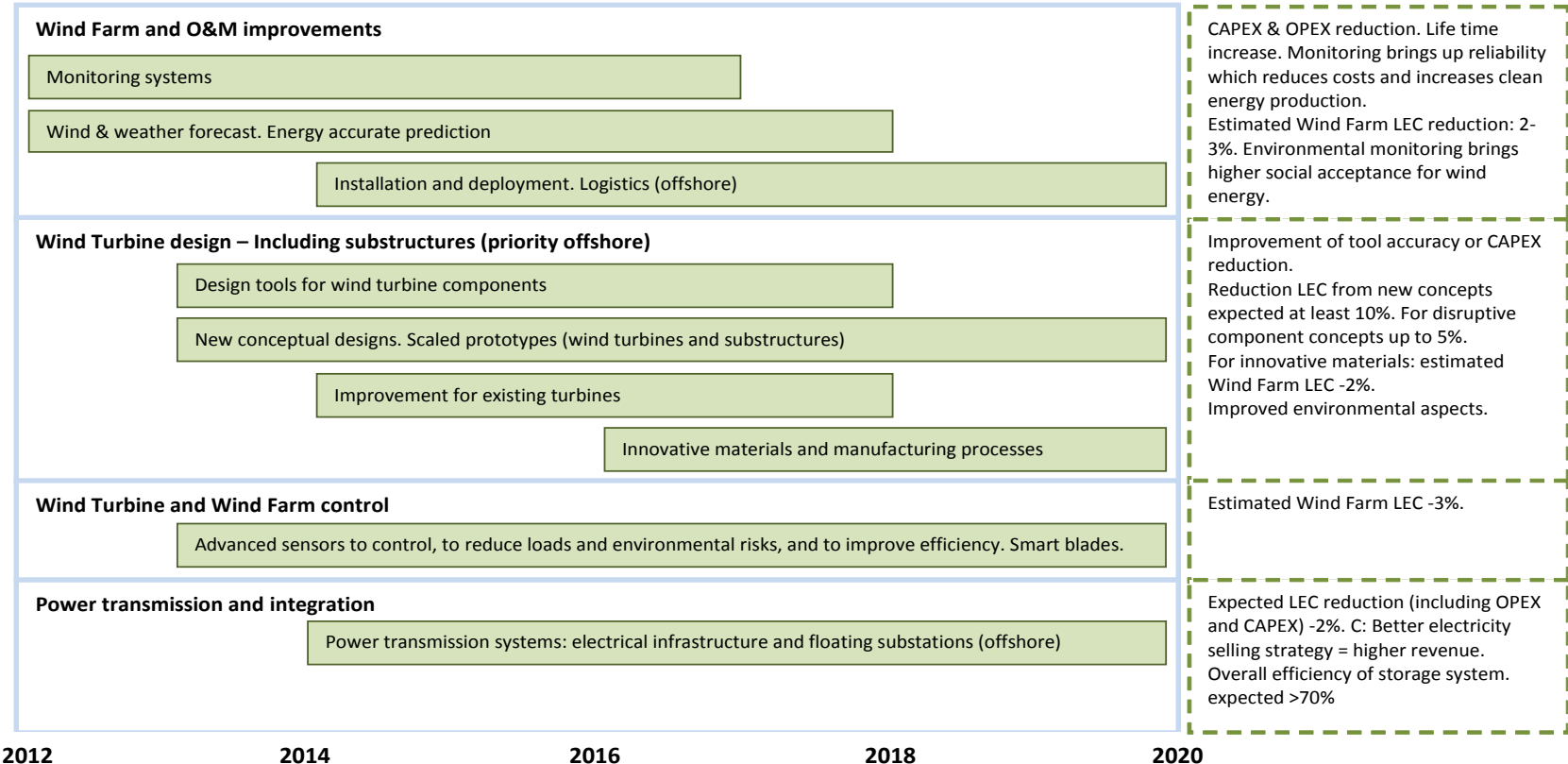
### WIND ENERGY

2020 Challenges

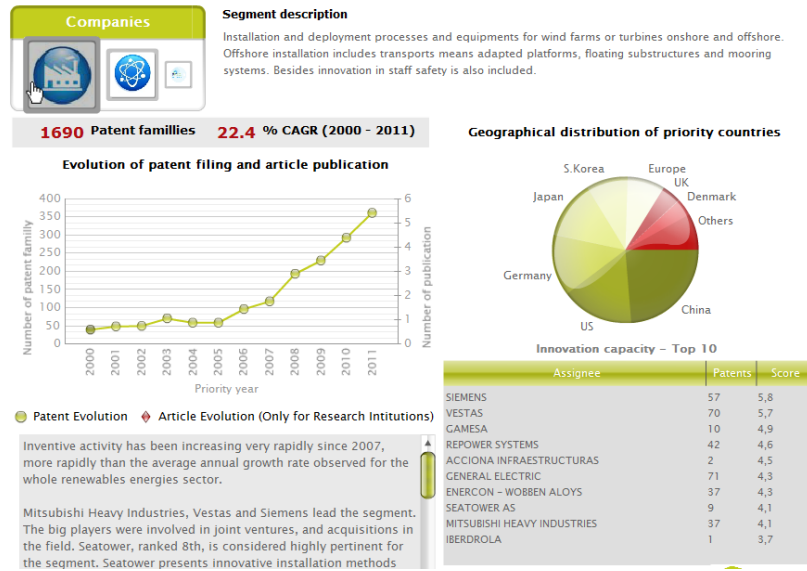
- Reduction of the LEC by improving reliability, lifetime and inspection costs and risks.
- Better accuracy of the energy prediction
- Reduction of the installation costs, especially in Offshore
- Innovative concepts and materials of the components for Onshore and Offshore Wind Turbines, including design tools
- Improving the power transmission and grid integration for increasing the wind farms deployment, including energy storage

Products & Services

### Target



## Top 10 ww Industry and Academic Players in KIC 110 Priority Technologies



### KPIs

- ✓ **IP Scoring**
  - Number of **Patents**
  - **Quality** of Patents
- ✓ **Innovation Scoring**
  - **R&D** capacity
  - **Strategic** index
- ✓ **R&D scoring**
  - **Publications**
  - **Quality** of publications
- ✓ **Collaboration scoring**
  - # of R&D&I projects/\$
  - R&D&I partners quality
- ✓ **Valorization capacity scoring**
  - # products in market
  - # spin-offs created

### Ww survey

- 237 KIC partners
- 651 worldwide top players

### Volume of Data analysed

- ~150 000 patents
- ~180 000 publications

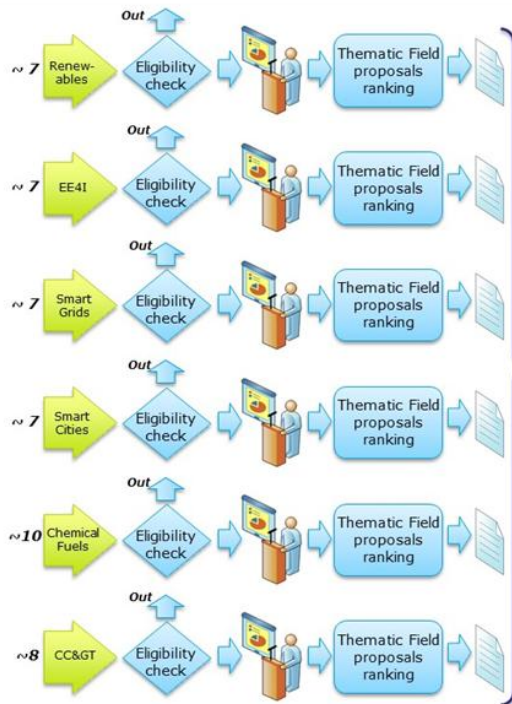
### Desk research

- Focused on ~800 worldwide players & 100 KIC partners
- 1890 identified collaborations
- 340 identified acquisitions / spin-off
- 1210 identified products / services
- 17 identified licenses

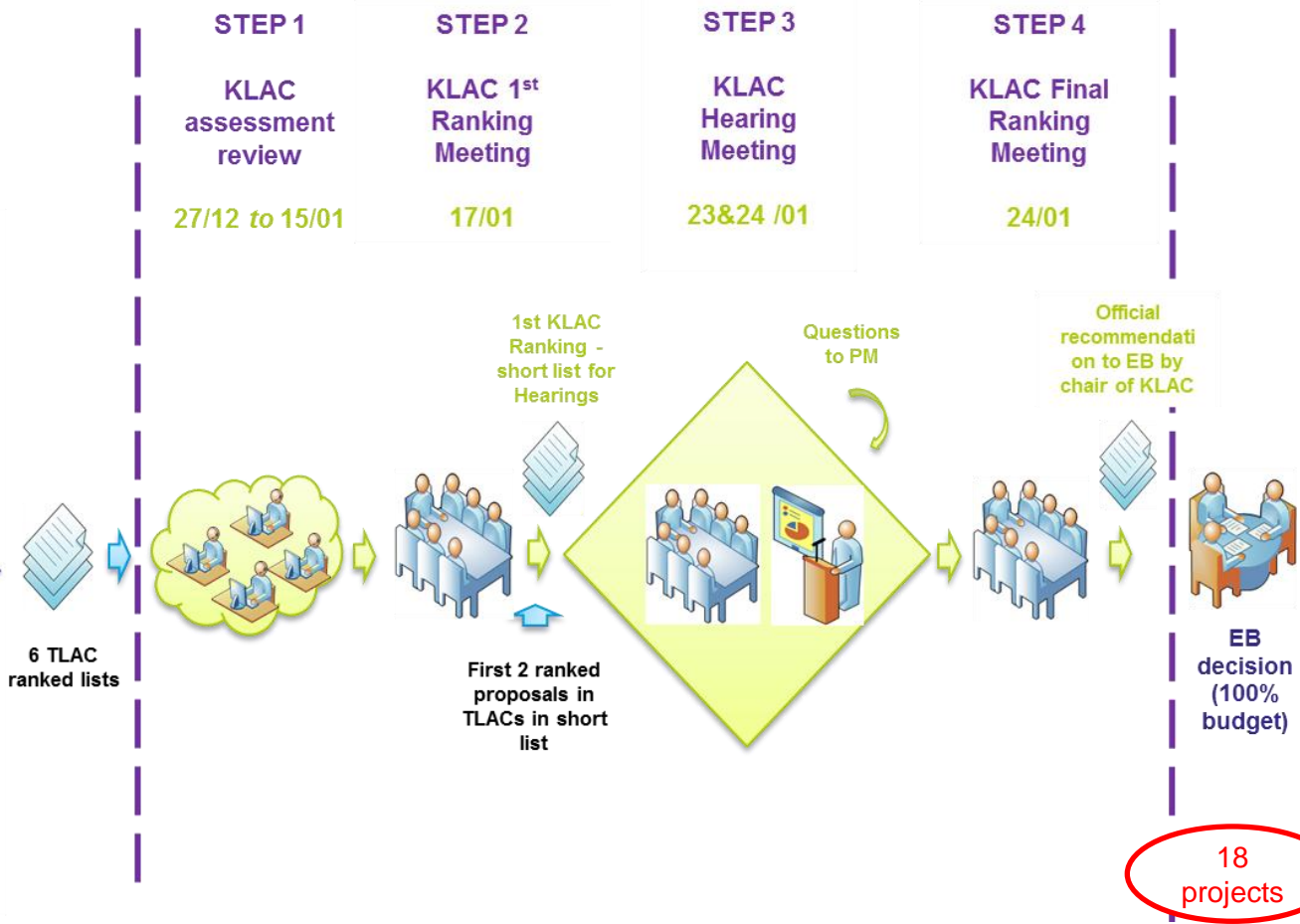


## Thematic Field level assessment

46 projects



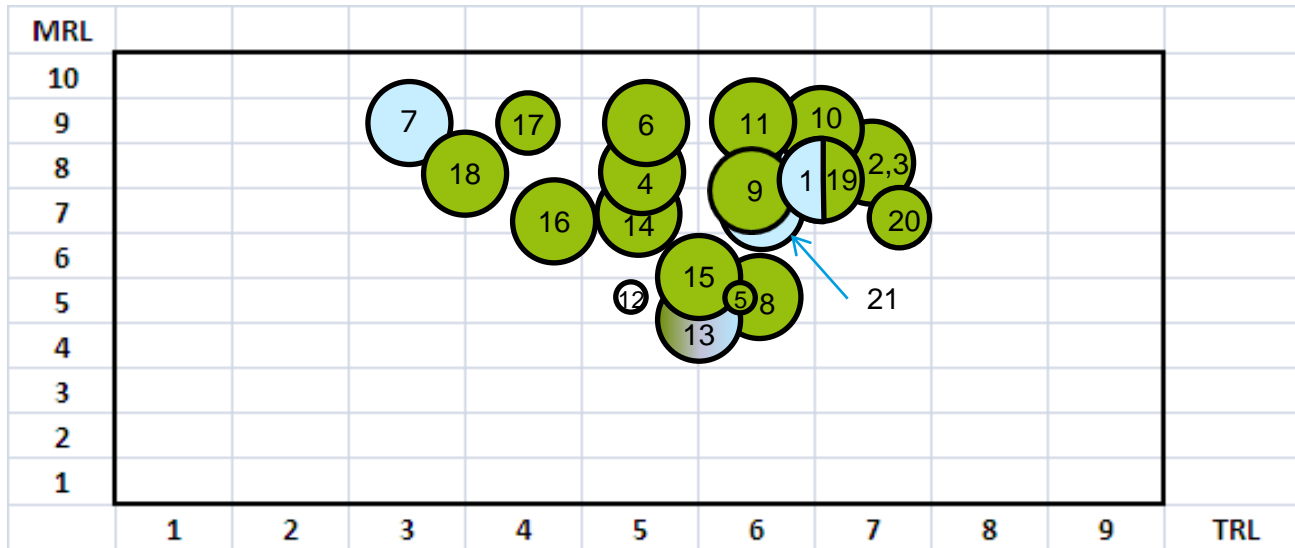
## KIC level assessment



## Assessment criteria (transparent, formalized, communicated, known)

<b>A1</b>	<b>BUSINESS DEVELOPMENT</b>	<b>6,0</b>
A1.1	Preliminary product or service definition (problem statement, solution benchmark,...)	2,0
A1.2	Business opportunity assessment (market analysis, competitive analysis, value proposition for customers, ...)	3,0
A1.3	Soundness of IP analysis (background, freedom to operate, protections, etc.)	1,0
<b>A2</b>	<b>RISK ANALYSIS</b>	<b>5,0</b>
A2.1	Availability of required knowledge in the consortium	2,0
A2.2	Technical barriers identified and mitigation plan	1,5
A2.3	Evaluation of other risks (financial, societal, law, resources, team,...) and mitigation plan	1,5
<b>A3</b>	<b>FINANCIAL VIABILITY</b>	<b>3,0</b>
A3.1	Project budget vs. market potential and scope of the project	1,0
A3.2	Justification of requested KIC investment	1,0
A3.3	Assessment of plan for KIC investment return	1,0
<b>A4</b>	<b>OPERATIONAL VIABILITY</b>	<b>4,0</b>
A4.1	Soundness of project plan (milestones, deliverables, availability of resources, etc.)	2,0
A4.2	Soundness of consortium vs. value chain	1,0
A4.3	Quality of project management	1,0
<b>A5</b>	<b>COMPLIANCE WITH KIC REQUIREMENTS</b>	<b>4,0</b>
A5.1	Integration of students, academics, education organisations	0,5
A5.2	Potential to create business (start-ups, spin-offs, ...)	1,0
A5.3	<a href="#">Compliance with KIC InnoEnergy roadmap</a>	2,0
A5.4	Participation of SMEs	0,5

## Portfolio Management Criteria TRL/MRL/TAM/"Year of market ready"



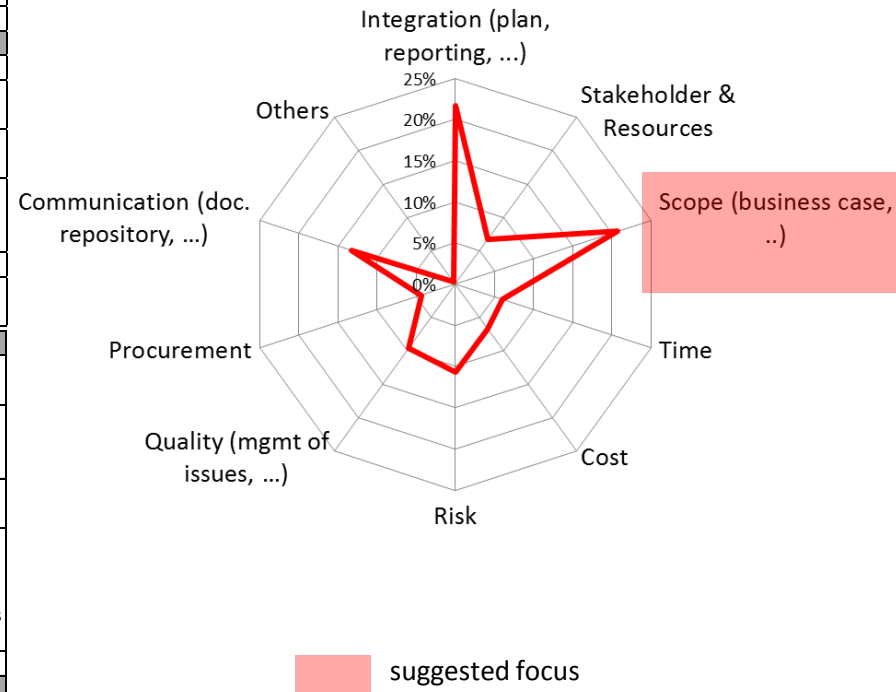
1. Biometha
2. Accor
3. Effic
4. Eye Us
5. Flowbox
6. AME OX200
7. Torsion Drive
8. Value Flex
9. Saga
10. Beest
11. Inevitad
12. Flex<sup>2</sup>
13. SmallFT
14. Refills
15. Deal
16. GasQ
17. BioORC
18. Fascom
19. CarbonOro
20. CySeMol
21. Sun-Rise

	Market ready [2016-2017]	Market ready [2018-2019]	Market ready [after 2020]
TAM [<10M€]			
10M€<TAM<100M€			
TAM>100M€			

## WPO at project level

Topic (headline)	Deliverable from WPO
<b>1. Product/service definition:</b>	
a. Product/service definition/specification	List of expected products and/or services
b. Technical assessment	Assessment of technical aspects
c. Problem statement	Description of what needs to be done technically
d. Innovativeness	Comparison and differentiation of the expected products and/or services with the state of the art
e. Technical benchmark, alternative without	Positioning of the function/performance of the expected products and/or services versus state of the art
<b>2. Market analysis</b>	
a. Market benchmark (3-5 years)	Target market segments and their sizes in Mio €
b. Product Market Combination's, /unique selling points	List of major competitors and unique selling points of the new products
c. Customer business case (why would the customer buy?)	Rentability analysis draft (profit and loss calculation) from vierpoin of the customer
d. Business case, (how to make profit?)	Rentability analysis draft of the project's product (profit and loss calculation) from vierpoin of the supplier / manufacturer of the product and/or service
e. Marketing 3P's (place, price, promotion)	Draft of the marketing plan
f. Required investment to overcome the valley of death?	Draft of the investment plan
<b>3. Competitive analysis:</b>	
a. Market price at market entrance (because of design to cost)	Target cost and price of the new products and/or services
b. Competitors and the difference with the proposed proposition	List of competitors and the value proposition of their competing products/services. Differentiation of the expected products/services from competing products/services
c. Value chain available and connected?	Description of all steps that need to be covered to make the new product / service available and who performs them
d. Industrial partners committed? (project consortium)	Major parts of the value chain are covered by partners to the consortium. These partners contribute adequate own resources and receive adequate KIC funding. Prefered form of the deliverable: Signed commitment from industrial partners (Project Agreement or Lol)
<b>4. Freedom to operate:</b>	
a. Intellectual Property: own	IP Agreement which lists identified Background in the consortium and makes it available to the consortium and partners in the value chain.
b. Intellectual Property: hostile	External IP identified and analyzed with the result that development and production of the new products / services is not restricted by external IP
c. Intellectual property: foreground and licensing	List of areas where new IP is expected, and to whom this new IP shall be licensed
<b>5. Detailed project plan/WBS</b>	
a. What, when, who, where to reach the goal.	Sound project plan
b. What are the deliverables in scheme	Milestones and output-oriented deliverables defined
c. Risk's and mitigation	Risk analysis and mitigation plan available: Risks identified and sound mitigation actions established?

## KIC InnoEnergy Project Management Office



  suggested focus

The **KIC InnoEnergy IRL tool**<sup>®</sup> allows you to assess the innovation potential of a given project considering the maturity of 5 dimensions:



The **Technology Readiness Level** measures the maturity of a given technology.

The **IP Readiness Level** measures the “*freedom to operate*” of a given product/service.

The **Market Readiness Level** measures the maturity of a given need in the market.

The **Consumer Readiness Level** identifies the level of knowledge about the consumer and to what extent affects the product/service to this consumer.

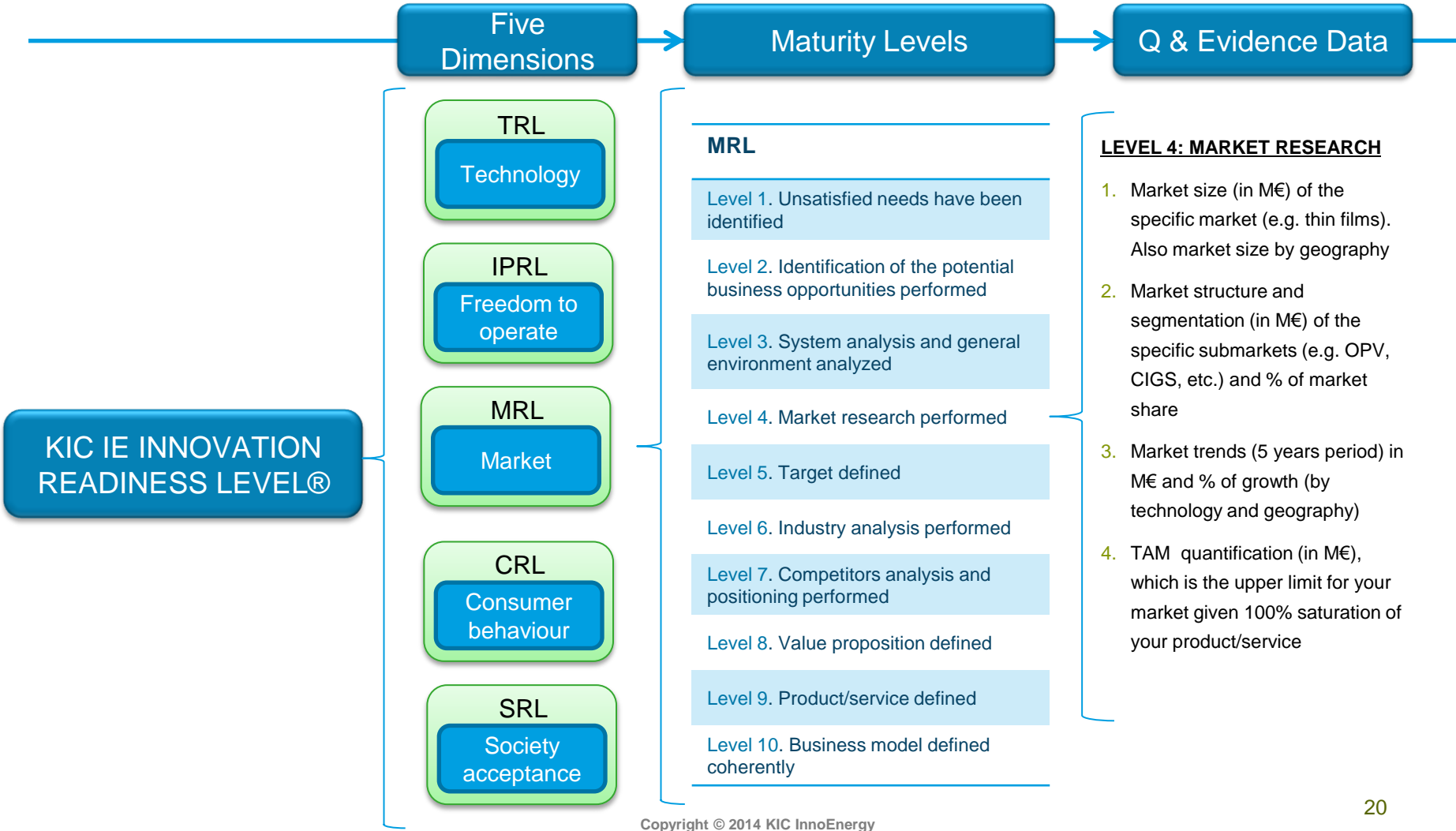
The **Society Readiness Level** identifies the level of knowledge about the stakeholders’ interests and concerns and to what extent affects the product/service to the society.

## KIC InnoEnergy Innovation Readiness Level (IRL tool)<sup>®</sup>



Each dimension has different **maturity levels**

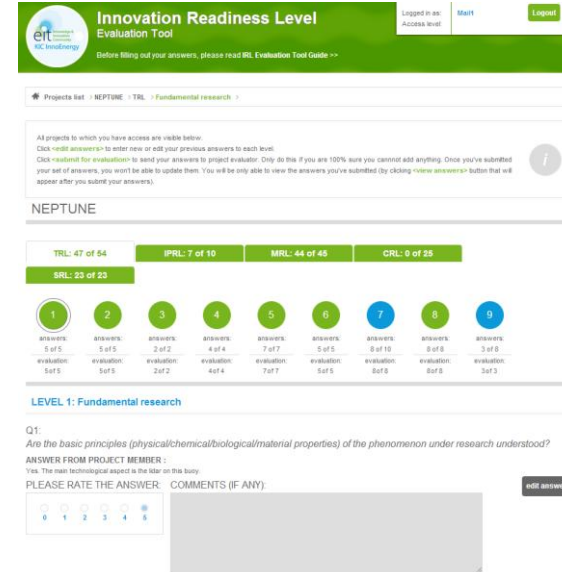
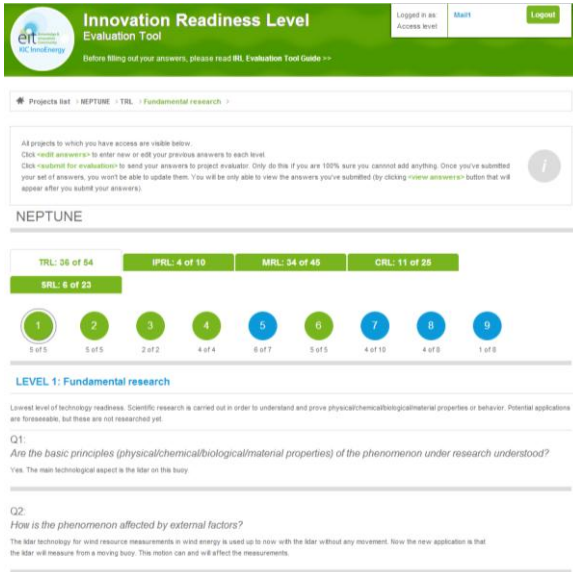
Each level has different **questions** to substantiate each maturity level





The Project Manager of a given R&D project fills the information.

The Committee evaluating the projects evaluates the quality of the answers and assign a level for each dimension.



The results obtained support the decision making.



Project name:	TRL	IPRL	MRL	CRL	SRL	OVERALL
NEPTUNE	answers: 47 of 54 level: 9 87.04% evaluation: level 1: 5, level 2: 5, level 3: 5, level 4: 5, level 5: 4, level 6: 4, level 7: 3, level 8: 2, level 9: 2	answers: 7 of 10 level: 3 70.00% evaluation: level 1: 2, level 2: 2, level 3: 1	answers: 44 of 45 level: 10 97.78% evaluation: level 1: 4, level 2: 4, level 3: 0, level 4: 2, level 5: 4, level 6: 3, level 7: 3, level 8: 2, level 9: 3, level 10: 4	N/A as MRL level 6 QS has been answered with 'NO'	answers: 23 of 23 level: 5 100.00% evaluation: level 1: 1, level 2: 0, level 3: 0, level 4: 0, level 5: 0	answers: 121 of 132 91.67% evaluation: TRL: OK, IPRL: OK, MRL: OK, CRL: none, SRL: Rejection
	level: 6 edit evaluation	level: 1 edit evaluation	level: 6 edit evaluation		level: 1 edit evaluation	submitted on 19/12/2013, no updates possible

**MATURITY LEVELS**



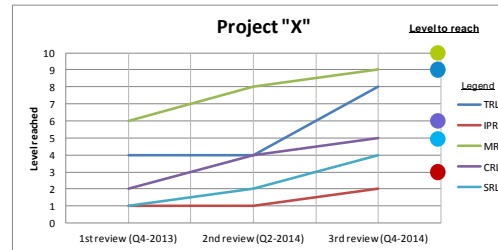
## Results from a given project

### Dimension analysis

Project name:	TRL	IPRL	MRL	CRL	SRL	OVERALL
NEPTUNE	47 of 54 answers: level 9	7 of 10 answers: level 3	44 of 45 answers: level 10	N/A as MRL level 6 QS has been answered with '0'	23 of 23 answers: level 5	121 of 132 answers: 91.67%
	evaluation: 87.04%	evaluation: 70.00%	evaluation: 97.78%	evaluation: 100.00%	evaluation: 91.67%	
	level 1: 5	level 1: 2	level 1: 4	TRL OK	level 1: 1	TRL OK
	level 2: 5	level 2: 2	level 2: 4	MRL OK	level 2: 0	IPRL OK
	level 3: 5	level 3: 1	level 3: 0	CRL: none	level 3: 0	MRL OK
	level 4: 5		level 4: 2	SRL: Rejection	level 4: 0	
	level 5: 4		level 5: 4		level 5: 0	
	level 6: 4		level 6: 3			
	level 7: 3		level 7: 3			
	level 8: 2		level 8: 2			
	level 9: 2		level 9: 3			
	level 10: 2		level 10: 4			
	level: 6	level: 1	level: 4		level: 1	
	edit evaluation	edit evaluation	edit evaluation		edit evaluation	
						submitted on 19/12/2013, no updates possible

## Further uses

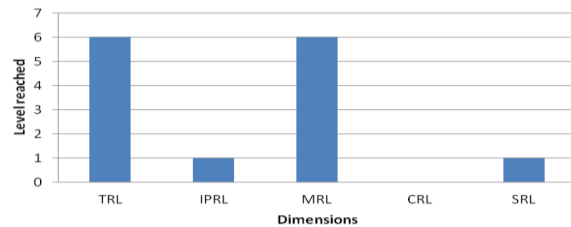
### Project Management



Evolution of a project over time.

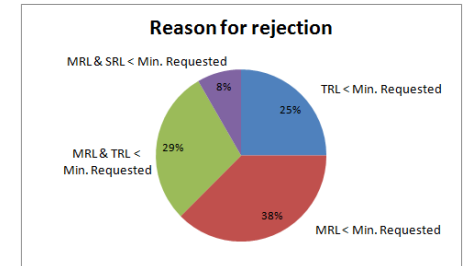
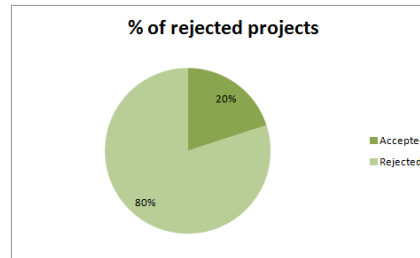
## Analysis

### Aggregated analysis

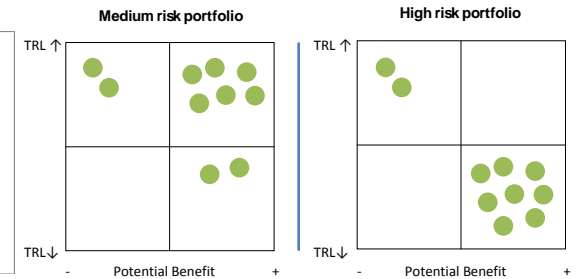
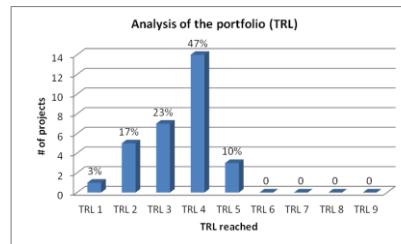


Coherence in the evolution of the different dimensions. Evaluation of the project as a whole.

### Ratio of accepted/rejected projects

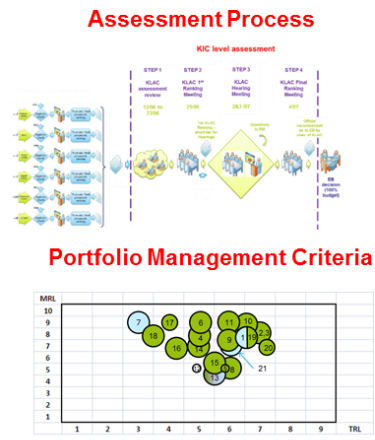
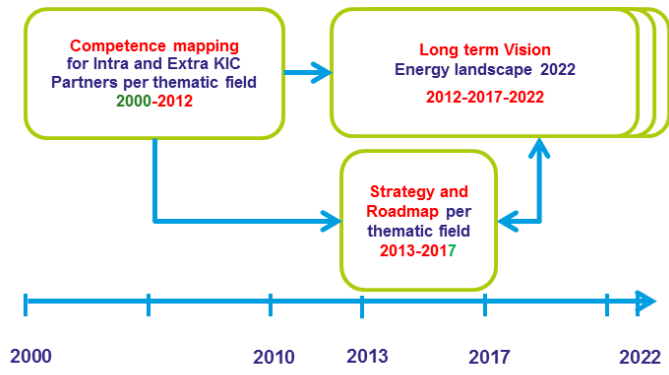
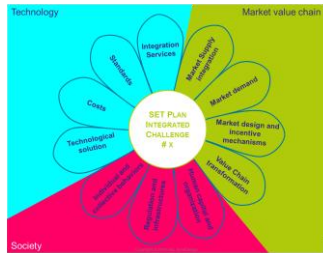
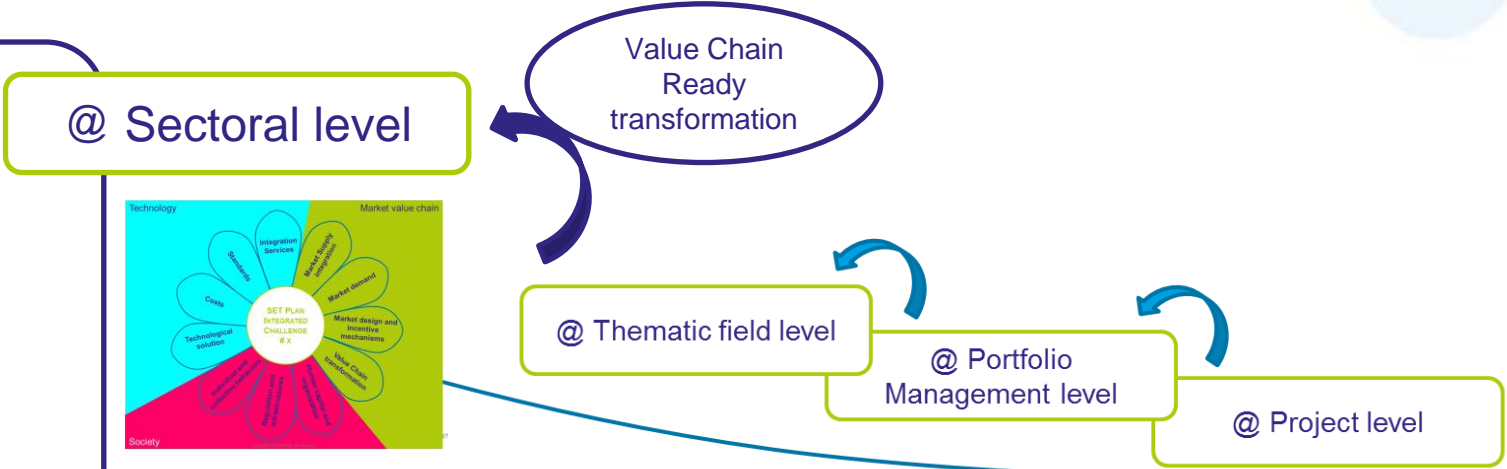


### Analysis of the portfolio of projects



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## SET Plan Integrated Roadmap

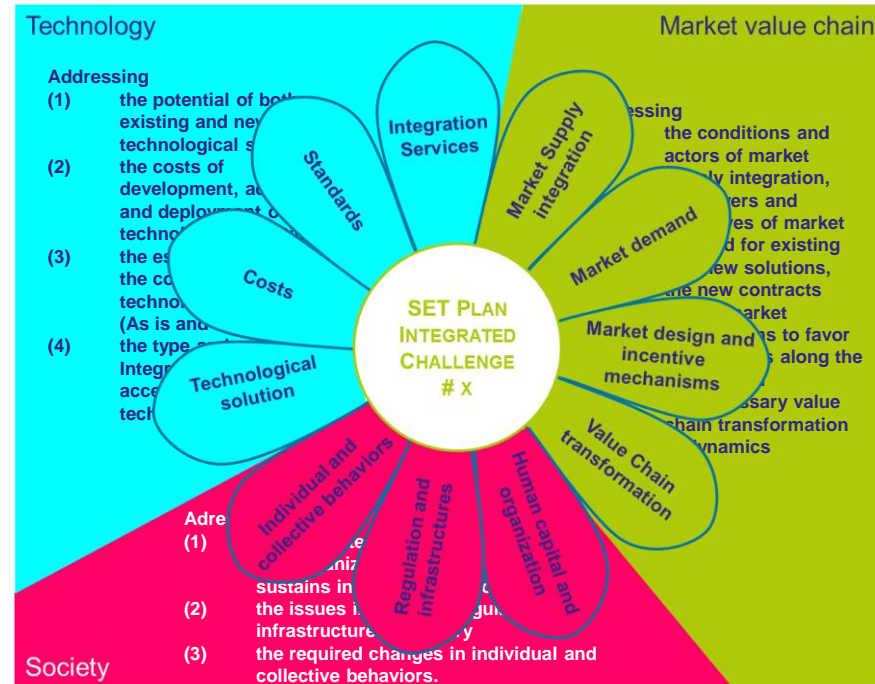


**KIC InnoEnergy IRL tool®**

**Innovation Project Monitoring and Support**

**Impact**

1. **Integration** by incorporation of **Societal Appropriation** Concerns and **Market Value Chain** Perspectives to the **Technological Dimensions** of energy challenges.
2. **Integration** by **experimentation** in generalized **Research and Innovation Action Hall**, to test, implement, learn, reinvent, measure transformation throughout the whole innovation chain.
3. **Integration** by **combination** of industry dynamics - **Value Chain Ready Transformation** - and project **Innovation Readiness Level**.



=> Measure Integration:  
 impact in job creation, in growth leverage, competitiveness increase...