



## **Integrated Research Programme on Wind Energy**

**Project acronym: IRPWIND**  
**Grant agreement n° 609795**  
**Collaborative project**  
**Start date: 01<sup>st</sup> December 2013**  
**Duration: 4 years**

## **Addendum to P3 report Work Package 2 - Deliverable D2.13**

**Lead Beneficiary: DTU**  
**Delivery date: 11-05-2017**  
**Dissemination level: PU**



The research leading to these results has received funding from the European Union Seventh Framework Programme under the agreement 609795.



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**Document Information**

| <b>Version</b> | <b>Date</b> | <b>Description</b> | <b>Prepared by</b> | <b>Reviewed by</b>       | <b>Approved by</b>        |
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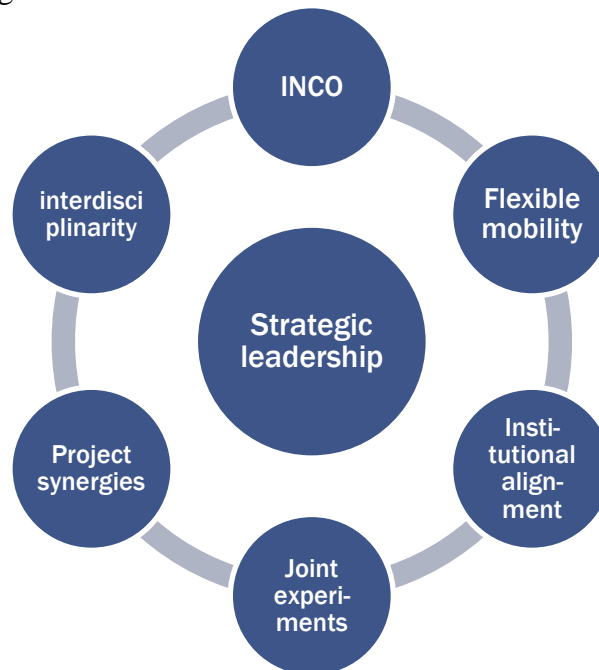
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## Executive Summary

During the first three years of IRPWIND, the project participants and the associated EERA Joint Programme for Wind Energy has gained invaluable experience in how to foster long term collaboration in European wind energy. This report summarises the main learnings and how IRPWIND has developed. The main learnings is that long term strategic collaboration is best fostered under stable policy conditions and focusing on pre-competitive research in close contact with industrial end users. The long-term collaboration should build on seven areas summarised in the figure below.



*Figure 1: seven areas of learning for IRPWIND*

The coordination actions undertaken in IRPWIND have all paid dividend, but only due to changes to the initial plans. The *mobility scheme* has been made more flexible; *international collaboration* has been productive with the US, while links to Japan have been less productive; Funding for *joint experiments* have been increased, as this scheme has been very useful to support research activities in IRPWIND. In national alignment – one of the cornerstones of the EU SET-Plan has been – *focus has shifted to institutional alignment*. In the third year of IRPWIND, activities on *open data and data management* have been increased significantly, with new deliverables introduced for the fourth reporting period of the project. Combined, IRPWIND has promoted synergies with national projects, opened new collaborations between scientific disciplines, strengthened the priority setting with industrial partners and build trust and collaboration between EERA JP WIND partners.

## 1. Introduction

When the proposal for an integrated research programme for wind energy, entitled IRPWIND, was written in 2012, we formulated the following ambition for the project:

*“The overall objective of IRPWIND is to implement an integrated research programme to foster long-term collaborative research and open innovation within the key research performers in Europe, led by the EERA’s Wind Joint Programme partners”*

(IRPWIND DoW, Part B. p. 8)

Five years later and three years into the project, the IRPWIND partners have learned valuable lessons about how to foster long term collaboration in wind energy.

This report, which is an addendum to the third periodic report of IRPWIND, summarises the main highlights of IRPWIND and the lessons learned from these as the EERA Joint Programme for Wind Energy prepares to continue the efforts of IRPWIND after the end of the project. The aim is to provide the IRPWIND reviewers, the IRPWIND participants and the European Commission with a quick overview of how the project has evolved.

Perhaps the most important question that IRPWIND has tried to answer is what research tasks are best solved at European level. That question has been driving the EU Strategic Energy Technology Plan and was asked explicitly to member states and industry during the revision of the SET-Plan in 2015. What should be done at member state level, what does the industry wish to do themselves and what should Europe support?

Two trends have determined the way that question was answered. Firstly, Horizon2020 has been about impact and the view has been that impact is best achieved by making sure that innovations made it all the way up the innovation ladder to TRL9. One consequence of that has been that Framework programme projects should have a significant industry participation to ensure knowledge transfer. Secondly, Horizon2020 and the SET-Plan has aimed to increase the coordination of member states R&I funding by using framework programme projects as leverage. The four Integrated Research Programmes, including IRPWIND, were created as tools to achieve this; bottom up coordination in the IRPs would enable the coordination of national funding programmes to fund strategic priorities in renewable energy research.

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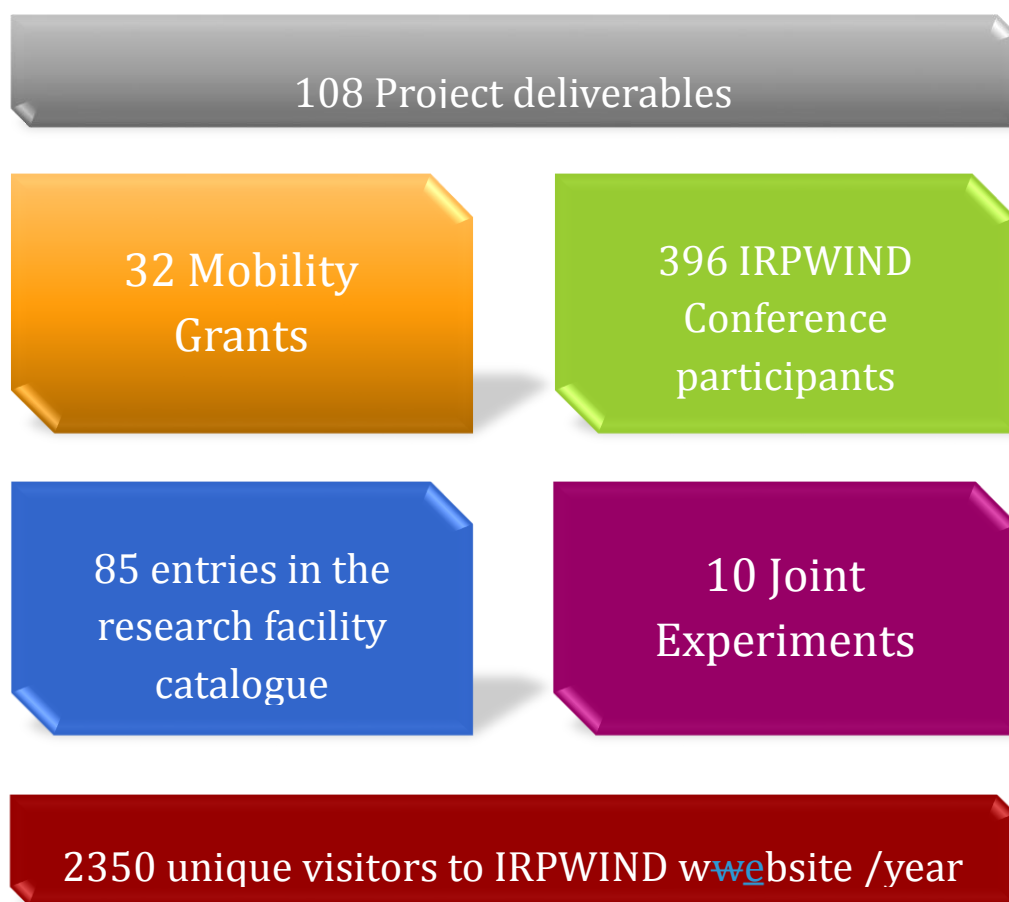
The lessons from IRPWIND and EERA JP WIND over the last 3 years have taught a different lesson. Firstly, industry sees a great potential in European projects developing new standards and providing break through knowledge, whereas they prefer bilateral agreements with research organisations or smaller national projects to do targeted technology development due to IPR issues. Secondly, member states have been reluctant to collaborate on joint funding for strategic priorities when it came to

implementation despite good intentions. Their priority is to support national industries and jobs.

What can and should be done at European level is instead *to foster long-term collaboration on precompetitive research*. This is an area where research organisations are able to share knowledge and can involve teaching and training of the future workforce. Pre-competitive research is also what creates the platform for next generation of wind energy that companies and research organisations can develop into new technologies in tighter collaborative efforts. And finally, pre-competitive research is what enables the technological leadership that makes European wind turbine manufactures competitive on the global market. The impact will follow.

The lessons learned in IRPWIND points in this direction and as the Key Performance Indicators show, the IRPWIND participants collaborates widely with industry thus ensuring the necessary knowledge transfer.

This report summarises the main lessons learned for IRPWIND and provides an overview of highlights from each reporting period that have led to this insight.



*Figure 2 The outcome of the first three years of the IRPWIND project in terms of Mobility Grants, Granted Joint Experiments, participants in the annual conference, entries in the research facility catalogue and visitors at the website.*

## 1.1 Lessons learned in IRPWIND

### Strategic Leadership

#### *Impact of strategic leadership increased by stable policy framework*

- The lessons from IRPWIND and EERA JP WIND during the project duration is that the impact of strategic leadership is increased when the policy framework conditions created by the EU SET-Plan is stable. The disruption to TPWIND and EWI during 2015-2016 had a negative impact on coordination with industry and member states, but overall the SET-Plan has provided the basis for a more focus strategic leadership that IRPWIND and EERA JP WIND aims to provide to the European research organisations involved in wind energy R&I.

### International collaboration

#### *Collaboration with US on precompetitive research fruitful*

- The international collaboration with the US Department of Energy and the National laboratories resulted in a closer dialogue on future areas of research collaboration. This opens up the possibility for coordinating pre-competitive research collaboration both at EU level and between individual organisations on both sides.

### Flexible mobility

#### *Senior scientist mobility scheme important, but key to success is flexibility in grant conditions*

- The mobility scheme in IRPWIND is a novel approach compared to existing EU schemes. It has been received positively although the use of the scheme has not met the expected targets. This is mainly due to lack in the flexibility needed to cater for the working conditions and/or family life of experienced researchers.

### Joint experiments

#### *Access to research facilities through joint experiment schemes effective to foster collaboration and link scientific projects to coordination efforts*

- The possibility to fund joint experiments between partners has been a real success on several parameters. It has increased collaboration between partner organisations and increased the link between IRPWINDs core scientific projects and the coordination efforts.

### Institutional alignment

#### *Alignment of institutions more realistic than alignment of national funding programmes and can support long term collaboration*

- While the alignment of national funding agencies through bottom up collaboration between research organisations has not worked, IRPWIND expects that a renewed focus on institutional alignment between two or more partner institutions can increase coordination and collaboration. The Integrated Research Programme (IRP) approach that IRPWIND fosters has a very positive effect on collaboration between organisations that are otherwise competitors at a European level.

### Project synergies

#### *Enabling and encouraging synergies between national projects and EU project can increase impact of both*

- Several of the scientific core projects (WP6-8) have great examples of how results, data or experimental material from national projects have been used to increase the quality and effect of the IRPWIND deliverables.

### Interdisciplinarity

#### *Prior programming efforts increase the success and likelihood of interdisciplinary collaboration*

- In WP7, the collaboration between scientific disciplines within material and structural research has been a real success in delivering new insights and increasing collaboration in the related sub-programme of EERA JP WIND, thus fostering long term collaboration.

**IRPWIND  
conference*****First IRPWIND conference with 120 participants***

- The IRPWIND conference has developed into an important annual event for wind energy R&D managers to discuss trends in European wind energy research and for the EERA Joint Programme and IRPWIND participant to stay updated on achievements in IRPWIND. The first EERA conference organised in 2014 gathered 120 participants and gave the organisers valuable experience about what participants are looking for and how the conference could be used to strengthen links with industrial partners.

**1st mobility grants*****6 mobility grants awarded to test novel mobility scheme***

- The EU Framework Programme does not offer opportunities for mobility grants for senior researchers of shorter durations. The IRPWIND mobility scheme has therefore been an exciting opportunity to try out a different form of mobility grant. During P1, IRPWIND granted the first 6 mobility grants. The low number was partly due to lack of awareness and partly due to the limited flexibility of the grant duration. The latter is an issue that has been addressed during IRPWIND to increase flexibility to accommodate the needs and conditions of senior scientists.

**KPIs*****Alternative KPIs proposed and rejected***

- The KPIs proposed for all EERA Integrated Research Programmes was considered less suitable to track the actual development of IRPWIND key performance. IRPWIND therefore proposed a limited set of new KPIs that would directly track the projects performance towards achieving a virtual centre of excellence. The KPIs were supported by the reviewers, but had to be dropped due to the need of EERA and the EC to have comparable KPIs across all four IRP projects.

**National  
coordination*****Mapping of national funding programme for wind reveals significant divergence***

- The deliverable D2.5 mapped the funding programmes of all member states represented by institutions in IRPWIND. The mapping showed a significant divergence in how wind energy is funded nationally both in terms of the size of funding and how funding is distributed. It also revealed how the wind energy research organisations involvement in national priority setting differ greatly from country to country. The divergence and the general lack of strategic wind energy funding programmes has been considered one of the reasons why national alignment has been difficult in IRPWIND.

**Open data*****Strategy for open data start of important IRPWIND activities***

- Open data and data management has increased in significance as IRPWIND has evolved. During the first reporting period, D2.19 "Strategy on access granting to data used in IRPWIND and wind energy research projects in general" was submitted. The report highlighted some of the challenges in accessing data, especially from industry. This challenge was later confirmed in IRPWIND WP6 where work on some deliverables were delayed due to lack of access to offshore datasets from industry.



**Project database*****The europeanwindprojects.eu wikipedia is launched***

- Following D2.5 that provided an overview of the European funding landscape, EERA JP WIND launched the database of europeanwindprojects.eu to provide an overview of publicly funded wind energy research in Europe. The database was well received in the IRPWIND community and the IRPWIND industrial advisory board which led to further development in P3.

**1st Joint experiments*****First 3 Joint experiments launched under the Joint Experiment scheme***

- The launch of the 1st Joint experiments were delayed from P1 to P2 due to challenges in setting up the legal requirements for the grant scheme. But in P2, a first call for experiments was opened and three experiments was granted.
- The experience from the first call led to changes in call conditions for the second call which included specific calls for open datasets that were asked for my participants in evaluating the 1st joint experiments.

**Flexible mobility*****Added flexibility to the mobility scheme in response to requests***

- After request from the IRPWIND community, the mobility scheme conditions were made more flexible and the programme was opened up to all EERA JP WIND participants. Another 11 mobility grants were granted during the second reporting period.

**Highest # participants*****155 participants makes the 2nd IRPWIND Conference the most well-attended***

- The second IRPWIND Conference is so far the most attended conference with 155 participants. The increased number also included more representatives from industry including members from the industrial advisory board who convened for the advisory board meeting in relation to the conference

**Offshore data delayed*****Data for deliverables delayed due to challenges with acces of industrial datasets***

- The work package for offshore experienced delay in accessing industrial datasets. In the review report for P2, the reviewers noted that "Seeking open sharing of commercial datasets across the whole ERA may be a futile task". If data owners are willing to share with individual research organisations under certain conditions, then perhaps effort is better spent organising a work flow for this to stream line the process for those institutes that are not aware of how to do this effectively rather than trying to convince companies to do things that seem contrary to their commercial interests.

**Wind power plants ancillary services*****WP81 demonstrates that wind power can deliver ancillary service - but incentives are missing***

- In P3 the scientific deliverables are increasing in numbers as research results are delivered. As an example, in WP81, research showed that wind power plants can provide frequency control, but that market incentives are missing.

**Interdisciplinarity strengthened*****Previously separate disciplines in materials research collaborating on structural reliability testing***

- Assessing what IRPWIND has made possible by drawing on the strong network created in EERA JP WIND, the WP7 highlighted the productive collaboration of researchers from the largest European institutes for wind energy bringing together work groups from 3 hitherto separate disciplines: i) structural testing, ii) NDT and iii) probabilistic analysis. Combined with the use of test specimens from partners, this highlights the strengthened collaboration that EERA JP WIND and IRPWIND have made possible.

**Contribution from national projects*****P2 delay in WP6 data compensated by working with national projects to acquire data and WP7 drew in test specimens from partners***

- The difficulty in acquiring data from industrial partners in WP6 was mitigated by working with national and privately funded projects externally to IRPWIND to access the necessary data to complete deliverables and reach the expected milestones.
- In WP7, IRPWIND partner WMC contributed with beams at WMC and DTU shared Blade parts with partners and invited CRES to perform NDT tests in DTUs labs.

**Communication newsfeed*****Monthly newsfeed in response to industry request***

- After suggestion from the IRPWIND industrial advisory board, WP4 introduced a monthly newsfeed to ensure more regular updates of activities. This was also in line with recommendations from the IRPWIND reviewers in the P2 review.

**Business Plan*****Business Plan delivered for post-IRPWIND continuation of activities***

- Significant efforts were put into developing a business plan for EERA JP WIND after the end of IRPWIND. The business plan contains a vision for how to continue EERA JP WIND based on a sustainable business model where core activities are funded by membership fees. Open data and institutional alignment have been identified as important focus areas for the future EERA JP WIND.

**DoE Workshop*****Workshop with the DoE and EC in Washington identifies areas of collaboration***

- After lengthy planning and development of the IRPWIND strategy for international collaboration (D2.7), the 1st IRPWIND organised INCO workshop was held in collaboration with the US Department of Energy (DoE) and the European Commission on June 8-9 2016 in Washington D.C. The workshop led to the definition of a number of areas for future collaboration. It was intended to be followed up with a workshop in autumn 2016 in Brussels, but the latter had to be postponed due to difficulties in finding suitable dates for high level representatives to participate.

**IRPWIND in ETIPWIND*****EERA JP WIND takes up 1/3 of seats in ETIPWIND steering committee***

- In a testimony to the acknowledgement of EERA JP WINDs ability to represent the public research organisations for wind energy in Europe, ETIPWIND invited EERA JP WIND to fill 8 out of 24 seats in the ETIPWIND steering committee. During P3, EERA JP WIND representatives were active in developing the ETIPWIND Strategic Research and Innovation Agenda and push the agenda towards member states and the European Commission.

## 1.2 Key Performance Indicators IRPWIND M24

|                | <b>KPIs</b>   | <b>Reported*<br/>Month 24</b> | <b>Target for<br/>M24</b> |
|----------------|---|-------------------------------|---------------------------|
| <b>KPI_1.</b>  | Number of national research programmes contributing to the long-term R&D strategy defined at EU level   | 15                            | 13                        |
| <b>KPI_2.</b>  | Total budget from national research programmes contributing to the long-term R&D strategy for wind energy defined at EU level (in €M)               | 46,6                          | 30                        |
| <b>KPI_3.</b>  | Joint research proposals prepared (by 3 or more IRPWIND partners) and submitted   | 27                            | 0                         |
| <b>KPI_4.</b>  | Number of joint publications by IRP participants supported by EU funding accepted/published in peer-reviewed journals                               | 43                            | >100                      |
| <b>KPI_5.</b>  | Number of joint publications by IRP participants supported by national funding accepted/published in peer-reviewed journals                         | 113                           | >60                       |
| <b>KPI_6.</b>  | Number of (existing and new) projects that cooperates actively with IRPWIND and that exchange knowledge (and data) with IRPWIND                     | 4                             | -                         |
| <b>KPI_7.</b>  | Number of collaboration agreements focused on institutional alignment between 2 or more IRPWIND or EERA JP WIND partners documented by a MoU        | 2                             | -                         |
| <b>KPI_8.</b>  | Number of tests carried out at the facilities of each IRP participant   | 235                           | 3                         |
| <b>KPI_9.</b>  | Number of joint tests carried out by two or more IRP participants   | 61                            | 3                         |
| <b>KPI_10.</b> | Number of jointly planned new research facilities at national level   | 7                             | 0                         |
| <b>KPI_11.</b> | Number of reports from researchers involved in mobility and exchange programmes   | 17                            | 18                        |
| <b>KPI_12.</b> | Number of days of mobility and exchange   | 1020                          | 900                       |
| <b>KPI_13.</b> | Number of joint publications related to the participation in the exchange programmes  | 6                             | >5                        |
| <b>KPI_14.</b> | Number of agreements between each IRP participants and industry (among others: contract research, license agreements, cooperation agreements, etc.) | 486                           | >1000                     |
| <b>KPI_15.</b> | Number of agreements between at least two IRP participants and industry (contract research, license agreements, cooperation agreements, etc.)       | 60                            | >40                       |
| <b>KPI_16.</b> | Number of patent applications submitted by IRP Participants   | 12                            | 14                        |
| <b>KPI_17.</b> | Number of IP assets entered into the web-based IP show case, maintained by the EERA Secretariat   | 0                             | >100                      |

### 1.3 The Development of EU SET-Plan 2014-1017

The policy framework provided by the EU-SET plan is part of the explanation of EERA's growth and success. EERA and its joint programmes have been formal stakeholders in the policy process and that has facilitated a close dialogue between the research communities, the European Commission and – to a lesser extend – the member states. This has not only allowed joint programmes such as JP WIND to influence the EUs policy agenda; it has also meant that the policy agenda has had a significant impact on the development of EERA JP WIND.

The initial SET-Plan had a clear structure with a Steering group at the top supported by two pillars: the European Industrial Initiative and EERA. The structure gave EERA a clear voice on behalf of RTOs and academia and the EIIs provided a common forum for member states to discuss with industry and the research organisations represented by EERA Joint Programmes.

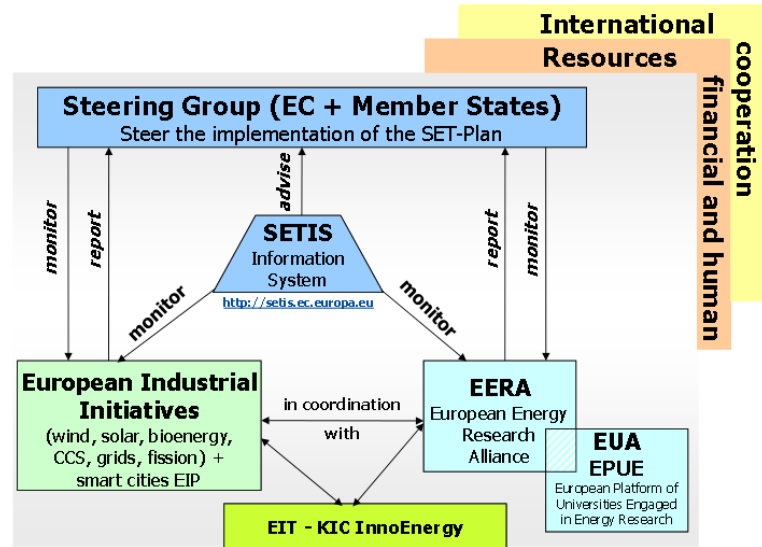


Figure 3 1st SET-Plan structure (2008 - 2014)

In wind energy, EERA JP

WIND developed a good collaboration with the Technology Platform for wind which resulted in a close collaboration on the organisations' research agendas and the Industrial Initiative on wind energy (EWI) was the best platform offered to translate those agenda's into common discussion points with the member states.

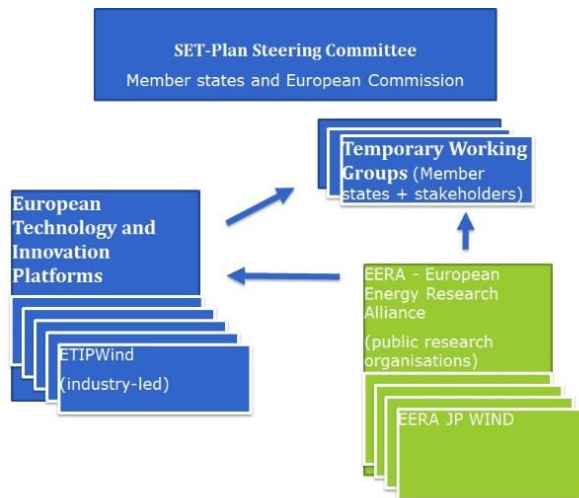


Figure 4 The new SET-Plan structure 2015

In 2014-15, an evaluation of the SET-Plan led to a restructuring of the SET-Plan. The EIIs were dropped and the Technology Platforms were redefined as Technology and Innovation Platforms. For wind energy, it meant that TPWind disappeared and EERA JP WIND consequently lost its direct interlocutor from industry. Likewise, EWI was closed down.

It was not until 2016 that ETIPWIND and the Temporary Working groups again provided common fora for industry, member

states and research organisations to discuss priorities. This gap period negatively affected EERA JP WIND and IRPWINDs possibility to work on the alignment with member states and with industry. But with ETIPWIND back and EERA having a prominent place in its Steering Committee, the collaboration is back on track. Meanwhile, the Temporary Working Group on Offshore wind energy provides some options for common discussions between member states, industry and EERA.