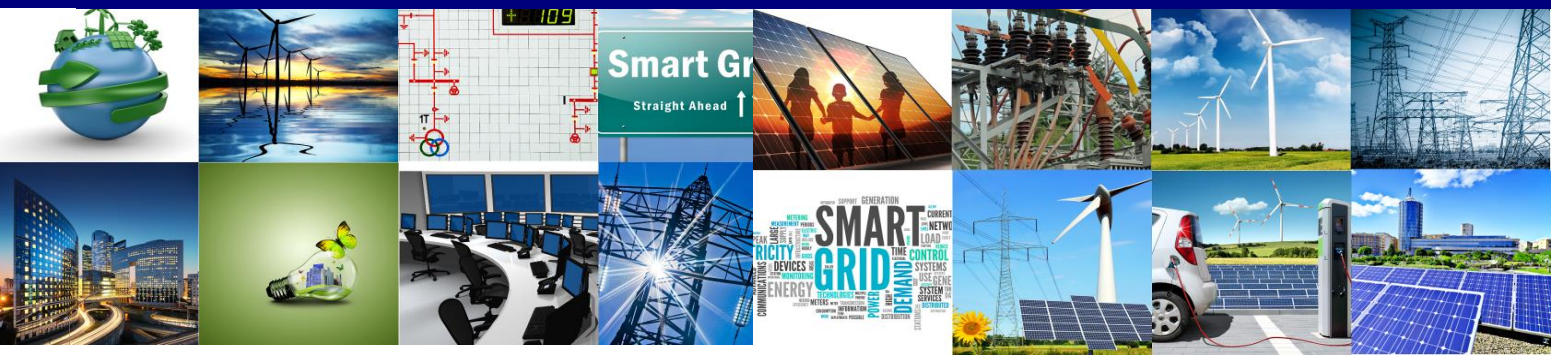
Project No. 609687

FP7-ENERGY-2013-IRP

ELECTRA

European Liaison on Electricity Committed Towards long-term Research Activities for Smart Grids



WP 11

Program Management and Reporting

Deliverable D11.3

IRP Detailed list of KPIs

28/01/2016

ID&Title	**D11.3** IRP Detailed list of KPIs	**Number of pages:**	30

Short description (Max. 50 words):

This deliverable evaluates the results the IRP obtained in the first 24 months. The evaluation is carried on through the analysis of a list of Key Performance Indicators (KPIs) defined within D11.1.

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Executive Summary

In this document the actual values of KPIs related to the first 24 months of the ELECTRA project are presented and discussed. The evaluation is made through seven categories of KPIs:

- integration among the European partners (KPIs-A);
- quality of research (KPIs-B);
- integration among the research facilities available at European level involved in the project (KPIs-C);
- collaboration to support the exchange of researchers (KPIs-D);
- innovation degree for the proposed solution (KPIs-E);
- INCO activities with extra-EU countries (KPIs-F);
- knowledge transfer and dissemination (KPIs-G).

The set of KPIs adopted by ELECTRA seems to allow then to check both the Coordination and Support Action (CSA) and the Research Technical Development (RTD) activities, providing a global vision of the IRP progress.

In the first two years ELECTRA reached the predefined targets in terms of integration (KPIs-A). The participants were informed about the Use Case methodology and existing European frameworks. Their adoption by some of the ELECTRA participant was evidenced too. ELECTRA interacted with several European projects and analysed the related outcomes. Finally, comments were provided to the ENTSO-E implementation plan 2016-2018 and to the smart grid gap analysis for ESFRI roadmap.

ELECTRA reached all the predefined targets in terms of quality of research (KPIs-B) except the KPI on the number of joint publications. This is mainly related to the ongoing activity of the new control architecture developed by ELECTRA in the first two years. Hence, publications are available only since April 2015 and are expected to increase in the second half of the project.

Coming to the KPIs related to research facilities (KPIs-C), in the first two years ELECTRA put the basis for the activities of the second half. A joint test with more than one participant and the joint research facility planned at national level allowed to overtake the results for month 24. However, in its second half ELECTRA will have to exploit the planned activities and reach the predefined goals.

In terms of exchange of researchers (KPIs-D), ELECTRA reached the objectives set for the first half of the project even if the second and third REX calls were not considered.

Under the innovation point of view (KPIS-E) ELECTRA partially reached the objectives. Gaps are evidenced in terms of agreements with the industry and in the definition of IP assets maintained by the EERA Secretariat. Hence, improvement are expected in the second half of the ELECTRA IRP.

For the INCO activities (KPIs-F), ELECTRA reached all the goals except for two KPIs: the number of meetings organized with the ICB and the number of LoS received from extra-European institutions. Regarding the former, the intrinsic difficulties in organizing meetings/workshops with institutions spread all over the world is the main reason for the missing of this target at present. For the latter instead ELECTRA has to increase the number of LoS from extra-European institutions, even if Non-Disclosure Agreements were signed by two extra-European institutions.

ELECTRA reached the targets set for the knowledge transfer and dissemination (KPIs-G). Through the meetings and workshops with grid stakeholders and relevant European or national projects

ELECTRA shared its findings and collected input. Finally, the website statistics evidence the users' habits.

This is one of the first attempts to try to quantify the actual progress of an R&D project and the ELECTRA Consortium is rather satisfied for the results obtained at this stage. With the experience gained in this exercise the Consortium expects to be able to further improve the KPI set and target values and to more easily identify the critical points that deserve special attention in order to take the needed counter actions and fully achieve the expected ELECTRA IRP outcomes.

Terminologies

Acronyms

ELECTRA	European Liaison on Electricity Committed Towards long-term Research Activity
AB	Advisory Board
AIST	National Institute of Advanced Industrial Science and Technology
BRICS	Brazil, Russia, India, China, South Africa
CSA	Coordination and Support Action
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DOE	Department Of Energy
DoW	Description of Work
EAT-SGIS	ELECTRA Assessment Tool for Smart Grid Interface Standard
EC	European Commission
EERA	European Energy Research Alliance
ETP	European Technology Platform
ESFRI	European Strategy Forum on Research Infrastructures
ICB	International Coordination Board
INCO	International Cooperation
IP	Intellectual Property
IRP	Integrated Research Programme
ISGAN	International Smart Grid Action Network
ISGF	India Smart Grid Forum
ITU	International Telecommunication Union
KERI	Korea Electrotechnology Research Institute
KPI	Key Performance Indicator
KSGI	Korea Smart Grid Institute
LoS	Letter of Support
NEDO	New Energy and Industrial Technology Development Organisation
R&D	Research & Development
REX	Researcher Exchange
RI	Research Institute
RTD	Research Technical Development
SANEDI	South African National Energy Development Institute
SET-Plan	Strategic Energy Technology Plan
SGCS	State Grid Corporation of China
SGRI	State Grid Smart Grid Research Institute
SIRFN	Smart Grid International Research Facility Network
SJTU	Shanghai Jiao Tong University
WP	Work Package

Abbreviations

MS	Milestone
R	Internal Report
D	Deliverable

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1 Introduction

Work Package 11 (WP11) is focussed on the activities to setup and operate a management structure covering legal, financial, operational and reporting aspects. These management activities allow the communication among the ELECTRA partners and promote a clear vision of the whole Project. Moreover, through WP11 it is possible to monitor the progress of the ELECTRA IRP and to act as contact with the European Commission (EC) for the scientific, technical, administrative and financial aspects of the Project.

In this frame, D11.3 provides an evaluation of the Project through a set of KPIs defined in D11.1, [4]. Seven categories allow to analyse the Project under different points of view:

- the integration between national research programmes and Research & Development (R&D) strategy defined at European level (category A);
- the quality of research performed within the Project (category B);
- the characteristics of tests and sessions carried out (category C);
- the quality of the researchers exchange (category D);
- the innovation coming along with the ELECTRA project (category E);
- the international cooperation in terms of actors and support provided by research institutes at international level (category F);
- the knowledge transfer and dissemination activities (category G).

After a brief explanation of the seven categories, Chapter 2 outlines if the targets defined for month 24 have been accomplished. The evaluation is carried out through the analysis of the values each KPI assumes. Finally, Chapter 3 summarizes the most relevant outcomes of the analysis, highlighting the achieved successes and the criticalities to be solved for the full realization of the proposed objectives.

2 KPI evaluation at month 24

Based on the KPIs available from the EERA Secretariat and the preliminary list provided by ELECTRA [4], Table 2-1 presents the KPIs that best fit to the smart grids technical area specificities and measure the quality of ELECTRA at month 24. The KPIs are split in seven categories, considering the different fields of interest. The results achieved at month 24 are evidenced and proved with the check item(s) indicated in the last column of Table 2-1. In the following, a brief description of each category is provided, while in [4] a more precise explanation of the KPIs is provided.

Integration KPIs (category A) describe the level of collaboration and integration of the Consortium with the aim of converge to a common European framework for the realization of the SET Plan objectives, [6].

The KPIs of category B describe the quantity and quality of the researches related to the ELECTRA activities. The evaluation of the national laboratories integration within the European research network is described through the KPIs of category C.

In terms of exchange of researchers, KPIs of category D allow to measure the cooperation among the Research Infrastructures (RIs) involved in the IRP.

The innovation level of the concepts developed within ELECTRA is taken into account by the KPIs of category E. These KPIs highlight the contact and the alignment of the project activities with the industry and grid stakeholders interests. Finally, KPIs related to INCO activities are collected in category F while the knowledge transfer and dissemination aspects are evaluated by category G.

The initial value for the activities launched at the same time of the IRP is zero. For other KPIs the initial value may be higher because related activities began before the launch of ELECTRA.

Table 2-1 – KPI evaluation at month 24

ELECTRA KPIs					
		Initial value	**Target**	**Result**	**Check Item**
(A) Integration/Impact					
A1	Number of participants informed on Use Case Methodology through the project	2	>10	21	[9], [10]
A2	Number of participants that adopted Use Case Methodology thanks to the project	2	>5	>15	[11], [12], [13]
A3	Number of participants informed on existing EU framework and EU references documents through the project (e.g. SGAM, Role models, etc.)	0	>8	21	[9], [10]
A4	Number of participants that started adopting existing EU framework thanks to the project	0	>5	9	[12]

ELECTRA KPIs					
A5	Number of data sources, information, models, tools, procedures and best practices developed by one member and shared with the consortium	0	>2	3	[5], [7], [22]
A6	Collaboration and live interaction with other ongoing EU projects	0	>3	5	[7]
A7	Analysis of main outcomes from other EU projects as inputs to the project	0	>3	6	[7], [11], [12]
A8	Number of grid stakeholders interested to the project with stable involvement and consultation	0	>2	6	[7]
A9	Consortium agreed positions and common comments on EU roadmaps and/or reference documents	0	>1	2	[16], [17]
(B) Quality of research					
B1	Number of joint publications by IRP participants supported by EU funding accepted/published in peer-reviewed journals and/or in proceeding of international conferences	0	>20	13 (21)	[7]
B2	Number of publications by IRP participants supported by national funding accepted/published in peer-reviewed journals and/or in proceeding of international conferences	0	>25	58	Table A- 1
B3	Number of PhD-thesis, master theses, awards etc.	0	>2	10	Table A- 2
(C) Research facilities					
C1	Number of tests carried out at the facilities of IRP participants	0	0	0	-
C2	Number of round-robin sessions carried out at the facilities of IRP participants	0	>2	0	-
C3	Number of joint and/or cross tests carried out by two or more IRP participants	0	0	1	[15]
C4	Total duration of joint and/or cross tests carried out by two or more IRP participants	0	0	10	[15]
C5	Number of jointly planned new research facilities at national level	0	0	1	[14]

ELECTRA KPIs					
C6	Number of jointly planned new research facilities at European/international level	0	0	0	-
C7	Number of Memoranda of Understanding (MoU) and agreements on the joint use and development of research facilities	0	1	0	-
(D) Exchange of researchers					
D1	No. of exchange calls	0	2	3	[8]
D2	No. of researcher exchanges	0	6	6	[8]
D3	No. of researcher-weeks of international exchange	0	12	12	[8]
D4	No. of extra-EU partners involved in exchange	0	2	1	[8]
D5	No. of trained young researchers	0	4	4	[8]
D6	No. of joint publications	0	6	6	[7], [8]
(E) Innovation					
E1	Number of agreements in the past two years between at least two IRP participants and industry (among others: contract research, license agreements, cooperation agreements, etc.)	0	2	0	-
E2	Number of patent applications submitted in the past 2 years	0	0	0	-
E3	Number of patent applications by at least two IRP participants submitted in the past 2 years	0	0	0	-
E4	Number of IP assets entered into the web-based IP show case, maintained by the EERA Secretariat	0	2	1	[7]
E5	Number of industry stakeholders involved in IRP R&D, or accessing IRP research facilities, or licenses of the IP generated within the IRP, or partners in the mobility programme	0	2	13	[7], [9], [10]
(F) International Cooperation activities					
F1	No. of Extra-EU countries represented in the ICB	3	8	10	[7]
F2	No. of BRICS and Developing countries represented in the ICB	1	2	2	[7]

ELECTRA KPIs					
F3	No. of ICB meetings (web-meetings or physical meetings)	0	7	4	[9], [10]
F4	No. of Extra-EU countries involved in INCO activity (including exchange of information)	0	2	10	[9], [10]
F5	International Organisations Letter of Support (extra-EU)	6	10	3	[9], [10]
(G) Knowledge transfer and dissemination					
G1	Number of meetings/workshops with Grid stakeholder representatives	0	>8	25	[7], [9], [10]
G2	Number of meetings/workshops with relevant EU projects representatives	0	>4	3	[9], [10]
G3	Number of meetings/workshops with relevant National projects representatives	0	>6	6	[9], [10]
G4	Number of citations of the project in papers with authors external to the consortium	0	>5	0	-
G5	Number of visits per month for project website	0	>300	421	[7]
G6	Number of registered users to access public project documents	0	>35	116	[7]
G7	Number of links that refer to project website (referral number)	0	>35	45	[7]
G8	Numbers of countries with more than 50 visits within a period	0	>20	22	[7]

2.1 (A) Integration

KPI-A1 counts the number of participants (hereby considered as partners and not as individuals) informed on the Use Case methodology through the project. Given that several web conferences and physical meetings have been held during the project, all the twenty-one ELECTRA participants have been informed on the Use Case methodology, as proved by [9] and [10]. The same applies for KPI-A3 that refers to the number of participants informed on existing European framework and reference documents (e.g. SGAM, ENTSO-E role model, Use Case methodology etc.).

Three references provide the evidence that at month 24 KPI-A2 is higher than fifteen (19). The partners collaborated on D.3.1 ([11]) within T3.2 and on D.4.1 ([12]) as part of T4.4 activities. Finally, at least nine participants are currently working on D.6.1 ([13]). Hence, through the analysis of these deliverables, more than fifteen participants used the Use Case methodology.

Regarding KPI-A4, [12] proves that nine participants adopt existing EU frameworks (e.g. SGAM, role model etc.) thanks to the project.

KPI-A5 is linked to the following three elements: the glossary, [5] the EAT-SGIS, [7], and the Use Case repository proposed by OFFIS, [22]. Thanks to these elements, KPI-A5 is higher than its target for month 24.

For KPI-A6, ELECTRA directly collaborated and interacted with five European projects: CoSSMic, DISCERN, evolvDSO, Grid4EU and IDE4L, as discussed in [7].

In order to exploit the synergies with other European projects, ELECTRA analysed the outcomes of the following European projects: DISCERN (see [7]), e-Highway 2050 (see [11] and [12]), evolvDSO (see [11]), Grid4EU, (see [7]), IDE4L (see [7]) and SmartC2Net (see [12]). The existence of these synergies allowed ELECTRA to develop the concepts defined within its WPs and to be in line with the target set for KPI-A7.

Regarding KPI-A8, ELECTRA has a stable involvement and consultation with the following grid stakeholders: EASE, EDSO4SG, ENTSO-E, ERA-Net+, ETP Smart Grids. Through a direct interaction, ELECTRA is developing concepts and control systems in line with the suggestions from relevant European bodies, [7].

For KPI-A9, ELECTRA reached Consortium agreed positions and provided common comments on the ESFRI RI gap analyses and on the ENTSO-E implementation plan, as proved by [16] and [17].

Hence, KPIs-A demonstrate that the Consortium is sharing the results among all the partners, leveraging on the synergies with other relevant European projects and adopting the frameworks and references currently available. Moreover, ELECTRA established a stable involvement and consultation of grid stakeholders and proposed a Consortium vision on European roadmaps and reference documents.

2.2 (B) Quality of research

KPI-B1 quantifies the number of joint publications supported by European funding and accepted/published in peer-reviewed journals or in proceeding of international conferences. In its first two years, ELECTRA produced thirteen joint publications, as presented in [7]. In case also the eight papers from one ELECTRA author would be considered, the number of ELECTRA publications rises at twenty-one. Given that ELECTRA is developing a new architecture for the control of the future power systems, many efforts were concentrated on the definition of its basis. Hence, the ELECTRA partners in practise begun to disseminate results of their researches only in the second year of the project. In general, given that the basis of the control architecture proposed by ELECTRA for the future power systems are available, an increase of these KPIs is expected in the second half of the project.

Moving the focus on the publications supported by national funding, ELECTRA overtook the target for KPI-B2. The ELECTRA partners produced fifty-eight publications, as collected in Table A-1. Given that Table A-1collects the publications of only five ELECTRA partners, this KPI would be much higher if all the partners' publications are included.

Finally, regarding KPI-B3, ten theses (both PhD and master theses) with reference to the ELECTRA activities are ongoing or completed, as presented in Table A-2.

2.3 (C) Research facilities

In general, in the first two years ELECTRA put the basis for reaching the targets set for the second half of its duration.

Regarding KPI-C1 and KPI-C2 tests at the facilities of the IRP participants or round-robin sessions were not carried out at IRP participants' facilities, being in line with the expected results for month 24.

For KPI-C3 and KPI-C4 a ten days test was carried out by more than one IRP participant in the first half of the project, as evidenced in [15]. Hence, KPI-C3 and KPI-C4 overtook the expected results for month 24.

Finally, as evidenced by [14], for KPI-C5 one new joint research facility at national level has been created while no research facilities have been planned at European/international level, as expected for KPI-C6 at month 24.

2.4 (D) Exchange of researchers

KPIs of category D describe the ELECTRA activities in terms of Researchers Exchange (REX). In the first two years, ELECTRA organized three REX calls, with the third call dedicated to exchangers with extra European countries.

Given that the exchanges for the second and third REX calls are not completed by month 24, they are taken into account just for KPI-D1. Hence, for the other KPIs just the first call will be considered.

In the first call, six research exchanges were organized (KPI-D2), in alignment with those foreseen for month 24. The six exchanges are completed and detailed in [8].

In the first call, the research exchanges duration was twelve weeks, targeting the goal set for KPI-D3, [8]. For KPI-D4, the only extra-European partner involved in the exchanges was CSIRO, also member of the ELECTRA ICB, [8]. However, given that the third call is dedicated to exchanges with non-European institutions, KPI-D4 is supposed to increase.

With the first call, four young researchers were trained, targeting the goal for KPI-D5, [8]. For KPI-D6 six joint publications were presented at the 2015 EDST International Symposium, as proved by [7] and [8].

In general, the situation for the exchange of researchers in the first two years of the project is fully aligned with the targets defined for KPIs-D at month 24. This highlights the interest the young researchers have in spending a period in another RI to analyse some aspects of the ELECTRA activities and improve their background and experiences.

2.5 (E) Innovation

For KPI-E1, in the first two years ELECTRA has not reached agreements with industry. Regarding KPI-E2 and KPI-E3, the ELECTRA partners have not submitted individual or joint patent applications, being aligned with the objective for month 24. However, the concepts developed in the first two years are not fully defined either for the submission of patent applications or the definition of agreements with the industry. In this regard, the second half of the IRP will be crucial for submitting patents and reach agreements with the industry.

Regarding KPI-E4, one IP ELECTRA asset[1] entered into the web-based IP show case and maintained by the EERA Secretariat, as discussed in [7], while for KPI-E5 the target set at month 24 has been reached. In fact, ELECTRA interacted through meetings and workshops with the following grid stakeholders: ENTSO-E (both the Secretariat and the R&D Committee), EDSO4SG, EASE, ABB, SIEMENS and Alstom Grid. In addition to them, ELECTRA involved ERDF, Landis+Gyr and Trento Rise, STRI, SGRI, ESKOM and ISGF. Finally, ELECTRA is establishing interactions with Russian, Indian and Korean organizations and grid stakeholders for the aspects considered in KPI-E5.

2.6 (F) International Cooperation (INCO) activities

Five KPIs aim to represent the efforts ELECTRA is doing in terms of International Cooperation activities. For KPI-F1, five extra-European countries are represented in the International Coordination Board (ICB): Australia, Brazil, China, Japan and USA. In addition, ISGAN and ITU are members of the ICB, while the Japanese NEDO and the American DOE are the observers interested in the ELECTRA activities, [9] and [10]. The ELECTRA partners have also close interactions with Russian (with ENERGOSTAT, SICON and KOMI), Korean (with KERI and KSGI), South African (with ESKOM and SANEDI) and Indian (with ISGF) institutions even if they are not ICB members. Hence, KPI-F4 overtook the target defined at month 24.

Regarding KPI-F2, Brazil and China represent the BRICS countries in the ICB, reaching the target for month 24. However, efforts are already in place to enlarge the participation to the ELECTRA ICB to other developing and BRICS countries.

KPI-F3 counts the number of meeting held with the ICB. In the first two years of the project two physical meetings and two online meetings were organized by ELECTRA, as evidenced in [9] and [10]. KPI-F3 does not reach the target for month 24. This can be justified considering that the organization of meetings (both physical and online) with institutions spread all over the world is a tough task.

As outlined by Table 2-2, in its first two years ELECTRA received ten Letters of Support (LoS) from international institutions. Among them, five are European (i.e. EDSO4SG, ENTSO-E, ERANet+, ETP SG, T&D Europe) two international (i.e. ISGAN, ITU) and three non-European (i.e. EPRI, AIST (FREA), INESC P&D). Hence, if the focus is on the LoS received from extra-European countries it is evident that ELECTRA will have to concentrate its efforts also on this direction, collecting support from institutions outside the European boundaries. However, the close interaction with AIST (FREA) and INESC P&D is evidenced also by the more rigid Non-Disclosure Agreements they signed with ELECTRA.

[1] EAT-SGIS from ENEA

Table 2-2 – List of the ELECTRA Letters of Support

Letter of Support for the ELECTRA IRP	
Continent	**Institution**
South America	INESC P&D
Asia	AIST (FREA)
Europe	EDSDO4SG
Europe	ENTSO-E
Europe	ERA-Net+
Europe	ETP SG
Europe	T&D Europe
International	ISGAN
International	ITU

2.7 (G) Knowledge transfer and dissemination

KPIs of category G are concentrated on the knowledge transfer and the dissemination of the ELECTRA results. As evidenced in [9], [10] for the coordination meetings and in [7] for the workshops, in the first two years ELECTRA had twenty-five meetings/workshops with grid stakeholders representatives, largely overtaking the target of KPI-G1 for month 24. In addition to [7], [9] and [10] further documents specifically related to each meeting can be provided.

Regarding KPI-G2, three meetings/workshops were organized with relevant European projects representatives and six with national project representatives, [9], [10].

KPI-G4 is zero mainly due to the fact that ELECTRA peer-reviewed publications refer to congresses held from April 2015 and it will certainly take several more months before the papers are actually available to the public and start to be eventually cited. Hence, an increase of KPI-G4 is expected for the second half of the project.

KPIs G5 to G8 presents the results for the visits to the ELECTRA website as discussed in [7]. All the KPIs values largely exceed the targets fixed for the first half of the project. Based on the data available from Google Analytics, an average of 421 visits per month were measured for the ELECTRA website from April 2014 to November 2015. For KPI-G6, 116 users registered to access public project documents, including 16 AB members and 19 ICB members. 45 links refer to the project website, overtaking the target for month 24. Finally, from April 2014 to November 2015, 22 countries visited the ELECTRA website with more than 50 visits.

3 Conclusions

In this document the results obtained from the ELECTRA IRP in the first two years are discussed through seven sets of KPIs:

- integration among the European partners (KPIs-A);
- quality of research (KPIs-B);
- integration among the research facilities available at European level involved in the project (KPIs-C);
- collaboration to support the exchange of researchers (KPIs-D);
- innovation degree for the proposed solution (KPIs-E);
- INCO activities with extra-EU countries (KPIs-F);
- knowledge transfer and dissemination (KPIs-G).

In terms of integration (KPIs-A) the results obtained by ELECTRA in the first two years reached the predefined targets. The participants were informed and then adopted the Use Case methodology and existing European frameworks. Moreover, ELECTRA interacted with some European project and analysed their outcomes. Finally, consolidated comments were provided to the ENTSO-E implementation plan 2016-2018 and to the smart grid gap analysis for ESFRI roadmap.

For the quality of research (KPIs-B), ELECTRA reached all the predefined targets apart from the joint publications one. The gap is mainly due to the fact that in its first half of activity ELECTRA put the basis for a completely new power system control architecture. Given that publications are available only since April 2015 they are expected to increase in the second half of the project.

In its first two years ELECTRA put the basis for the activities related to the research facilities, as considered by KPIs-C. A joint test with more than one participant and the joint research facility planned at national level allowed to overtake the results for month 24. However, in its second half ELECTRA will have to exploit the planned activities and reach the predefined goals.

Regarding the exchange of researchers (KPIs-D), ELECTRA reached all the predefined objectives, even if the exchanges of the second and third REX calls have not been considered since they were not completed at month 24 yet.

In terms of innovation (KPIs-E), ELECTRA partially reached the predefined objectives. The main gaps are in terms of agreements with the industry and in the definition of IP assets maintained by the EERA Secretariat. Hence, patents, new IP assets and agreements with the industry are to be fostered in the second half.

For the INCO activities (KPIs-F), ELECTRA reached the predefined targets except for two KPIs. One is related to the number of meetings/workshops with the ICB. In this case, the gap is mainly related to the intrinsic difficulties in gathering institutions spread all over the world. The other is related to the number of LoS received by ELECTRA from extra-European organizations/institutions. In this frame, ELECTRA will have to get further LoS from extra-European institutions even if two Non-Disclosure Agreements have already been signed by extra-European institutions.

The knowledge transfer and dissemination (KPIs-G) activities overtook the predefined targets. A number of meetings and workshops with grid stakeholders, relevant European and national projects were organized. Finally, the web statistics largely exceed the targets, evidencing how the external users regularly visit some specific page of the ELECTRA website.

The KPI activity hereby discussed is one of the first attempts to try to quantify the actual progress of an R&D project. On one end it allows to further improve the KPI set and target values, on the other end it is expected to allow a more easily identification of the critical points for taking the needed counter actions and fully achieve the expected ELECTRA IRP outcomes. In conclusion, the ELECTRA Consortium is rather satisfied for the identified KPIs; however, it is expected that during the next activity periods by using extensively those KPIs there will be the possibility to further improve their soundness and usefulness in monitoring the project progress.

4 References

[1] ELECTRA Description of Work – Annex I
[2] ELECTRA Consortium Agreement
[3] ELECTRA Grant Agreement
[4] D11.1 “Initial list of KPIs”, ELECTRA
[5] http://www.electrairp.eu/
[6] http://ec.europa.eu/energy/en/topics/technology-and-innovation/strategic-energy-technology-plan
[7] Deliverable D12.2 “IRP Communication and Dissemination Plan”, ELECTRA
[8] Deliverable D9.2 “Interim report on exchange programme outputs on the IRP website (M24)”, ELECTRA
[9] Deliverable D1.2 “2nd Report on Coordination Activities (M24)”, ELECTRA
[10] Deliverable D1.1 “1st Report on Coordination Activities (M12)”, ELECTRA
[11] Deliverable D3.1 “Description of security concerns and proposed solutions for the frequency and voltage control system & maturity model for smart grid risk assessment combining SGIS and NIST IR approaches”, ELECTRA
[12] Deliverable D4.1 “Description of security concerns and proposed solutions for the frequency and voltage control system & maturity model for smart grid risk assessment combining SGIS and NIST IR approaches”, ELECTRA
[13] Deliverable D6.1 “Functional specification of the control functions for the control of flexibility across the different control boundaries”, ELECTRA
[14] Deliverable D2.2 “Proposal for a coordinated investment planning of the future European smart grid research infrastructure (M12)”, ELECTRA
[15] Deliverable D2.4 “Report on Collaboration with ISGAN’s SIRFN (M24 (interim report), M46 (final report)”, ELECTRA
[16] Contribution by the EERA JP Smart Grids / ELECTRA IRP to the Smart Grids Gap Analysis for ESFRI Roadmap Update (September 2014)
[17] EERA JP on Smart Grids / ELECTRA IRP Compiled comments on ENTSO-E: Implementation Plan 2016 – 2018 presently under public consultation”
[18] http://www.smartgrids.eu/documents/eventsandworkshops/2015/2ndJointWorkshop/07_OCHOA_Future_Network_Management_Systems_A_Centralised_Approach.pdf
[19] http://www.smartgrids.eu/documents/eventsandworkshops/2015/2ndJointWorkshop/08_GONZALES_INDRA_Closed_Loop_Ecosystem_Edge_Computing_Short.pdf
[20] http://www.smartgrids.eu/documents/eventsandworkshops/2015/2ndJointWorkshop/09_RETIERE_Fractal-Grid.pdf
[21] http://www.smartgrids.eu/documents/eventsandworkshops/2015/2ndJointWorkshop/10_MANCARELLA_The_multi-energy_dimension_in_the_WoC_concept.pdf
[22] http://ucmr-electra.offis.de/#!loginView

5 Disclaimer

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The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Commission.

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Annex

The values of KPI-B2 and KPI-B3 are proved with Table A- 1 and Table A- 2, respectively.

Table A- 1 - Publications by IRP participants supported by national funding accepted/published in peer-reviewed journals and/or in proceeding of international conferences

Publications from the ELECTRA partners			
Partner	**Authors**	**Title**	**Conference/Journal**
RSE	R. Terruggia, G. Dondossola	Cyber Security Analysis of Smart Grid Communications with a Network Simulator	4th D-A-CH Energieinformatik 2015, Book Chapter No. 13: Energy Informatics Karlsruhe (DE), 12-13 November 2015, DOI:10.1007/978-3-319-25876-8_13, November 2015
RSE	P. Wylach, R. Terruggia, G. Dondossola	Testing della Sicurezza nelle comunicazioni standard delle Smart Grid	Telecontrollo 2015 Made in Italy: A step Forward for a Better Life, Soluzioni Sostenibili Per le Smart Community, Milan, 29-30 September 2015
RSE	D. Tosi, S. Marzorati, M. La Rosa, G. Dondossola, R. Terruggia, S. Fratti, E. Fasciolo	Energy consumption and demand estimation from cellular network data: A real world case study	CIRED 2015, Lyon 15-18 June 2015
RSE	R. Terruggia, G. Dondossola	Security of communications in voltage control for grids connecting DER: impact analysis and anomalous behaviours	Cigré Journal Science and Engineering Innovation In the Power Systems Industry Vol. 2 Paris, June 2015
RSE	J. Zerbst, I. Pietre-Camacedes, M. Ekstedt, G. Dondossola, C. Poirer, P. Sitbon, et al.	Security architecture principles for digital systems in Electric Power Utilities	Cigré Technical Brochure n. 625 Paris, April 2015
RSE	R. Terruggia, G. Dondossola	Cyber Security of Smart Grid Communications: Risk Analysis and Experimental Testing	Book-Chapter No 7: Cyber Physical Systems Approach to Smart Electric Power Grid S.K. Khaitan, J.D. McCalley, C.C. Liu, Springer-Verlag (Eds.) ISBN 978-3-662-45928-7, January 2015
RSE	J. Zerbst, L. R. Jouppi, G. Dondossola, C. Poirier, P. Sitbon, J. McDonald, D. Holstein	Status of Cybersecurity	Cigré Electra Magazine n. 276, Paris, October 2014
RSE	R. Terruggia, G. Dondossola	Security of communications in voltage control for grids connecting DER: impact analysis and anomalous behaviours	Cigre´ Session 45 Paris 24-30 August 2014
RSE	G. Dondossola, R. Terruggia,	Smart Grid Architectures: from Use Cases to ICT Requirements	CIRED 2014 Challenges of implementing Active Distribution System Management

Publications from the ELECTRA partners			
	S. Bessler, J. Grønbæk, R. Olsen, F. Iov, C. Hägerling		
RSE	M. Rossi, G. Viganò, D. Moneta	Methodology for the Optimal Siting and Sizing of Storage Systems in Distribution Networks	Convegno Annuale Internazionale AEIT, Napoli 14-16 Ottobre 2015
RSE	M. Rossi, G. Viganò, D. Moneta	Integration of Droop Control Functions for Distributed Generation in Power Flow Simulations	Convegno Annuale Internazionale AEIT, Napoli 14-16 Ottobre 2015
RSE	M.T. Vespucci, P. Piscella, G. Viganò, D. Moneta	Optimization models for the operation of medium-voltage AC networks	EURO 2015 27th European Conference on operational Glasgow, 12-15 July 2015
RSE	M. Rossi, G. Viganò, D. Moneta	Analytical approach to identify optimal position and exchange profile of storage systems in distribution networks	ICCEP 2015, Taormina (ITALY), 16-18 June 2015
RSE	L. Cristaldi, M. Faifer, M. Rossi, P. Soulantiantork, S. Toscani	Iterative Model-Based Maximum Power Point Tracker for Photovoltaic Panels	2015 IEEE International Instrumentation and Measurement Technology Conference, Pisa 11-14 Maggio 2015
RSE	D .Moneta, M. Rossini, M. Verga	Perspective functions of LV microgrids: simulations and tests on the RSE´s test facility	CIRED 2015, Lyon 15-18 June 2015
RSE	M. Rossi, G. Viganò, D. Moneta, M. Gallanti	Applicazione dell'algoritmo DISCoVER per la stima di Hosting Capacity delle reti attive di distribuzione	Convegno Annuale AEIT 2014 Trieste
RSE	M. Garau, G. Celli, E. Ghiani, G.G. Soma, F. Pilo, S. Corti	ICT Reliability Modelling in Co-Simulation of Smart Distribution Networks	RTSI 2015 1st Int. Forum on Research and Technologies for Society and Industry, Torino, 16-18 September 2015
RSE	M. Garau, G. Celli, E. Ghiani, F. Pilo, S. Corti	A Co-simulation tool for active distribution networks	CIRED Workshop 2014, Rome June 2014
RSE	M. Farina, A. Guagliardi, F. Mariani, C. Sandroni, R. Scattolini	Model predictive control of voltage profiles in MV networks with distributed generation	Control Engineering Practice n° 34, 2015 pag. 18-29, 21 Ottobre 2014
RSE	D. Moneta, L. Consiglio, D. I. Rochira	Nuove esigenze di monitoraggio nelle reti attive di distribuzione	AEIT, numero 11/12, novembre/dicembre 2014
RSE	E. Ciapessoni, D. Cirio, F. Conte,	Demand Side Response for Frequency Control in a Regional Power System	Paper D581, IEEE ICCEP 2015, Taormina, June 16, 2015

Publications from the ELECTRA partners			
	S. Massucco, F. Silvestro		
RSE	M. Benini, S. Canevese, A. Cavaliere, D. Cirio, A. Gatti, P. Grisi, A. Pitto	Cost/benefit analyses of storage systems applications for the provision of dispatching services	Proceedings of the 2015 IEEE International Conference on Environment and Electrical Engineering, EEEIC 2015
RSE	F. Conte, S. Massucco, F. Silvestro, E. Ciapessoni, D. Cirio, A. Pitto	Gestione e controllo del carico in relazione alla fornitura di regolazione per contribuire alla sicurezza della rete elettrica	International Annual Conference AEIT, Napoli 14-16 October 2015
RSE	F. Baccino, F. Conte, F. Silvestro, S. Massucco, E. Ciapessoni, D. Cirio	Impact Analysis of Load Control for Frequency Regulation: the case of Sardinia in 2020	IEEE ISGT Europe 2014, Istanbul, October 15
CRES	P-J. Alet, F. Baccaro, M. De Felice, V. Efthymiou, C. Mayr, G. Graditi, M. Juel, D. Moser, M. Petitta, S. Tselepis, G. Yang	Quantification, challenges and outlook of PV integration in the power system	31st EUPVSEC 2015 Hamburg, Germany, 14-18 September 2015
CRES	T. Stetz, M. Kraiczy, K. Diwold, M. Braun, B. Bletterie, C. Mayr, R. Bründlinger, B. Noone, A. Bruce, I. MacGill, B. Mather, K. Ogimoto, K. Washihara, Y. Ueda, A. Iaria, A. Gatti, D. Cirio, M. Rekinger, I. Theologitis, K. De Brabandere, S. Tselepis, C. Bucher, W. Yibo	High penetration pv in local distribution grids	29th EUPVSEC 2014 Amsterdam, Netherlands, 22-26 September, 2014

Publications from the ELECTRA partners			
CRES	S. Tselepis	Design and operational control of the agios efstratios island microgrid	6th IRED 2014 Kyoto, Japan, 18-20 November, 2014
CRES	S. Tselepis, I. Nikoletatos	Design and operational control of the agios efstratios island microgrid	International Journal of Distributed Energy Resources and Smart Grids vol. 10, No. 1 (2014), pp. 57-77
CRES	I. Nikoletatos, S. Tselepis	Renewable integration in power grids	IEA ETSAP Technology brief E15, December 2013, pp.1-10
SINTEF	P. Ahcin, I. Petersen, H. Sæle	A business case for a local community electricity market	CIRED 2015, Lyon 15-18 June 2015
SINTEF	B. A. Bremdal, M. Jo, H. Sæle, V. Kristoffersen, J.A. Foosnæs	Using communities of summer houses as a winter time demand-response resource	CIRED 2015, Lyon 15-18 June 2015
SINTEF	S. D'Arco, J.A.W. Suul, O.B. Fosso	Small-signal modelling and parametric sensitivity of a virtual synchronous machine in islanded operation	International Journal of Electrical Power & Energy Systems 2015; Volume 72. s. 3-15
SINTEF	H. Seljeseth H. Kirkeby H. Taxt	Benefits of voltage measurements with smart meters.	CIRED 2015, Lyon 15-18 June 2015
SINTEF	H. Sæle K. Sand O.S. Grande	Smart tariffs - in an active distribution grid	CIRED 2015, Lyon 15-18 June 2015
SINTEF	H. Taxt, H. Kirkeby, H. Seljeseth	New methods for distribution network monitoring with smart meters - verifying data in network information systems	CIRED 2015, Lyon 15-18 June 2015
SINTEF	J. Beerten, S. D'Arco, J.A.W. Suul	Identification and Small-Signal Analysis of Interaction Modes in VSC MTDC Systems	IEEE Transactions on Power Delivery 2015
SINTEF	K. May, L. Sigrist, P. Vingerhoets, A. Z Morch, P. Verboven, L. Rouco	Improving scalability and replicability of smart grid projects	CIRED 2015, Lyon 15-18 June 2015
SINTEF	R. Schytte, K. Sand, R.E. Grundt	Use cases for efficient integration of smart homes PV	CIRED 2015, Lyon 15-18 June 2015
SINTEF	E. Tønne, J.A. Foosnæs, K. Sand	New planning method for smart and active distribution grids	CIRED 2015, Lyon 15-18 June 2015
DTU	R. Sharma, Q. Wu, S-T. Cha, K.H. Jensen; T.W. Rasmussen, J. Østergaard	Fault ride through capability enhancement of VSC-HVDC connected offshore wind power plants	Dianli Xitong Zidonghua/Automation of Electric Power Systems (ISSN: 1000-1026) (DOI: http://dx.doi.org/10.7500/aeps20140119001), vol.: 39, issue: 3, pages: 14-22, 2015
DTU	Q. Wang, C. Zhang, Y. Ding, G. Xydis, J. Wang	Review of Real-time Electricity Markets for Integrating Distributed Energy Resources and Demand Response	Applied Energy (ISSN: 0306-2619) (DOI: http://dx.doi.org/10.1016/j.apenergy.2014.10.048) vol: 138, pages: 695–706, 2015

Publications from the ELECTRA partners			
	J. Østergaard		
DTU	S. Huang, Q. Wu, S.S. Oren, R. Li; Z. Liu	Distribution Locational Marginal Pricing through Quadratic Programming for Congestion Management in Distribution Networks	IEEE Transactions on Power Systems (ISSN: 0885-8950) (DOI: http://dx.doi.org/10.1109/TPWRS.2014.2359977), vol: 30, issue: 4, pages: 2170 - 2178, 2015
DTU	E. Dmitrova, M.L. Wittrock, H. Jóhannsson, A.H. Nielsen	Early Prevention Method for Power System Instability	IEEE Transactions on Power Systems (ISSN: 0885-8950) (DOI: http://dx.doi.org/10.1109/TPWRS.2014.2353693), vol.: 30, issue: 4, pages: 1784-1792, 2015
DTU	X. Zhang, M. Lind, O. Ravn	Design of multilevel flow modelling-based decision support system by using multiagent platform	International Journal of Process Systems Engineering (ISSN: 1757-6342) (DOI: http://dx.doi.org/10.1504/IJPSE.2014.066692), vol.: 2, issue: 3, pages: 246-259, 2015
DTU	P.J. Douglass, K. Heussen, S. You, O. Gehrke, J. Østergaard	System Frequency as Information Carrier in AC Power Systems	IEEE Transactions on Power Delivery (ISSN: 0885-8977) (DOI: http://dx.doi.org/10.1109/tpwrd.2014.2335694), vol.: 30, issue: 2, pages: 773-782, 2015
DTU	Y. Li, Q. Wu, H. Zhu	Hierarchical Load Tracking Control of a Grid-connected Solid Oxide Fuel Cell for Maximum Electrical Efficiency Operation	Energies (ISSN: 1996-1073) (DOI: http://dx.doi.org/10.3390/en8031896), vol.: 8, issue: 3, pages: 1896-1916, 2015
DTU	H. Zhao, Q. Wu, C. Wang, L. Cheng, C.N. Rasmussen	Fuzzy Logic based Coordinated Control of Battery Energy Storage System and Dispatchable Distributed Generation for Microgrid	Journal of Modern Power Systems and Clean Energy (ISSN: 2196-5625) (DOI: http://dx.doi.org/10.1007/s40565-), vol.: 3, issue: 3, pages: 422-428, 2015
DTU	H. Zhao, Q. Wu, Q. Guo, H. Sun, Y. Xue	Distributed Model Predictive Control of A Wind Farm for Optimal Active Power Control	IEEE Transactions on Sustainable Energy (ISSN: 1949-3029) (DOI: http://dx.doi.org/10.1109/TSTE.2015.2418282), vol: 6, issue: 3, pages: 831-839, 2015
DTU	S. Delikaraoglou, P. Pinson, R. Eriksson, J.T.G. Weckesser	Optimal dynamic capacity allocation of HVDC interconnections for cross-border exchange of balancing services in presence of uncertainty	ArXiv, 2015
DTU	H. Zhao, Q. Wu, Q. Guo, H. Sun, Y. Xue	Optimal Active Power Control of A Wind Farm Equipped with Energy Storage System based on Distributed Model Predictive Control	IET Generation Transmission and Distribution (ISSN: 1751-8687), 2015
OFFIS	A. Ohsenbrügge, M. Blank, S. Lehnhoff, M. Sonnenschein	Efficient Provision of Ancillary Services by Decentralized, Volatile Generating Units	ETG-Fachtagung, V Von Smart Grids zu Smart Markets“, 2015
OFFIS	M. Blank, M. Gandor, A. Niesse, S. Scherfke, S. Lehnhoff, M. Sonnenschein	Regionally-Specific Scenarios for Smart Grid Simulations	5th International Conference on Power Engineering, Energy and Electrical Drives (POWERENG2015), 2015

Publications from the ELECTRA partners			
OFFIS	M. Blank, S. Lehnhoff	Correlations in Reliability Assessment of Agent-based Ancillary-Service Coalitions	18th Power Systems Computation Conference (PSCC), August 18-22, 2014, Wroclaw, Poland
OFFIS	M. Blank, S. Lehnhoff	Considering Correlations for Reliable Distributed Ancillary Service Provision	5th IEEE PES Innovative Smart Grid Technologies (ISGT) Europe, October 12-14, 2014, Istanbul, Turkey
OFFIS	H.-J. Appelrath, C. Wissing, S. Schnabel, C. Mayer, S-C. Schnabel	Future Energy Markets	acatech Studie, 2014 (in press)
OFFIS	M. Blank, M. Calabria, R. Dietz, F. Fuchs, T. Klingenberg, S. Lehnhoff, A. Mertens, W. Schumacher	Agentenbasierte Vorhaltung und Erbringung von Primärregelleistung	Automatisierungstechnik; 2014
OFFIS	K. Piech, R. Bleiker, S. Lehnhoff, C. Mayer	Automatisierung heterogener, verteilter Energieanlagen mittels OPC UA. Zukünftige Stromnetze für Erneuerbare Energien	IRED Germany. Berlin, Januar 2014 (angenommen, noch nicht veröffentlicht).
OFFIS	M. Sonnenschein, C. Hinrichs, A. Nieße, U. Vogel	Supporting Renewable Power Supply by Distributed Coordination of Energy Resources	Erscheint in: L M Hilty, B Aebischer: ICT Innovations for Sustainability, Springer Advances in Intelligent Systems and Computing, 2014 (angenommen, noch nicht veröffentlicht).

Table A- 2 - Theses related to ELECTRA activities

Theses related to ELECTRA activities		
Partner	**Title**	**Details**
IWES	Frequency control in future energy supply structures	Author: Arun Kannan Supervisor: D. Geibel Period: 01-01-2015 to 30-06-2015
DTU	Distribution network observability and development of decision support features for real time operation of 2030 power system PhD project	Author: A. Prostejovsky Supervisors: H. W. Bindner, A. M. Kosek, O. Gehrke Expected ending date: December 2016
DTU	Observability and decision support for supervision of distributed power system control PhD project	Author: M.Pertl Supervisors: H. W. Bindner, M. Marinelli, K. Heussen Expected ending date: November 2017
DTU	Validation of decentralized and coordinated operation of frequency and voltage control systems in the control room PhD project	Author: M. Rezkalla Supervisors: H. W. Bindner, M. Marinelli, K. Heussen Expected ending date: March 2018
DTU	Investigation of system stability issues in future power	Author: C. Toigo

Theses related to ELECTRA activities		
	systems Master thesis project	Supervisors: R. Turri (Univ. Of Padova), M. Marinelli, M. Pertl Expected ending date: May 2016
OFFIS	Verteilte kontinuierliche Einsatzplanung in Dynamischen Virtuellen Kraftwerken PhD project	Author: A. Nieße Day of defense: 17th April 2015
OFFIS	Marktbasiertes Redispatch mit Flexibilität von Netznutzern für das Verteilnetz PhD project	Author: C. Wissing, ReFlex Day of defence: 9th March 2015
OFFIS	Reliability Assessment of Coalitions for the Provision of Ancillary Services PhD project	Author: M. Blank Day of defence 16th December 2015
OFFIS	Bereitstellung von Systemdienstleistungen im Verteilnetz mit Hilfe intelligenter Anlagenverbände Master thesis project	Author: B.A. Lüers February 2015
OFFIS	Risikobewertung für die Vorhaltung von Systemdienstleistungen (SDL) aus verteilten Energieerzeugungsanlagen Master thesis project	Author: C. Buschmann June 2015