

Distributed Intelligence for Cost-Effective and Reliable Distribution Network Operation



4th External Workshop

The role of KPIs in evaluating Smart Grid Projects

Workshop Minutes

Author: DNV GL

Date: 10.02.2016

Version: 1

www.discern.eu

Confidential (Y / N): N



The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement No. 308913.

Title	3 rd External Workshop - The role of KPIs in evaluating Smart Grid Projects
--------------	--

WP number	WP title	WP Leader
9	Dissemination	RWE
Task title	External Workshop	

Main Author	DNV GL
Project partners involved	DNV GL UFD SSEPD RWE KTH VTF CIRCE

Type (Distribution level)
<input checked="" type="checkbox"/> PU, Public
<input type="checkbox"/> PP, Restricted to other program participants (including the Commission Services)
<input type="checkbox"/> RE, Restricted to other a group specified by the consortium (including the Commission Services)
<input type="checkbox"/> CO, Confidential, only for members of the consortium (including the Commission Services)

Status
<input type="checkbox"/> In Process
<input type="checkbox"/> In Revision
<input checked="" type="checkbox"/> Approved

Further information	www.discern.eu
----------------------------	--

Table of contents

1	Objective of the workshop.....	4
2	Scope of the workshop	5
2.1	Agenda.....	5
2.2	Annexes	5
2.3	List of participants.....	6
3	Review of applicability and use of KPIs from a project perspective	7
3.1	DISCERN	7
3.2	DREAM.....	7
3.3	IDE4L.....	7
3.4	UPGRID	7
3.5	evolvDSO	7
3.6	Joint experiences and findings.....	8
4	Review on applicability and use of KPIs from an industry perspective	9
4.1	Regulatory perspective	9
4.2	Research & Development perspective.....	9
4.3	Industry perspective	10
5	Application of KPIs for different purposes	11
5.1	Workshop Session on KPI Framework	11
5.2	Workshop results and common statements	11
6	Conclusion.....	14

1 Objective of the workshop

The fourth DISCERN external workshop was a review and knowledge sharing event to discuss and elaborate on common findings and exchange experiences relating to the use and implementation of KPIs with respect to evaluation of smart grid projects.

Special emphasis was placed on determining whether KPIs present a viable solution to evaluate project performance by:

- Sharing experiences and lessons learnt of implementing KPIs in Smart Grid Projects;
- Understanding the different purposes of applying and using KPIs with inputs by regulator, vendors and industry;
- Discussing findings and outcomes of using a KPI based approach for project evaluation, and
- Evaluating the level of applicability of KPIs for project evaluation.

2 Scope of the workshop

2.1 Agenda

Time	Activity
10:00	Registration and coffee
10:30	Introduction and objectives of the workshop Thomas Wiedemann, RWE Deutschland AG and Alan Birch, DNV GL (chairman)
	Session 1: How KPIs are used in existing projects and lessons learnt
10:40	▪ DISCERN , Katrin Spanka, DNV GL
10:55	▪ DREAM , Juan Luis Garrote Molinero, Schneider-Electric
11:10	▪ IDE4L , Giovanni Massa, A2A
11:25	▪ UPGRID , Irene Aguado Cortezón, Instituto Tecnológico de la Energía
11:40	▪ evolvDSO , Victoria Gerus, EDSO4SG / Paul Cuffe, UCD
11:55	Break
	Session 2: Application of KPIs by different elements of the industry
12:30	Towards Output-Based Regulation Luca Lo Schiavo, Italian Regulatory Authority Electricity, Gas, Water
12:50	How to become a Utility of the Future? Rolf Apel, Siemens AG
13:10	Usage of KPIs by DSOs Gareth Bissell, Enel
13:30	Lunch break
	Workshop session
14:30	The use, relevance and applicability of KPIs to industry stakeholders in reporting and understanding network performance
15:30	Final discussion and closing remarks Lars Nordström, KTH / DISCERN technical coordinator
15:50	EU Project support Michael Laubheimer, European commission
16:30	Meeting close

2.2 Annexes

- 2_DISCERN_DNV GL
- 3_DREAM_Schneider Electric
- 4_IDE4L_A2A
- 5_UPGRID_ITE
- 6_evolvDSO_EDSO4SG_UCD
- 7_Towards output based regulation_ itailian regulatory authority
- 8_How to become a utility of the future_ Siemens
- 9_Usage of KPIs by DSOs_ Enel
- 10_DISCERN KPI Framework Matrix _Workshop results

2.3 List of participants

Name	Company
DISCERN	
Alan Birch (Chair and moderator)	DNV GL / DISCERN
Katrin Spanka	DNV GL / DISCERN
Ying He	Vattenfall / DISCERN
Fernando Salazar Saez	Gas Natural Fenosa / DISCERN
Angel Yunta Huete	Gas Natural Fenosa / DISCERN
Sarah Rigby	SSEPD / DISCERN
Laura Gimenez	Circe / DISCERN
Lars Nordström	KTH / DISCERN
Carmen Calpe	RWE Deutschland / DISCERN
Thomas Wiedemann	RWE Deutschland / DISCERN
External	Company/ project represented (if applicable)
Luca Lo Schiavo	Italian Regulatory Authority
Juan Luis Garrote Molinero	Schneider Electric / DREAM
Giovanni Massa	A2A / IDE4L
Rolf Apel	Siemens
Irene Aguado Cortezón	ITE / UPGRID
Michael Laubheimer	European Commission
Victoria Gerus	EDSO4SG / evolvDSO
Paul Cuffe	University College Dublin / evolvDSO
Gareth Robert Bissell	ENEL / Isernia project
Henrik Dam	European Commission
Rieke Bärenfänger	University St. Gallen / DREAM
Nico Keyaerts	Vlerick Business School / STORY

3 Review of applicability and use of KPIs from a project perspective

Experiences in existing projects on KPIs:

- ▶ Five EU projects shared their KPI approach and their experiences; each within a short presentation of 10-12 minutes, followed a brief discussion round.
- ▶ The following paragraphs summarize the status of KPIs within the project, the objectives of the KPIs and the type of KPIs used.
- ▶ Provided experiences are summarized at the end of this chapter, as it became obvious that similar experiences were expressed by the presenters.

All the presentations are available as Annexes of this document. See Annexes 2 to 6 for project presentations.

3.1 DISCERN

- Project almost finished, KPI approach implemented and results available
- KPIs were applied for technical and economical evaluation of different Use Cases¹
- For this, performance, e.g. SAIDI, hosting capacity, success index in meter reading, and cost KPIs have been defined, selected and data collected

3.2 DREAM

- Project in its last year, KPI approach implemented, results not yet available
- KPIs were applied for technical and economical evaluation of different the DREAM concept
- For this, technical and conceptual KPIs have been defined to evaluate the success of DREAM

3.3 IDE4L

- Project in its last year, KPI approach implemented, results not yet available
- KPIs were applied to validate the IDE4L architecture, per demo but also by comparing results from different demos
- For this, measured KPIs and theoretical KPIs (i.e. simulated) have been defined

3.4 UPGRID

- Project in its second half, KPI approach implemented, results not yet available
- KPIs were applied to measure the impact of each demo (determined by component or development) in respect to EEGI goals (high level KPIs)
- For this, detailed and high level KPIs have been used, with a weight matrix to converge detailed to high level KPIs

3.5 evolvDSO

- Project in its last year, KPI approach implemented, validation of results on-going
- KPIs were applied to assess the quality and performance of the tools
- For this, operational KPIs have been developed

¹ A Use Case is the implementation of a technical solution to provide the required functionality.

3.6 Joint experiences and findings

1. KPI definitions were mainly based on EEGI framework as an initial starting point and other project KPIs (if available)
2. A template approach was applied in most cases to define KPIs, the calculation methodology and applicability (e.g. relation to other KPIs / EEGI, detailed settings for data collection, etc.)
3. Important to implement a clear methodology (KPI framework) right at the beginning of the project, despite high uncertainty of goals (of projects, tools, demos, etc.)
 - Use Cases naturally evolve after closer interaction with the trial sites - KPIs thus difficult to be planned early in a one-time effort
 - Implement an iterative approach to align KPI definition and goals (along the project)
 - Do not impose KPIs; KPIs should be the result of a collaborative effort of all the involved parties
 - Joint KPIs are rather difficult to reach; majority applied individual KPIs that are based on individual projects / demo conditions and expected data availability
4. Data availability remains a challenge in itself and impacts the KPI definition and selection
 - Availability of Business as Usual (BaU) data has been expressed as real challenge; no clear approach to define BaU values in the absence of BaU data
 - KPIs that require cost information are less incorporated in KPI frameworks (and even sometimes avoided), as it remains a tough challenge to collect cost data
 - Different challenges in respect to data gathering lead to a lower level of data availability at the end of the project
5. Quantitative data needs to be enhanced with qualitative assessments
 - A lack of data leading to an incomplete picture for evaluation needs to be backed up with qualitative information to enable sensible evaluation
6. Comparing Use Cases based on KPIs is not meaningful or feasible in all cases
 - UPGRID does not consider KPIs as means to enable comparison of Use Cases, but rather to measure the impact of a solution.
 - DISCERN highlights that Use Cases need to be similar in nature, e.g. maturity stage, size and network issue(s) to be addressed, in order to consider KPIs as means for comparison
7. Ensure engagement by all parties to contribute to KPIs
 - Facilitated if KPI tasked is “lived” along the project (“get them working”)
 - Appoint a central partner in charge for KPIs in the projects to engage parties and participation

4 Review on applicability and use of KPIs from an industry perspective

See Annexes 7 to 9 for presentations.

4.1 Regulatory perspective

See Annex 7.

- Presentation of the Italian approach to include smart grid solutions in the regulation scheme
 - Differentiation between output and input-based incentives; with output based incentives relevant for more mature phases and input-based for rather transition phases. Main idea is to include the learnings and (maybe products) from the input-based phase into the output-based regulation
 - Output-based incentives:
 - Incentives for efficiency (bonus/malus scheme)
 - Ex-post evaluation
 - KPIs used to define key outcome indicators (direct link to incentives)
 - Relevant KPI characteristics: reliable, clear and fair, trackable and auditable
 - Examples: SAIDI, SAIDI, MAIFI
 - Input-based incentives:
 - Incentives for pilot projects (field tests) selection (no penalties)
 - Ex-ante evaluation of the expected performance based on KPIs
 - Incentive has nothing or little to do with KPIs (fixed incentives)
 - Examples: P-smart (increase in DG-produced electricity / hour)

> Applicability of KPIs depend on the purpose and subject matter

> Differences in context (e.g. rural, urban, etc.) need to be considered in the evaluation and incentive scheme

4.2 Research & Development perspective

See Annex 8.

- Presentation of the Siemens approach to select most appropriate technology solutions to reach set targets (company goals)
 - Development of Smart Grid Compass ® for the development of smart grid related strategies
 - Apply KPIs in order to measure the impact of technology solutions in respect to defined “capability levels”

> Framework that relates technology solution to defined objectives and indicates their contribution

4.3 Industry perspective

See Annex 9.

- Presentation on KPIs for a cost benefit assessment, linked to the JRC Guidelines for conducting a Cost Benefit Analysis of Smart Grid Projects

- > There is no approach of “one-fits-all”
- > KPIs have to be handled with care
- > Both quantitative and qualitative outputs of CBA must be considered
- > Qualitative analysis based on the definition of KPIs/metrics are more useful for benefits evaluation
- > Combination with monetary value is not straightforward

- > In absence of well-defined calculation methods, KPI assessment through the merit deployment matrix might be strongly affected by the subjectivity of the evaluator
- > It is therefore fundamental to provide with objective explanations and evaluation methods
- > In the CBA’s monetary and non-monetary appraisals alike
- > KPIs can support the definition of benefits for the CBA - we see the added value of the availability of these produced at European level
- > It would not be recommended to use KPIs to compare the deployment of different solutions on different networks
- > KPI results can support justification for investment but only with background understanding of the technologies, elements and goals of the project
- > Sensitivity analysis should be used

5 Application of KPIs for different purposes

5.1 Workshop Session on KPI Framework

- ▶ Participants were separated into three working groups to discuss the required attributes for designing KPI frameworks, evaluating a list of attributes provided by DISCERN as a starting point for the discussions. Further input to this initial set of attributes was sought from the participants through their work group discussions illustrated through project examples and inputs from each of the projects participants.
- ▶ Participants were tasked with completing the matrix and presenting their views as to the level of applicability of the attributes to the relevant purpose and providing an evaluation of “must”, “could” or “not applicable” against each group of KPI cluster and attribute in the matrix.

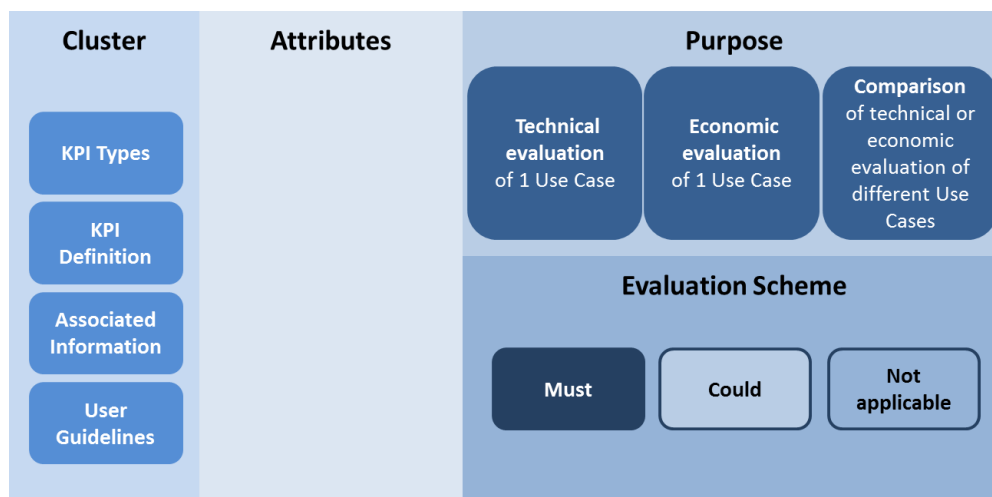


Figure 1: Structure of the DISCERN KPI Framework Matrix

5.2 Workshop results and common statements

- ▶ Results were provided per group and briefly presented and discussed with the other groups.
- ▶ The results of the work group’s discussions show mostly consistency, however, fields that are multi-coloured indicate areas with views that differ based on experiences from each of the projects and their own examples for the implementation/use of KPIs.

Cluster	Attributes	Purpose		
		Technical evaluation	Economic evaluation	Comparison
KPI Types	KPI framework incorporates technical KPIs , that measure the impact of the technical solution.	Must	Could	Not applicable
	KPI framework incorporates monetizable KPIs , that measure the impact of the technical solution and can be translated into a monetary value.	Could	Must	Not applicable
	KPI framework incorporates cost KPIs , that measure the expenses and/or cost structure of the technical solution.	Could	Must	Not applicable
KPI Definition	KPI definitions are transparent and clear , i.e. similar structured.	Must	Not applicable	Not applicable
	KPI definitions include the equation that defines the KPI, the explanation of the different variables within the equation and the description of input data for each of the variables.	Could	Must	Not applicable
	KPI definitions compensate for different measurement periods and allow annual evaluations, i.e. can be transposed on an annual base. This may be complementary to defining the measurement period.	Must	Could	Not applicable
Associated Information	KPI definitions capture expected outcomes , i.e. expected impact of solution.	Could	Could	Not applicable
	The KPI framework considers context information on Use Case (such as demo site, applied technical solution, regulatory framework, etc.).	Must	Not applicable	Not applicable
User Guidelines	KPI framework includes guidelines, processes and procedures that support user friendliness and enables comparison, i.e. sets the basis for comparing different solutions.	Must	Not applicable	Not applicable
	KPI framework provides a defined set of KPIs for each sub-functionality . A common definition of issues should be applied.	Could	Could	Not applicable

Must Could Not applicable

Figure 2: DISCERN KPI Framework Matrix with evaluation by the work groups

Further amendments have been suggested by the work groups regarding:

- ▶ KPI Types
 - Include also KPIs that capture a range of externalities, i.e. that bring benefits to various stakeholders, e.g. societal (e.g. acceptance), environmental, safety, market, as such factors can be influential in decision making when considering the wider roll out of a solution
- ▶ KPI Definition
 - the definition should also specify the units associated with the KPI
 - KPI targets are seen useful, however,
 - a. the question of valid evaluation was raised, e.g. is the solution a ‘failure’ where a target is set at a 10% improvement and a project achieves an improvement of 9%?
 - b. the determination of targets is challenging, especially for R&D projects that actually intend to explore the potential of a solution.
 - KPIs should be time-independent respectively time-horizon should be clear (especially if it looks in the future or backwards)
- ▶ Associated Information
 - the age of networks/network assets may also be of relevance
 - information on any ‘smart’ projects already deployed in the network area of the project (which may impact the result of the solution under assessment)
- ▶ User Guidelines
 - consideration of existing data sets can help with engaging DSOs in the process
 - examples should be given to DSOs of how the inputs to the KPI calculations can be derived from different source data sets
 - Dictionary of KPIs, i.e. clarify SAIDI and its related country individual definitions
- ▶ Comparison could also be considered as comparison of the benefits per actor

6 Conclusion

The Technical Coordinator of DISCERN, Lars Nordström, led the final workshop session that discussed the materials and views presented in the earlier sessions and identified a common set of themes and experiences, providing **summary statements** of the workshop discussions:

- KPIs need to be complemented with qualitative / contextual information.
- Monetizing KPIs could be useful, but not needed in all cases.
- For comparison of different demo site using KPIs the specific characteristics of the demos needs to be considered.
- A catalogue of KPIs available for voluntary use in projects should be developed.
- Cost-benefit-analyses in R&D projects are really necessary although associated with high uncertainty.
- To capture costs, set targets for costs that must be met for the cost-benefit-analysis to be positive – although not straight forward.
- Sensitivity analysis is needed as part of the CBA.
- Some KPIs are dependent on time.

Overall, the **exchange of experiences** was found to be **very useful** by the workshop participants; many expressed their **interest in continuing** this kind of experience exchange between projects. As each project was at a different state of development, the discussion and experiences shared by the projects provided guidance for newer projects and enabled the more mature projects to share knowledge and findings for the benefit of others and future projects.

On reflection the presented **KPI Framework Matrix** provided as a basis for discussion and further enhancement, served well as a starting point for the debate, however, the group discussion revealed **further development needs and inter-project coordination** in order to develop the KPI framework matrix as a practical tool for providing orientation when developing KPI frameworks in projects. Further **standardization**² (or coordinated work) **might be considered** to ensure a common language and understanding when working with KPIs, as there are different views on KPIs, their structure and applications – very much depending on the project that developed the KPIs and the scope of the project.

² E.g. enhancement of EEGI Framework