Draft methodological guidelines to perform a scalability and replicability analysis

Task Force Replicability & Scalability Analysis

December 2019

This report has been elaborated with the support of DOWEL MANAGEMENT within the INTENSYS4EU Coordination and Support Action. The INTENSYS4EU Project supports the BRIDGE activities and has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731220.

Document Information (Intensys4EU project)

Report number	D3.12.g
Report name	Draft methodological guidelines to perform a scalability and replicability analysis - Task Force Replicability & Scalability Analysis
Reviewed by	DOWEL Management
Date	December 2019
Work Package and Task	WP3, task 3.4
Lead Beneficiary for this Deliverable	BRIDGE Task Force Replicability & Scalability Analysis

Version Control

Version	Date	Author	Description of Changes
V1.0	01/10/2019	Rafael Cossent Lola Alacreu	First draft report
V1.1	02/10/2019	Rafael Cossent Lola Alacreu	Revised draft report
V1.2	10/10/2019	Rafael Cossent Lola Alacreu	Revised draft report based on comments received from European Commission
V1.3	08/11/2019	José Pablo Chaves Ávila Manuel Serrano Matoses	Revised draft report based on comments received from European Commission
V1.4	13/12/2019	José Pablo Chaves Ávila Manuel Serrano Matoses	Revised draft based on feedback received during the European Commission Session at European Utility Week on November 12th 2019; Contributions from WISEGRID and GOFLEX
V1.5	17/12/2019	Nicolas Peraudeau	Review of the document
V1.6	18/12/2019	José Pablo Chaves Ávila	Revised draft based on comments from Nicolas Peraudeau
V1.7	19/12/2019	Eric Lecomte EC/DG Ener	General review of the document
V1.8	20/12/2019	Álvaro Nofuentes Prieto	Additional information from WISEGRID based on comments received from European Commission
V1.9	22/12/2019	Venizelos Efthymiou	Additional information from GOFLEX based on comments received from European Commission
V2.0	23/12/2019	Stéphanie Petit	Final review of the document

Authors of the present report

Name	Organization	E-mail	Project
Rafael Cossent	Comillas University	Rafael.cossent@iit.comillas.edu	InteGrid
Lola Alacreu	ETRA I+D	lalacreu.etraid@grupoetra.com	WiseGrid
José Pablo Chaves	Comillas University	Jose.chaves@comillas.edu	InteGrid
Manuel Serrano	ETRA I+D	mserrano.etraid@grupoetra.com	WiseGrid

Contributors of the present report

Name	Organization	E-mail	Project
Venizelos Efthymiou	University of Cyprus	efthymiou.venizelos@ucy.ac.cy	GOFLEX
Bradley Eck	IBM	bradley.eck@ie.ibm.com	GOFLEX
Álvaro Nofuentes Prieto	ETRA I+D	anofuentes.etraid@grupoetra.com	WiseGrid

Leading team of the BRIDGE Replicability & Scalability Task Force, quality check of the present report

Leader of the Task Force

Name	Organisation	E-mail	Project
Rafael Cossent	Comillas University	Rafael.cossent@iit.comillas.edu	InteGrid
Lola Alacreu	ETRA I+D	lalacreu.etraid@grupoetra.com	WiseGrid

Guidance from European Commission

Name	Organisation	E-mail
Eric Lecomte	EC/DG.ENER	eric.lecomte@ec.europa.eu

Editor

Name	Organisation	E-mail
Nicolas Peraudeau	DOWEL Management	nicolas.peraudeau@dowel.eu

Table of Contents

LIST OF ACRONYMS AND ABBREVIATIONS **4**

EXECUTIVE SUMMARY **5**

1. INTRODUCTION **6**

1.1 AIMS AND SCOPE OF THE TASK FORCE 6
1.2 CONTENTS OF THIS REPORT 6

2. MAIN FINDINGS FROM SURVEYS AMONG BRIDGE PROJECTS **7**

2.1 SURVEY 1 – MAPPING OF SRA STATUS IN PARTICIPATING PROJECTS 7
2.2 SURVEY 2 - CHARACTERIZATION OF SRA METHODOLOGY AND LESSONS LEARNT IN PREVIOUS PROJECTS. 10

3. DRAFT GUIDELINES TO PERFORM A SRA IN A H2020 PROJECT **14**

3.1. GENERAL APPROACH 14
3.2. PILOTING THE METHODOLOGY 18
3.2.1 Application of the methodology to the WiseGRID project 18
3.2.2 Application of the methodology to the GOFLEX project 21
3.2.3 Comments of SRA methodology from other projects 24

4. IDEAS FOR A SRA TOOLBOX/REPOSITORY **25**

5. CONCLUSION AND RECOMMENDATIONS **26**

LIST OF FIGURES **27**

LIST OF REFERENCES **28**

ANNEX I – SURVEY 1 ..... **29**

ANNEX II – SURVEY 2 ..... **33**

List of Acronyms and Abbreviations

CBA	Cost-benefit Analysis
DER	Distributed Energy Resources
DG	Distributed Generation
DR	Demand Response
DSO	Distribution System Operator
EC	European Commission
GA	General Assembly
GDPR	General Data Protection Regulation
GDPR	General Data Protection Regulation
ICT	Information and Communications Technology
KPI	Key Performance Indicator
RES	Renewable Energy Sources
SGAM	Smart Grid Architecture Model
SRA	Scalability and Replicability Analysis
TF	Task Force
TRL	Technology Readiness Level
TSO	Transmission System Operator
WG	Working Group

Executive Summary

BRIDGE is a European Commission initiative which unites Horizon 2020 Smart Grid and Energy Storage Projects to create a structured view of cross-cutting issues which are encountered in the demonstration projects and may constitute an obstacle to innovation.

The BRIDGE process fosters continuous knowledge sharing amongst projects thus allowing them to deliver conclusions and recommendations about the future exploitation of the project results, with a single voice, through four different Working Groups representing the main areas of interest: Business Models, Consumer Engagement, Data Management and Regulations.

As a result of the last General Assembly (GA) of the BRIDGE initiative a number of task forces (TF) where created to address topics that could be horizontal to more than one of the above-mentioned working groups. In this way, a specific TF was launched to investigate how the different projects were tackling the Scalability and Replicability Analysis (SRA) of the different project results.

The objectives of the TF were: (i) to develop common guidelines to perform SRAs; and (ii) to develop ideas on how to define the scope and implementation of a toolbox/repository of past experiences, best-practices and necessary data.

The current report fully covers the first objective, proposing a methodology for the definition of SRA that has already been piloted by two of the projects participating in BRIDGE. The second objective has been addressed too, and some ideas on how the SRA repository/toolbox could look like are also included in the report.

Moreover, the report also presents a summary of the main findings from two surveys carried out among participating projects on the status of the SRA in their projects and information on SRA carried out in previous projects in which they had participated respectively.

As result of the piloting activities with the SRA methodology, it is possible to conclude that:

- It is a methodology that the projects can follow to ensure they do the SRA of their project in a high-quality manner, i.e. to agree on quality standards that a good SRA needs to meet.
- The methodology is flexible enough to consider all the particularities of the different projects, but at the same time structures the analysis in a number of necessary steps. This enables for different SRAs to be comparable.

1. Introduction

The Task Force (TF) on scalability and replicability was created after the BRIDGE GA meeting held in Brussels on the 12th and 13th of March 2019, based on the outcomes of two parallel sessions which addressed this topic. These sessions clearly showed the interest among BRIDGE project participants to exchange experiences on how to perform a Scalability and Replicability Analysis (SRA) as well as to be able to draw best-practices from past projects.

This report presents the results of the activities of this TF obtained in the first 6-8 months after its creation in March 2019. This work has been presented at the European Utility Week held in Paris on November 2019. Therein, the next steps of this TF will be discussed at the next BRIDGE General Assembly in 2020.

1.1 Aims and scope of the Task Force

Many projects participating in the BRIDGE initiative are required to perform a SRA as part of their committed activities. In order to support these projects and to ensure that these are performed based on common and consistent grounds, the need to have some common general guidelines as well as a repository of past experiences has been identified in the last BRIDGE GA.

In order to address this need, a dedicated TF was created on April 2019 with the following goals:

i. Develop common guidelines to perform a SRA.

ii. Develop ideas on how to define the scope and implementation of a toolbox/repository of past experiences, best-practices and necessary data.

The TF was asked to summarize its outcomes in a report (done herein), presented during an EC session dedicated to Replication at the European Utility Week in November 2019.

The common guidelines on SRA should take into account the following:

- The aim is to agree on guidelines that Bridge projects can follow to ensure they do the SRA of their project in a high-quality manner, i.e. to agree on quality standards that a good SRA needs to meet.
- These guidelines ought to consider between the particularities of the different projects, e.g. TRL of the project, consortium composition, etc.
- The guidelines should, to the extent possible, identify the relevant data required to perform a high-quality SRA, e.g. network data or market rules.

During the session at the European Utility Week, WiseGRID and GOFLEX, two BRIDGE projects, were volunteer to implement/apply the guidelines on SRA and provide feedback for their improvement (results presented in the part 3 of the document).

1.2 Contents of this report

This report presents a summary of the work done in these last months after the creation of the TF. After this introductory section, section 2 presents the main findings from two surveys carried out among participating projects on the status of the SRA in their projects and information on SRA carried out in previous projects in which they had participated respectively. Next, section 3 presents the proposed draft methodological guidelines to perform a SRA, developed based on the information gathered from the surveys and the application to the H2020 projects, as well as an exhaustive description of the application of the methodology in WiseGRID and GOFLEX projects. Section 4 presents ideas for a SRA repository. Lastly, section 5 provides a few concluding remarks and identifies some topics that could be addressed in the future work of this TF.

2. Main findings from surveys among BRIDGE projects

This section describes the goals and contents of two surveys that have been carried out within the TF and presents their main findings.

2.1 Survey 1 – Mapping of SRA status in participating projects

The first of the aforementioned surveys kicked-off the activities of the TF. It aimed at identifying the expectations and motivations of the TF participants and perform a first mapping of the methodological approaches to perform a SRA within the participating H2020 projects. The survey was created as a google form and respondents were given around 10 days to fill-in the questionnaire. A total of 17 answers were received; a summary of the feedback received is presented on the ensuing.

The first question asked to TF members was about whether their H2020 projects planned on doing a SRA and, in case of an affirmative answer, what was the status of such analysis. This showed that most of TF members indeed had to perform a SRA (15 out of 17). Moreover, most of these projects have not started to carry out this analysis or in the early stages (see Figure 1).

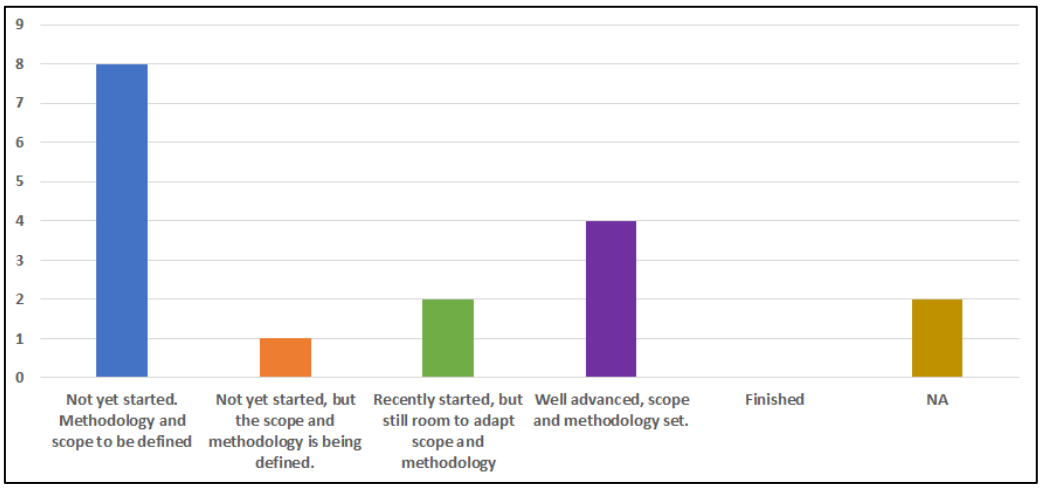


Figure 1: Responses to survey 1 – Status of the SRA in TF H2020 projects

This fact is clearly reflected in the answers obtained to the question on what TF members expected from the activities of the TF. Despite the fact that diverse expectations were raised, most responses were related to receive support to carry out a SRA (methodology, barriers, exchange of ideas), and input data (see Figure 2). In fact, some participants explicitly stated that they considered this as an opportunity to exchange ideas with other projects, share best-practices and learn more to support the SRA in their projects. The open answers also revealed that different projects were interested in different dimensions (ICT, business models and market readiness, etc.).

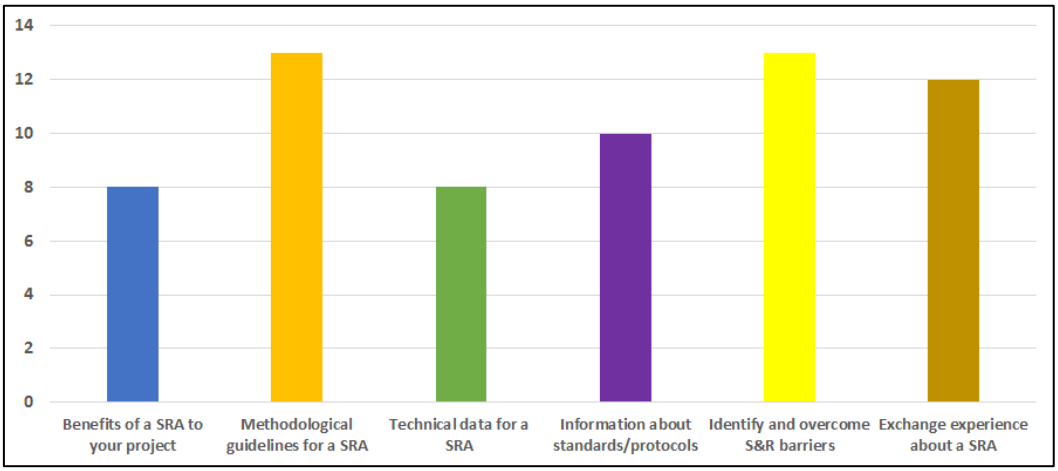


Figure 2: Responses to survey 1 – Expectations from the TF

In light of this information, it was concluded that the TF is in a position to support on-going projects and that the initial goals of the TF are well aligned with the expectations from H2020 projects.

The next question was related to the scope of the SRA they were involved in, i.e. what dimensions or SGAM layers their project was addressing. The answers (see Figure 3) showed that H2020 projects address a wide range of SRA dimensions, being the business aspects (regulation, economic, market) and ICT replicability particularly relevant. The functional layer was not included in the options, but it was referred to by several respondents, so it seems relevant too.

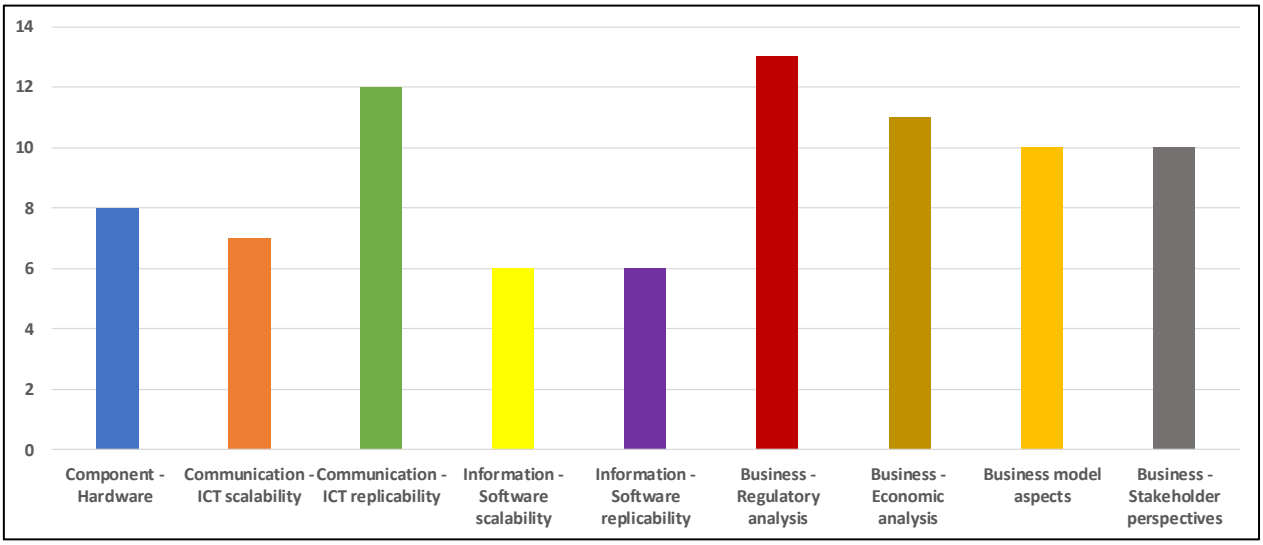


Figure 3: Responses to survey 1 – Scope of the SRA

The diverse dimensions covered by different projects is reflected in a diverse number of methodological approaches to SRA reported by the participants (see Figure **4**). The most common methodology cited is based on stakeholder consultation and desk-research, mostly for the ICT replicability and business-layer analyses. Additionally, simulations seem to be commonly used to perform ICT SRA and functional analyses, whereas lab work is mentioned for hardware-related analyses. In one case, real-life tests involving actual end users were mentioned.

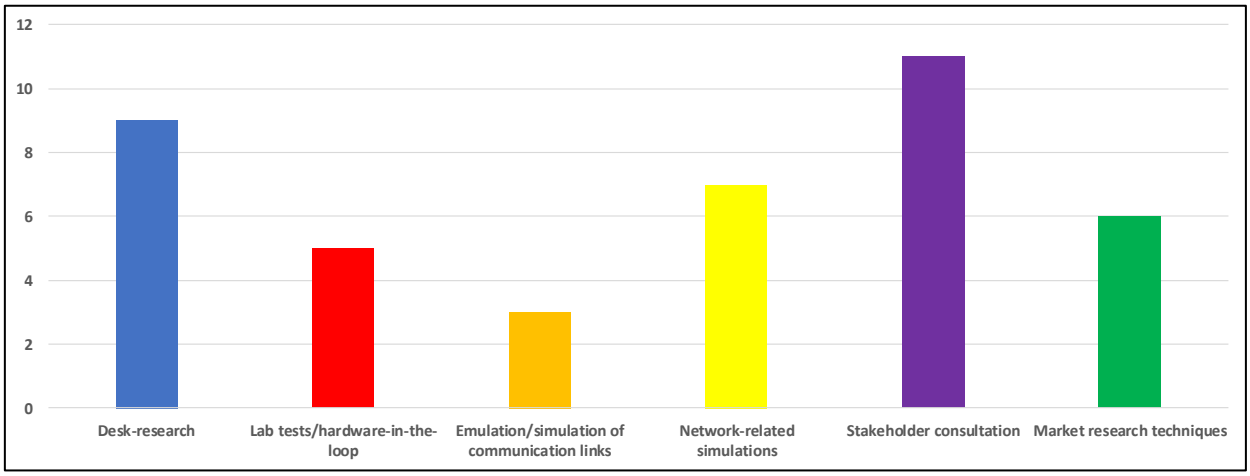


Figure 4: Responses to survey 1 – Methodology for the SRA

This information may have relevant implications to the activities of the TF. From this initial assessment, it seems that developing a single common detailed methodology may not be practical or feasible. The question to address then is what level of detail is necessary in the methodological guidelines in order to effectively support the projects, whilst avoiding being over-prescriptive.

However, the next question about the main barriers or challenges encountered when performing a SRA showed that some sort of guideline is still required (see Figure 5). The most common barriers mentioned comprise the lack of methodological guidelines and common standards, and the lack of input data (network, regulation and market information). In relation to the barriers concerning data availability, some respondents provided additional details. For instance, the lack of harmonization on market rules was mentioned as a key barrier, as it requires much more resources for data collection and hampers easy comparisons for replicability. Likewise, some participants mentioned that, in those cases where the data needs to be provided by a project partner, it is not always easy to convince them to do so or the GDPR introduced barriers for this. Lastly, a few projects mentioned the lack of resources or know-how to perform the SRA (something to be addressed at the proposal stage).

Furthermore, some participants considered that the SRA should be more tightly linked to the exploitation of the products or solutions developed within the project, for example by assessing the business case under different regulatory settings. However, this seems to face some barriers such as the lack of time, resources or adequate stakeholder participation to adjust the product to the needs of the market once the project ends.

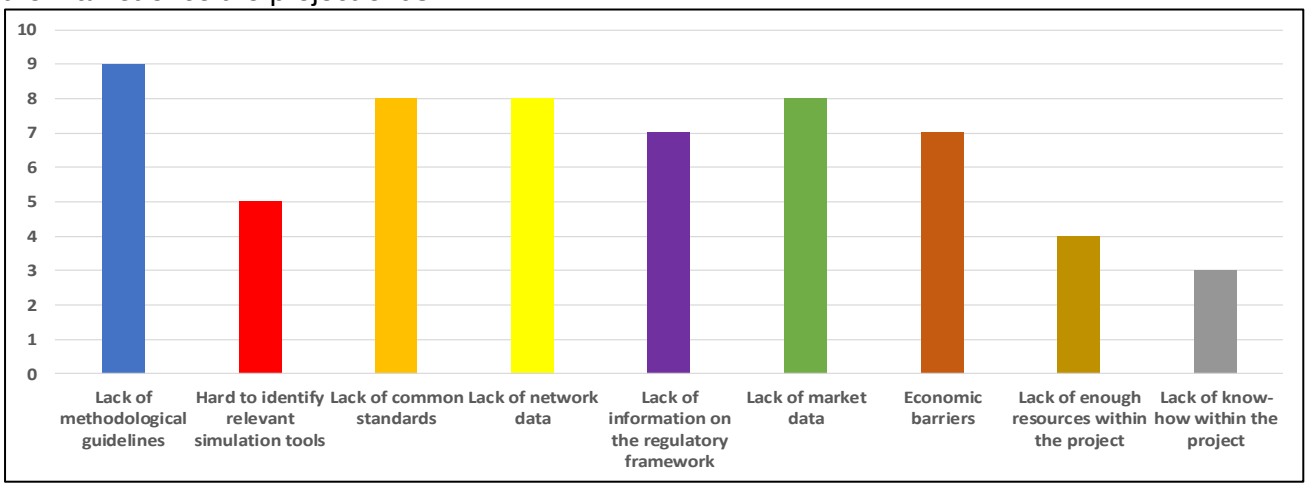


Figure 5: Responses to survey 1 – Most important barriers or challenges

Based on the barriers identified, it may be concluded that the TF results may provide two types of support to H2020 project. At an early stage, methodological guidelines or support to find best practices may be provided, whereas input data or guidance as to where to find open data sources could be provided during the execution of the SRA. Enough resources & know-how should be ensured from the proposal stage (indications in the call, evaluation criteria, etc.). It remains to be seen to what extent the SRA may inform the subsequent exploitation of a product or service developed within the project (relevant only for projects with a high TRL).

Some of the major conclusions from this first survey were that, due to the wide variety of dimensions/approaches followed in different projects (as well as different technological solutions and business models), a single common SRA methodology was not feasible. However, the TF can guide and speed up the first stages of the SRA through a set of common general steps to help projects identify possible methodologies and data sources, ensuring that the methodology selected is the one that best suits the project goals and capabilities. In order to do this, the need to rely on previous experiences in other projects and identify best practices was considered necessary. Consequently, a second survey was designed to address this issue.

2.2 Survey 2 - Characterization of SRA methodology and lessons learnt in previous projects

The second survey carried out among the TF members aimed to characterize the methodology followed to perform the SRA in past and on-going projects, including:

- The SGAM layers analysed.
- The specific dimensions analysed within the previously selected layers.
- The type of methodology followed, i.e. whether it was qualitative, quantitative, or a combination of both; as well as a brief description of this methodology.
- The main lessons learnt, both in terms of what to do and what not to do.
- Links to relevant documents or references where further information may be found.

The survey was created as a questionnaire in an excel spreadsheet and circulated among the TF members. Moreover, many of the project representatives in this TF asked their partners to fill-in the questionnaire based on their experiences in past projects. As a result, information was collected from a total of 24 finished or on-going projects. Out of these, 16 were H2020 projects, 7 were FP7 projects, and another corresponded to a national R&D program. 9 of these projects have already finished, whilst the remaining 15 projects are still on-going. An overview of the responses obtained for the first three bullet points listed above can be found in Annex II.

On the ensuing, a preliminary analysis of the responses will be presented (Figure 6). First, it is worth assessing what SGAM layers are most commonly addressed by the SRA in these projects. It can be seen that most SRA address the functional and business layer (21 out of 24); in fact, all the projects address either both of them or none, i.e. no project assesses the functional layer without considering the business layer or vice versa. The next layers most commonly studied are the information and communication layers, which, with a few exceptions found in projects very focused on the scalability and replicability of software tools, are also commonly included in the same analysis. Lastly, the component layer was found to be the least commonly addressed layer in the previous projects (and in most cases purely qualitatively)[1].

[1] Note that the fact that most projects address certain SGAM layers does not necessarily mean that these are the most relevant to new projects. This information reflects the objectives of the H2020 projects involved in

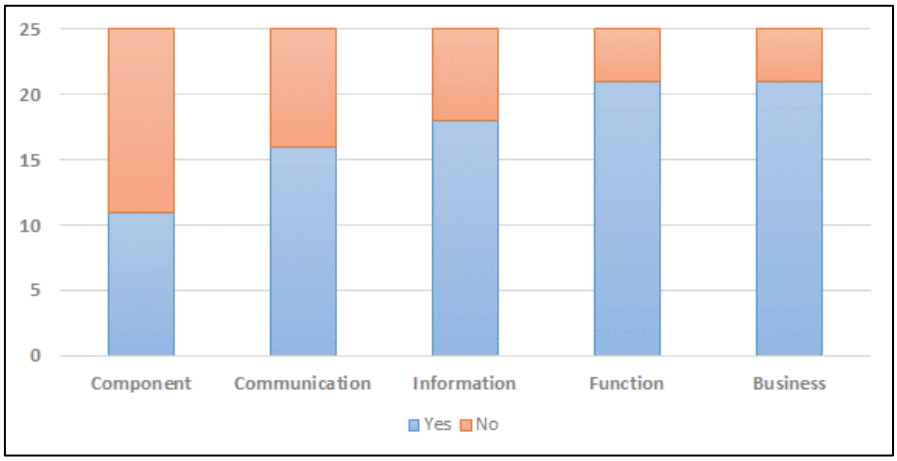


Figure 6: Responses to survey 2 – SGAM layers covered in previous SRA

The next relevant information about previous projects is to determine what dimensions within the SGAM layers are specifically addressed. The dimensions included in the analyses were identified based on the feedback to the previous questionnaire and a first review of previous projects. These included a total of 11 dimensions: hardware (component layer), ICT scalability and ICT replicability (communication layer), software scalability and software replicability (information layer), use case replicability and use case scalability (function layer), regulatory analysis, economic analysis, market analysis and stakeholder perspectives (business layer).

Additionally, respondents were asked to indicate, for each one of these dimensions, what type of analysis was carried out, i.e. qualitative, quantitative, or a mixed approach. A summary of the feedback received to these questions is presented in Figure 7.

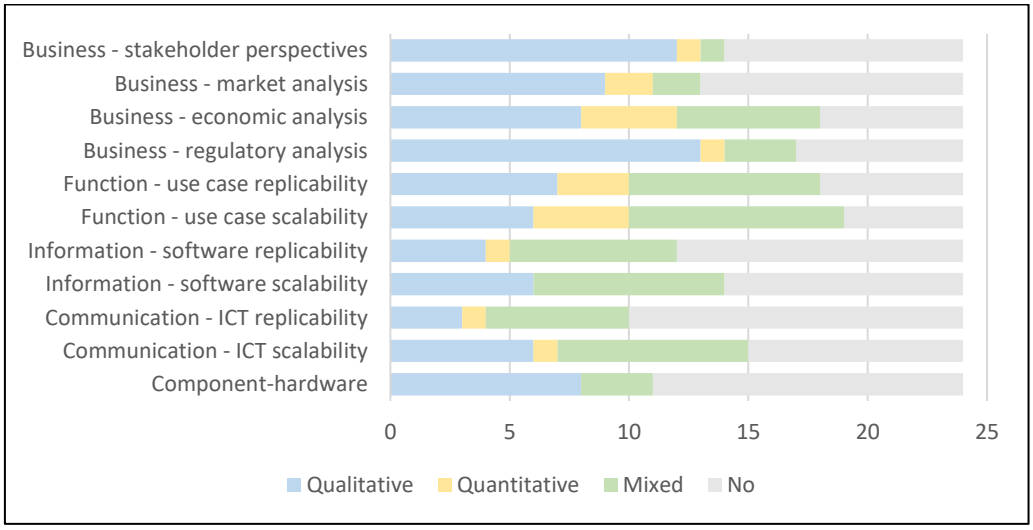


Figure 7: Responses to survey 2 – SRA dimensions and type of methodology

Figure 8 complements the previous figure by comparing, for each SRA dimension, the share of projects that considered this dimension against the share of projects that performed a quantitative (or mixed) assessment of this layer (considering only those which analysed it). This information is relevant to identify whether there are significant differences among the dimensions within a layer, in terms of how often they are addressed or through what methodology, as well as to detect what

BRIDGE, which tend towards high TRLs and demonstration. For instance, projects with low TRL may not address the business layer.

dimensions are most commonly assessed in a qualitative manner and which ones are most commonly analysed in a quantitative one.

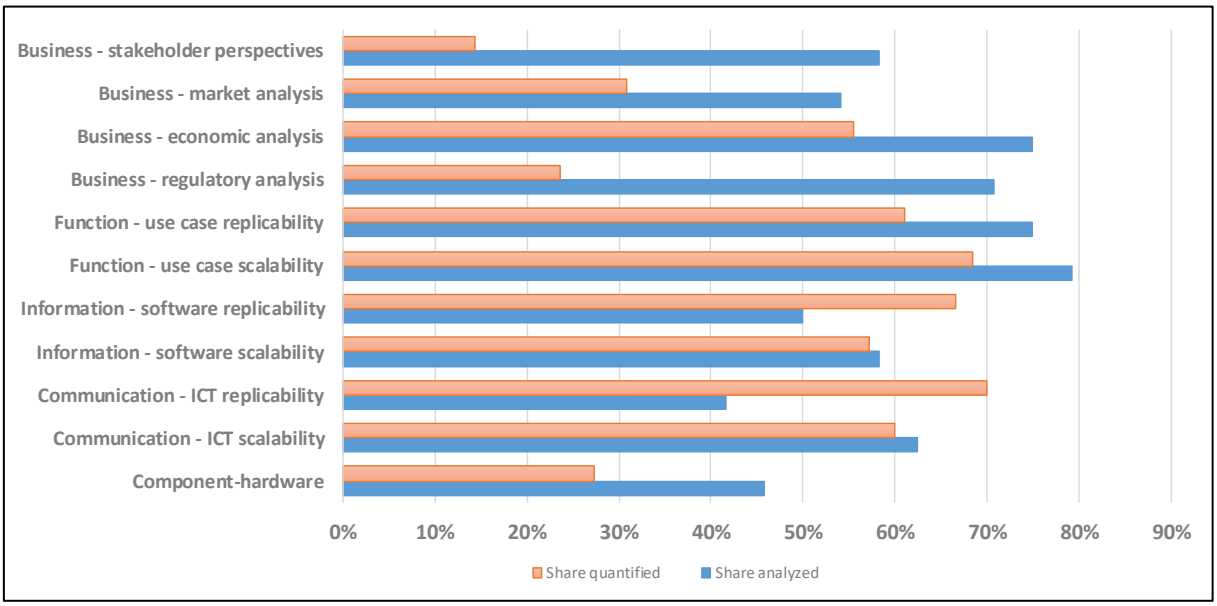


Figure 8: Responses to survey 2 – share of projects that analysed each SRA dimension and share of projects that performed a quantitative/mixed analysis for each dimension

The previous figures show that the component layer, besides being the last commonly analysed, also presents very low levels of quantification. The most common methodology reported to evaluate this dimension relied on the identification of different attributes of the key components that may limit scalability or replicability, e.g. modularity, compliance with standards, etc. Subsequently, these attributes are ranked based on importance or criticality through desk research or survey on project developers, technology developers and/or operators.

On the other hand, the analyses corresponding to the communication, information and function layers include some form of quantification in more than 60% of the cases. Within the communication layer, the projects reported that ICT scalability is somehow more commonly studied than its replicability; all projects assessing the latter also assess the former but its reciprocal is not true. In this case, several projects report using simulations to assess the impact of different requirements on the scalability and replicability of ICT systems, i.e. the performance of the systems under different operating conditions as measured through a set of ICT-related KPIs (data loss, latency, error rate, etc.). Additionally, the qualitative side usually comprises aspects such as interoperability or the use of standards (surveys to elicit expert feedback is sometimes reported).

Concerning the function layer, most projects report the use of simulation tools to assess the performance of the project functionalities or use cases through a set of KPIs adapted to each project, e.g. energy savings, reduction in peak load, drop in energy losses, reliability improvement, etc.

When performing a SRA of software tools (information layer) of the use cases (function layer), whilst both scalability and replicability are most usually addressed, some projects reported studying just one of these two aspects. Most projects stated that the information layer was addressed in a qualitative way, relying on the knowledge of the consortium members and, in some cases, on surveys carried out among experts from DSOs or developers to identify critical aspects and map their importance. Some projects, particularly those where the development of software tools was an essential part of the project, reported the use of simulations to assess the performance (especially their scalability) of software tools under different scenarios, i.e. the requirements for software tools (runtime, memory requirements, etc.).

Lastly, the business layer analysis is mostly limited to qualitative assessments, with the exception of the economic dimension and, to a lower extent, the market dimension. In this case, the methodological approaches reported varied significantly among the different dimensions identified. The regulatory and stakeholder analyses, essentially qualitative with the exception of some quantification of the impact on some KPIs of alternative regulatory frameworks, mostly aim at identifying (and removing) non-technical barriers to the deployment of the solutions developed. This oftentimes involves running surveys, interviews, questionnaires, workshops, etc. Regarding the market perspective, the responses indicate that most projects address this dimension as part of the regulatory and economic SRA (e.g. CBA), and some additionally report the definition of business models. However, it seems that the SRA not linked to exploitation after the end of the project.

The last piece of information provided by this survey, beyond the links and references, corresponds to the **key lessons learnt** from previous projects. Unfortunately, the sample collected so far is rather limited and only nine out of 24 projects reported have actually finished and are able to provide on this topic[2]. Nonetheless, some general lessons can be already gathered in relation to the definition of the SRA methodology. These are summarized on the ensuing:

- Scalability and replicability ought to be **considered from the beginning of the project** when designing the architecture and when defining the relevant use cases and KPIs that allow to scale them into the potential wider uptake of the project.
- Projects should carefully **select all the SRA dimensions that are relevant to your project** to make sure relevant aspects are not neglected.
- An **appropriate definition of the scope (functionalities) and scenarios (combination of parameters/variables studied) for the SRA early in the project** is essential. Projects should first identify critical aspects for scalability and replicability and prioritize these (i.e. the most scalable solutions are probably not the ones that deserve the most attention). Especially when quantitative analyses are performed, failing to do this may lead to a waste of time and resources.
- In line with the previous point, projects may face **challenges due to the need to use several different simulation tools and the fact that the number of possible scenarios is virtually infinite**. The scenarios analysed must make sense from a practical point of view; sometimes assessing scenarios with extreme values of the relevant parameters are the most relevant to determine the SRA boundaries.
- **Access to the necessary data can be a big barrier** and delay the studies. Barriers may arise from confidentiality concerns, challenges when dealing with immature technologies or, when dealing with regulatory frameworks or market rules, frequent changes and large differences across countries.
- The analyses of **different SRA dimensions can be linked** and coordinated, e.g. regulatory and market, functional and economic (CBA), software and functional, etc.

[2] It would be advisable to periodically ask finishing projects to fill-in a revised version of this survey in order to progressively populate the information to be considered by future projects.

3. Draft guidelines to perform a SRA in a H2020 project

3.1. General approach

H2020 projects, even if they all address new solutions related to smart grids and storage, are very diverse and consider a wide range of functionalities and technologies at different TRLs. Consequently, proposing a strict common SRA methodology suitable to all projects does not seem practical or feasible. The aim of the guidelines proposed herein is therefore not to be overly prescriptive whilst ensuring that the proposed set of steps can support and speed up the delivery of a high-quality SRA. These steps may be seen as a checklist to ensure that any aspect included or not in the SRA methodology selected by a project has been carefully considered. In any case, there is much room for those in charge of performing the SRA to implement and adapt the proposed guidelines as required by the characteristics of their project.

In this regard, the CBA methodology to conduct a CBA of smart grid projects proposed by the Joint Research Centre (JRC)[3], which is commonly considered by European projects, has been taken as a reference. In fact, the executive summary of the report where these guidelines are described states something very similar:

> *"The content of our guidelines should be seen as a structured set of suggestions, as a checklist of important elements to consider in the analysis. A comprehensive analysis of Smart Grid projects requires adaptation to local circumstances and will ultimately rely on the professional skills and judgement of project developers and relevant decision-makers. It is not our goal to provide an exhaustive and detailed set of indications to fit all possible projects, scenarios and local specificities."* JRC Guidelines for conducting a cost-benefit analysis of a smart grid project, 2012.

The guidelines and the corresponding steps proposed by the JRC to conduct a CBA of a smart grid project are illustrated in Figure 9. Therein, it can be seen how the JRC proposed a set of general guidelines with ample room for projects to adapt them. At this stage, the goal of this report is to develop a first preliminary set of similar guidelines to be discussed with the members of the TF and test them with the support of a few projects (WiseGRID and GOFLEX), which would apply them to their project and provide feedback and suggestions to improve them.

[3] https://ses.jrc.ec.europa.eu/smart-grid-cost-benefit-analysis

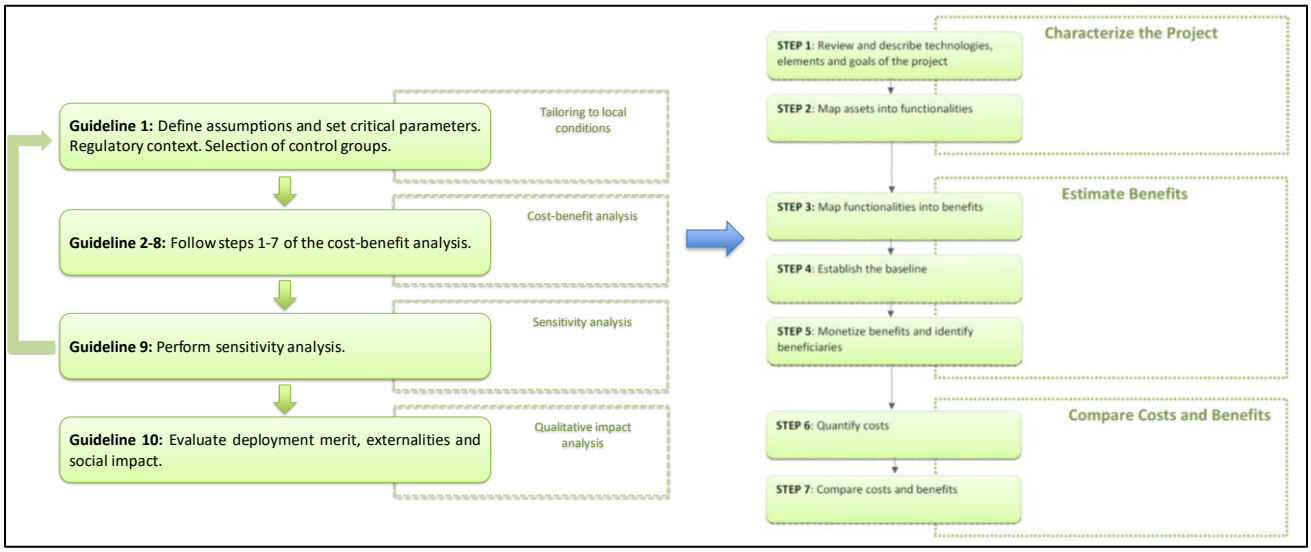


Figure 9: Guidelines and analysis framework to conduct a CBA of smart grid projects proposed by the JRC (see footnote 3)

Similarly to what was done in the surveys previously discussed, the structure of the SGAM (see Figure 10) will be used as the backbone for the definition of the SRA guidelines. This model has become a standard and it has proven useful to provide a common framework to conceptualize and compare different smart grid projects in Europe[4].

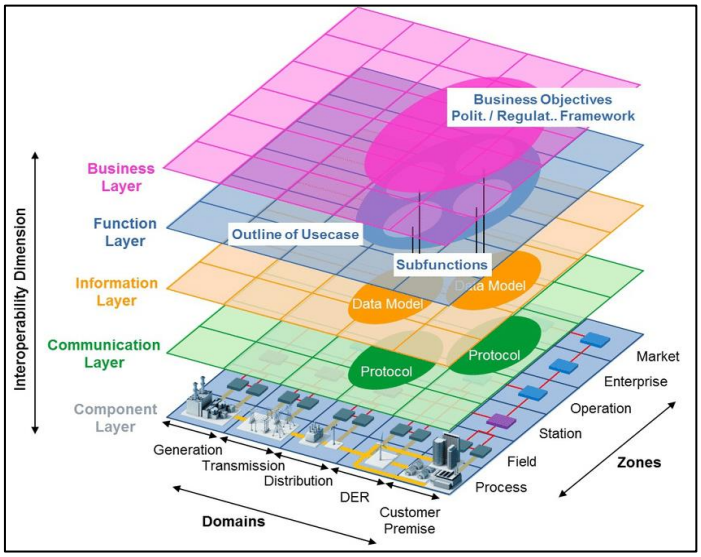


Figure 10: SGAM framework

The draft steps to perform a SRA of a smart grid project proposed in this report are depicted in Figure 11. It can be seen that the overall approach can be broken down into four stages, each of them comprising several steps. The most complex stages correspond to the definition of the SRA methodology and actually carrying out the SRA. In both cases, several steps will need to be performed once for each SRA dimension included in the analysis. Next, these four stages are briefly described.

[4] https://ec.europa.eu/energy/sites/ener/files/documents/xpert_group1_reference_architecture.pdf

- **Define the scope of the SRA:** firstly, the SGAM layers and, within each SGAM layer, the SRA dimension[5] or dimensions that will be assessed need to be selected.
- **Define methodology for each SRA dimension selected:** the second stage requires defining the methodological approach specifically for each of the dimensions previously selected. In order to do this, a set of general steps have been proposed. In order to make informed decisions at each one of these steps, it is recommended to rely on best practices from previous projects. SRA developers need to consider that, when developing quantitative analyses, it is key to properly define the relevant KPIs and simulation scenarios, focusing on the most critical parameters affecting the scalability and replicability within a given dimension. In addition to the scenarios, an early definition of the input data required as well as potential data sources that enables an early start of the data collection is essential to prevent delays in the execution of the SRA.
- **Perform the SRA for each dimension selected:** Once the methodology has been defined, SRA developers need to collect the required input data and perform the corresponding qualitative/quantitative analyses for the scenarios previously defined. As this stage progresses, it could be necessary to go back and re-assess some aspects of the initial methodology.
- **Draw conclusions and deliver the SRA rules/roadmap:** the last stage consists in analysing the results obtained in the SRA, first for each dimension individually and subsequently trying to relate among them the results for the different dimensions when relevant. This analysis should allow inferring a set of SRA rules, which may be defined as conclusions on the most important aspects affecting scalability and replicability of the technologies or solutions studied, such as scaling-up factors, the validity domain for replication or the drivers and barriers that may be encountered. In addition to these rules, a SRA may also be used to deliver an implementation roadmap which may include a timeline and milestones for the implementation and/or exploitation of the technologies or solutions evaluated.

[5] The SRA dimensions to be assessed can be: Regulatory analysis, Economic analysis (CBA), Business models, Stakeholders perspectives, Software scalability, Software replicability, ICT scalability, ICT replicability and Hardware. Please refer to section 3.1 for examples of the application of the methodology to the WiseGRID and GOFLEX projects.

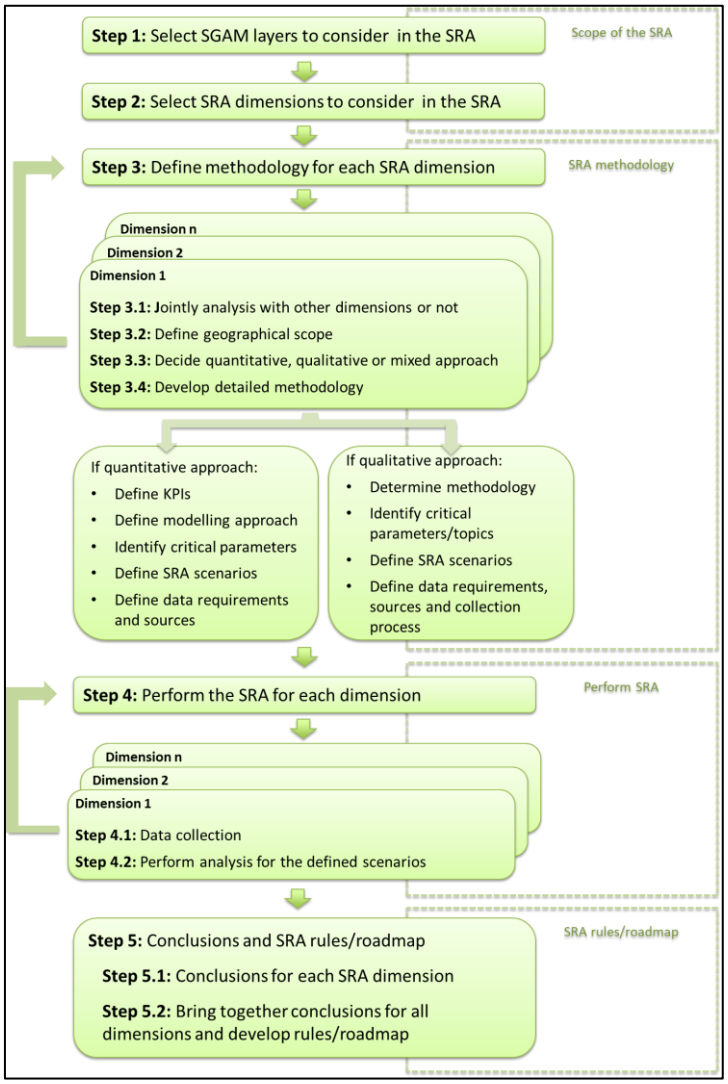


Figure 11: SRA guidelines

It must be noted that the guidelines presented above intend to be flexible in guiding a SRA, rather than constraining SRA developers. The following additional considerations should be considered when following them:

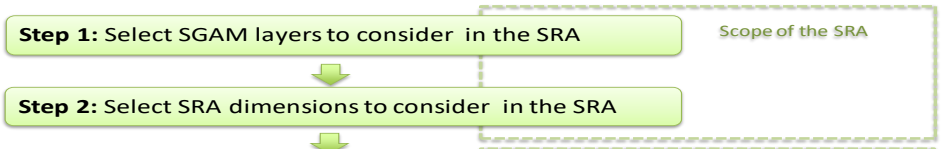
- The resources and know-how available within the consortium may be a relevant factor to consider when making decisions about the SRA methodology.
- Several steps require carefully considering the critical aspects affecting S&R of the solutions you are developing/assessing/demonstrating within the project.
- Several iterations may be required to fine-tune the methodology based on available resources, data access limitations, etc.
- For each SRA layer/dimension (and even for different types of technologies/solutions evaluated), much more detailed guidelines may be developed.
- Best practices from previous projects can provide a valuable guidance for several of the previous decisions.

3.2. Piloting the methodology

3.2.1 Application of the methodology to the WiseGRID project

The WiseGRID[6] project provides a set of solutions, technologies and business models which increase the smartness, stability and security of an open, consumer-centric European energy grid and provide cleaner and more affordable energy for European citizens, through an enhanced use of storage technologies and electro-mobility and a highly increased share of renewable energy sources. It aims to deliver the tools and business models that will facilitate the creation of an open market and enable all energy stakeholders to play an active role towards a democratic energy transition.

The project WiseGRID has applied a series of procedures for a future scalability and replicability of its results at the end of the project. These procedures were aligned with the methodology presented previously in this document. Summarizing, WiseGRID has taken the following steps:



Step 1: Select Smart Grid Architecture Model layers

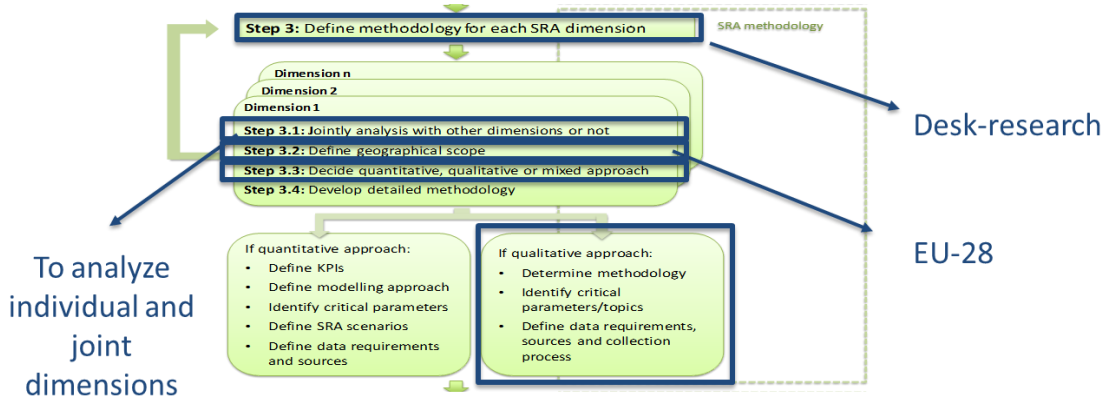
Firstly, WiseGRID selected and created the SGAM layer to be treated in the project. These layers are: **Component, Communication, Information and Function.** The project has performed an extensive analysis of the different Business Models unleashed by the project using a specific methodology for it. For that reason, the Business layer is not envisaged in WiseGRID's SGAM, which is mainly used for the technical developments of the project and their interactions.

Step 2: Select SRA dimensions

In parallel, the project also selected in which dimensions the project would have an impact in order to consider them in the replicability and scalability task. These dimensions are: **Regulatory analysis, Economic analysis (CBA), Business models, Software replicability and ICT replicability**.

[6] Further details of WISEGRID can be found at: https://www.wisegrid.eu/

Step 3: Define methodology for each SRA dimension

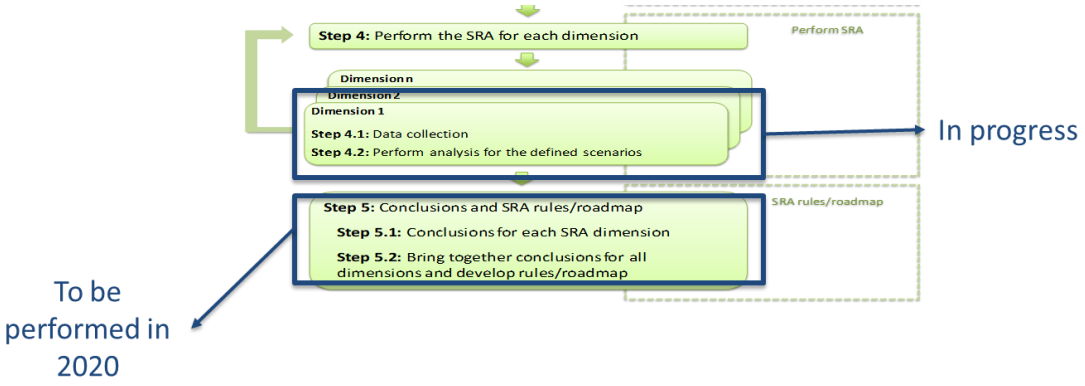


When thinking about how to implement the methodology, WiseGRID consortium decided to perform the following steps using a desk-research approach[7]:

- To analyse the above-mentioned dimensions in an individual way but also looking for some joint dimensions (such as the joint interaction between the Business models and the ICT replicability).
- To define the geographical scope as: the EU-28. The project has made an extensive regulatory analysis of 24 out of the 28 EU countries and it is expected to complete them all by the end of the project. This analysis sets the basis for a proper replicability of the project around Europe.
- To follow a qualitative approach by identifying the critical parameters for the future integration of WiseGRID results and defining data and sources requirements.

This is the summary of the actions performed so far. Until the end of the project in April 2020, the next steps to be taken are steps 4 and 5:

Steps 4 & 5: Perform SRA for each dimension, conclusions and roadmap



[7] For further details on this methodology please consult D1.1 and D16.1: https://cdn.nimbu.io/s/76bdjzc/channelentries/1k3tosl/files/D1.1_WiseGRID_Legislation%20business%20models%20and%20social%20aspects.pdf?e7dezc7
https://cdn.nimbu.io/s/76bdjzc/channelentries/y2u1048/files/WiseGRID_D16.1_Impact_assessment_and_CBA_planning.pdf?yfhm7r4

The project is currently collecting the required data from the pilot sites in order to perform the analysis of the defined scenarios.

The Regulatory Analysis dimension (already performed) includes the following aspects:

1. The governance system
    i. Relevant institutions
    ii. Energy competences and regionalisation
2. Electricity market
    i. Regulatory framework
    ii. Energy security dimension
3. Market characteristics and idiosyncrasies of the pilots' sites[8]
    i. General barriers and challenges due to the special characteristics of the local market
    ii. RES generation
    iii. Market penetration of storage technologies
    iv. Market penetration of smart metering
    v. Market penetration of Demand Response services
    vi. Market penetration of smart homes systems
    vii. WiseGRID products in different market
4. Smart metering systems
5. Demand response
6. Data protection
7. Electric vehicles and storage

The other dimensions are currently being defined according to the data that the consortium is collecting.

At a final stage, WiseGRID will define a roadmap with the conclusions of each SRA dimension and will develop a roadmap for having guidelines for the replicability and scalability of the project.

Overall conclusions coming from the WiseGRID project

During the implementation of WiseGRID scalability and replicability activities, the consortium has commonly agreed on the fact that the activities were easy to follow and quite flexible for covering the different fields of the project. The fact on basing the methodology on the SGAM framework is quite convenient as most of the Smart Grid projects define their architecture with this framework.

As a way to increase the impact of the tool, WiseGRID suggests:

- To promote a common Use Cases repository among the different projects for the Function layer of SGAM.

[8] The sub-dimensions listed here are analyzed from the current regulations point of view. Economic profitability or economic figures are not discussed here.

- That the projects implementing this SRA methodology show the pros and cons of the Qualitative or Quantitative approach taken. This could be useful for future projects that have to deal with this decision.

3.2.2 Application of the methodology to the GOFLEX project

The GOFLEX[9] project aims to accelerate the GOFLEX technology solution in Europe by developing and demonstrating mature and commercially viable, scalable and easy-to-deploy solutions for distributed flexibilities. Automated dynamic pricing is utilized to enable the establishment of a flexibility market for distributed resources and Demand Response in order to improve the secure energy supply at local level and increase the economic efficiency of the overall energy system.

To meet these strategic goals, the main objective of GOFLEX is to make a set of technology solutions for distributed flexibilities and automated dynamic pricing market ready which enables regional actors like Generators, Prosumers, Flexible Consumers and Demand Side Operators, Energy Suppliers, Microgrid Operators and Energy Communities to aggregate and trade flexibilities.

In the following sections, the GOFLEX application of the proposed methodology is summarized.

Step 1: Select Smart Grid Architecture Model layers

As a tool to analyze the scalability and replicability of projects, the adapted methodology uses the Smart Grid Architecture Model (SGAM) to identify the applied aspects of a smart grid system or project. The GOFLEX project considers all layers of this model:

- Business Layer
- Function layer
- Information layer
- Communication layer
- Component layer

Step 2: Select SRA dimensions

Within the layers of the architecture model, several dimensions for scalability and replicability analysis have been identified. As a comprehensive demonstration project, GOFLEX also addresses to some degree all of the identified dimensions. These are summarized in the following table.

SGAM Layer	SRA Dimension	Analyzed in GOFLEX?	Summarized in this document	GOFLEX Deliverable
Business	Regulatory analysis	Yes	Yes	D10.2
	Economic analysis (CBA)	Yes	Yes	D789.2, D789.3
	Business model aspects: market preparedness, market maturity, competition level, ease of doing business	Yes	No	D789.2,
	Stakeholder perspectives	Yes	No	D7.1, D8.1, D9.1
Function	Identification of applied use cases	Yes	No	D2.1,2.2, 2.3,2.4
	Flexibility as an ancillary service to the integrated grid	Yes	No	D2.1,2.2, 2.3,2.4

[9] Further details of GOFLEX project can be found at https://www.goflex-project.eu/

SGAM Layer	SRA Dimension	Analyzed in GOFLEX?	Summarized in this document	GOFLEX Deliverable
	Identification of tradeable implicit and explicit services of flexibilities	Yes	No	D2.1,2.2, 2.3,2.4
Information	Software scalability	Yes	No	D2345.4
	Software replicability: open-source, libraries, etc.	Yes	No	D2345.4
Communication	ICT scalability: simulation on latency, bandwidth, etc.	Yes	No	D2345.4
	ICT replicability: modularity, standards, open protocols, etc.	Yes	No	D6.2
Component	Hardware (modularity, standardization, plug and play)	Yes	No	D6.4

As this summary is intended to serve as an example, only two of the dimensions are elaborated.

Step 3: Define methodology for each SRA dimension

According to the draft guidelines, a methodology should be developed for each dimension including consideration of the geographical scope and quantitative or qualitative approach, among other factors. The following sections outline the methodology taken in GOFLEX for each SRA dimension.

Step 3.1 Methodology for Regulatory analysis

- Geographical scope: EU Energy Market.
- Analysis approach: Qualitative.
- Methodological details: consider EU regulation on use cases implemented at GOFLEX trial sites.

Step 3.2 Methodology for Economic analysis (CBA)

- Geographical scope: territories of EAC, ESR, and SWW.
- Analysis approach: Qualitative & quantitative.
- Methodological details: cost benefit analysis.

Step 4: Perform SRA for each dimension

Step 4.1 SRA for Regulatory analysis

The following use cases were considered:

- Ancillary services to the Transmission System Operator
- Microgrid Optimisation
- Balance Group Optimisation
- Congestion Management

The GOFLEX deliverable 10.2[8] provides a brief overview of the planned functionality and the open architecture approach based on building blocks that offers the opportunity to collaborate with third parties and to integrate existing legacy systems. It gives a preliminary assessment of this approach regarding the chances to succeed in the European market.

It also explores successful business models and successful customer involvement strategies from other projects and companies which are already in place and discusses the partnership/competition aspects regarding the relationships that GOFLEX aims to build with these projects and companies.

Also, the possible roadmap for the implementation of GOFLEX flexibility business models during the project time is explored.

For more information, see Chapter 3 “Regulation on Flexibilities in the EU Energy Market” and Chapter 4 “Regulatory Impacts on GOFLEX Trial Use Cases” in Deliverable D10.2[10].

Step 4.2 SRA for Economic analysis (CBA)

For one example consider the case of the GOFLEX Germany demonstration site where the CBA analysis presented in deliverable D9.2[11] estimates the cost of energy flexibility that that the system should achieve in order to be profitable.

Step 5: Conclusions & roadmap

Step 5.1 Conclusions for Regulatory analysis

The provision of ancillary services to the TSO is possible in all countries, so there is a first commercial business case possible to set up the infrastructure for decentralised flexibilities for all trial sites. The other use cases can be implemented only partly and possibly don’t have a positive business case yet due to regulation issues, as explained in section 4.5 of D10.2.

Step 5.2 Conclusions for Economic analysis (CBA)

For the Germany demonstration site of GOFLEX, an estimated threshold price of energy flexibility was identified. Thus, if the proposed smart grid system can deliver energy below the price it will be profitable, as described in section 9.1 of Deliverable 9.2.

Overall conclusions coming from the GOFLEX project

- The initial approach of building the methodology on the SGAM architecture based on the experience of evaluating smart grid projects has proven to be helpful and adequately flexible and adaptive to facilitate the variability of technologies, users and systems.
- The variability of technologies, users and systems call for the adaptation of a growing library of use cases that can support this variability and thus strengthen the scalability and replicability of projects outcomes.
- Projects can benefit from early adaption of a systematic approach to the methodology to be adapted to identify ways for strengthening the scalability and replicability of project results / solutions. This need calls for an early push in this direction which can lay the benefits of automating the collection of the required data / results to fit to the required KPIs assessment process. Lessons learned through this process from past projects should be publicly available and the methodology used should be a living process to achieve a continuous maturity evolution that can be diversified and applicable in wider fields of interest.
- A publicly accessible repository containing the above collective experience and addressing the versions of the available methodology related to specific class of projects can turn out to be highly useful for achieving higher levels of replicability and scalability.

[10]Available at https://www.goflex-project.eu/Down.asp?Name={MJRHNNPNBR-712201810540-GPZIBWBPWV}.
[11] Available at https://www.goflex-project.eu/Down.asp?Name={GYCKWLBOOC-7122018105259-FEAEUFTNHA}

3.2.3 Comments of SRA methodology from other projects

During the TF meeting in Paris at the European Utility Week in addition to WISEGRID and GOFLEX, three different H2020 projects (INVADE[12], Integrid[13] and FutureFlow[14]) discussed the challenges of SRA methodologies. Some of the conclusions highlighted as summarized following the SGAM layers.

Business layer

- Business is as important as technology in the evolution of technologies. An example of the identified business layer is the financing methodology especially for the DSOs.
- Financing the growth of the business is to be looked at. A big financial push is needed to go from TRL6 or TRL 8 to the market. SRA should consider different levels of TRLs.

Information and communication layers

- Interoperability, communication, integration and exploitation of data are crucial to consider.
- Some of the difficulties highlighted are: to gather data, to choose relevant scenarios and to make them available for the required analysis for the identified functions using ICT services. Sometimes hard to generalize the conclusions.
- Regarding communication/cybersecurity requirements for equipment shall be adapted to the size and type of resource (small resource, small risk and investment).
- Real grid data would be useful to perform SRA but the challenge is maintenance and fulfilment of data protection requirements.
- Collaborations is a key: information from DSO, ICT and technologies providers, consumers' improvement of data harmonization from the DSO in different countries.

General comments

- SGAM methodology was highlighted as a powerful tool to guide SRA assessment.
- Difficulties faced to apply SRA methodology: pilots are different and restricted to local conditions thus the methodology should be flexible and adaptive to capture these differences, identify commonalities and formulate principles for appropriate scalability / replicability of results achieved.
- Regarding the good practices: start exploitation at day 1 to have a whole project exploitable and be used by external actors. SRA methodology could help to address the barriers from the beginning. This methodology would have helped to pinpoint barriers in early stage and addressed them from the beginning. Indeed, the SRA/exploitation start too late.

[12] https://h2020invade.eu/
[13] https://integrid-h2020.eu/
[14] http://www.futureflow.eu/

4. Ideas for a SRA toolbox/repository

The second main goal of the SRA TF was to develop ideas and recommendations about how to define the scope and implementation of a toolbox or repository of past experiences, including best-practices and necessary data. During this initial stage of the TF, this topic has not been addressed in detail. This brief section simply mentions some preliminary thinking that ought to be discussed with the TF members in the next meeting in order to define the next steps.

A first alternative would consist in having the TF creating a repository with relevant input data. However, this database, unless properly maintained, can rapidly become obsolete, especially for topics such as regulation. Therefore, due to the fact that significant efforts would be needed to maintain and update the repository, this would seem outside the scope of the TF activities. Alternatively, the TF participants could collect existing open data sources and bookmark these in a repository that would be available for future H2020 projects[15].

Some examples of institutions or web pages with information of this kind are listed below (not exhaustive list; just illustrative):

- Regulation: ACER, CEER reports
- Network data: JRC DSO Observatory: https://ses.jrc.ec.europa.eu/distribution-system-operators-observatory
- Market data: DG ENER-METIS: https://ec.europa.eu/energy/en/data-analysis/energy-modelling/metis

Concerning a toolbox, its contents and implementation remains to be discussed. An example of a previous experience can be found in the ReFlex project, where a replicability toolbox and guidebook were created and made publicly available (http://reflex-smartgrid.eu/).

[15] The repository could be one task of the (future) BRIDGE service contract, based on toolbox/experience/data items collected by the TF. The Bridge website already offers public and restricted areas where the items could be stored. A possibility which require further evaluation would be on creating a sub-space for the TF-SRA in https://intranet.h2020-bridge.eu/

5. Conclusion and recommendations

From March 2019 the BRIDGE SRA TF has been working in order to exchange experiences on how to perform a Scalability and Replicability Analysis (SRA) methodology and toolbox. Based on this, this report presents the results of the activities of this TF obtained in these first 6-8 months. This work was presented at the European Utility Week held in Paris on November 2019. Therein, the next steps of this TF will also be discussed.

Until now, the members of the TF have completed two surveys with information about the status of the SRA in their projects and about the SRA carried out in previous projects in which they had participated respectively. This has been very useful to know the status of the SRA and the knowledge and interests of the partners involved.

As preliminary conclusions from the collected additional information it seems that there are not enough experiences to make much more progress.

On the other hand, based on the project answers, the link between SRA and exploitation was not made evident and has not been addressed in detail yet. This would only be relevant for projects with a high TRL. However, as a result of the TF meeting in November 2019, some participants highlighted the importance of considering SRA methodology as well for low TRL projects.

The proposed methodology has been analysed by two H2020 projects: WISEGRID and GOFLEX. Both projects have highlighted the usefulness and alignment of the proposed SRA methodology with the corresponding activities in their project.

Some of the main feedback received from the projects is to consider the business and market dimensions as key aspects for SRA. Related to this, the rules governing on activities that regulated such as agents can performed has to be revised. Data management, interoperability and availability for SRA analysis has been highlighted as key to be addressed. Finally, there is a general consensus to consider SRA methodology from the beginning of the project to guide the project developments.

Based on the work done so far, some of the potential next steps to be discussed in the SRA TF are:

- To develop a more detailed of methodology providing common guidelines for future research projects to perform a SRA;
- To describe a list of KPIs in order to assess the impact of the scalability and replicability methodology of the projects of this SRA TF;
- To develop ideas on how to define the scope and implementation of a SRA toolbox and a repository with experiences and best-practices from past and ongoing projects;
- To identify potential projects participating in SRA TF as project pilot in order to test the SRA methodology from the beginning to the end of the project.

List of figures

Figure 1: Responses to survey 1 – Status of the SRA in TF H2020 projects 7
Figure 2: Responses to survey 1 – Expectations from the TF 8
Figure 3: Responses to survey 1 – Scope of the SRA 8
Figure 4: Responses to survey 1 – Methodology for the SRA 9
Figure 5: Responses to survey 1 – Most important barriers or challenges 9
Figure 6: Responses to survey 2 – SGAM layers covered in previous SRA 11
Figure 7: Responses to survey 2 – SRA dimensions and type of methodology 11
Figure 8: Responses to survey 2 – share of projects that analysed each SRA dimension and share of projects that performed a quantitative/mixed analysis for each dimension 12
Figure 9: Guidelines and analysis framework to conduct a CBA of smart grid projects proposed by the JRC (see footnote 3) 15
Figure 10: SGAM framework 15
Figure 11: SRA guidelines 17

List of references

- JRC study on Smart grid cost-benefit analysis
https://ses.jrc.ec.europa.eu/smart-grid-cost-benefit-analysis

- CEN-CENELEC-ETSI Smart Grid Coordination Group, Smart Grid Reference Architecture, 2012
https://ec.europa.eu/energy/sites/ener/files/documents/xpert_group1_reference_architecture.pdf

Annex I – Survey 1

This questionnaire is kicking-off of the activities of the Task Force (TF) on Scalability and Replicability Analysis (SRA) within the BRIDGE initiative. As you know, this TF was created after the last BRIDGE General Assembly held in March 2019 in Brussels, with two main goals:

i) Develop a draft methodology providing common guidelines for H2020 projects to perform a SRA

ii) Develop ideas on how to define the scope and implementation of a SRA toolbox and a repository with experiences and best-practices from past and ongoing projects

The aim of this questionnaire is to identify the expectations and motivations of the TF participants and perform a first mapping of the methodological approaches to perform a SRA within the H2020 projects.

The questionnaire is estimated to require about 10min. Thank you very much for joining the TF and for your contributions to this questionnaire and subsequent activities of the TF.

For further information, please contact:

Rafael Cossent – Leader of the TF on SRA leader

Lola Alacreu Garcia – Leader of the WG on Business Model

Nicolas Peraudeau – BRIDGE support action contractor

Section 1. Contact details and expectations

Provide your contact details

Q1. What do you expect to get from this task force? You may select more than one item. *

- ❑ *Learn what benefits a SRA can provide to your project*
- ❑ *Methodological guidelines to carry out a SRA*
- ❑ *Technical data to carry out a SRA in your project (grid data, load/generation profiles, simulation tools)*
- ❑ *Information about existing standards/protocols*
- ❑ *Information to identify and overcome scalability and Replication barriers (regulatory, economic, technical, etc.)*
- ❑ *Exchange ideas and experience about performing a SRA*

Q2. Would you like to provide further information about your motivation to join the TF and your expectations for the TF results?

Open answer

Section 2. Characterization of SRA methodology and scope in your project.

Scalability and replicability may be broadly defined as assessing the implementation potential of a given technology/solution/application/business model at a larger scale or in a different context. However, the specific scope and corresponding methodology selected to perform a scalability and

replicability analysis (SRA) may vary significantly depending on the type of questions that each project wants to answer as well as the characteristics of the project itself.

In particular, questions may address different layers of the SGAM (Smart Grids Architecture Model), illustrated by the figure 1.

- A project may decide to focus its SRA on the properties of a device tested within the project, i.e. on the component layer of the SGAM, would be raising questions such as is the technology modular? Is it compatible with other manufacturers? Does it comply with standards?
- Alternatively, another project may focus its SRA on the communication layer and assess whether the technology used is based on open protocols, how different applications may affect the parameters such as the use of bandwidth, data latency or data loss.
- Should a project focus on the information layer, the focus would be on software capabilities, memory requirements, computational times, etc.
- Likewise, at the functional layer, the focus would be on assessing how the expected results from project's use cases would vary to changes in boundary conditions such as the characteristics of the distribution grid on which they are implemented, the load profiles of consumers, etc.
- Finally, SRA may also intend to address many different questions related to the business layer of the SGAM, including: whether current regulation may create barriers to the new solutions, what the costs and benefits of a scaled-up implementation of the solution would be (interaction between SRA and CBA), assess the willingness of different groups of stakeholders to participate/accept the innovative solution, or evaluate the market readiness for a given solution (interaction between SRA and result exploitation).

Having this in mind, we would like to ask you the following questions about your H2020 project.

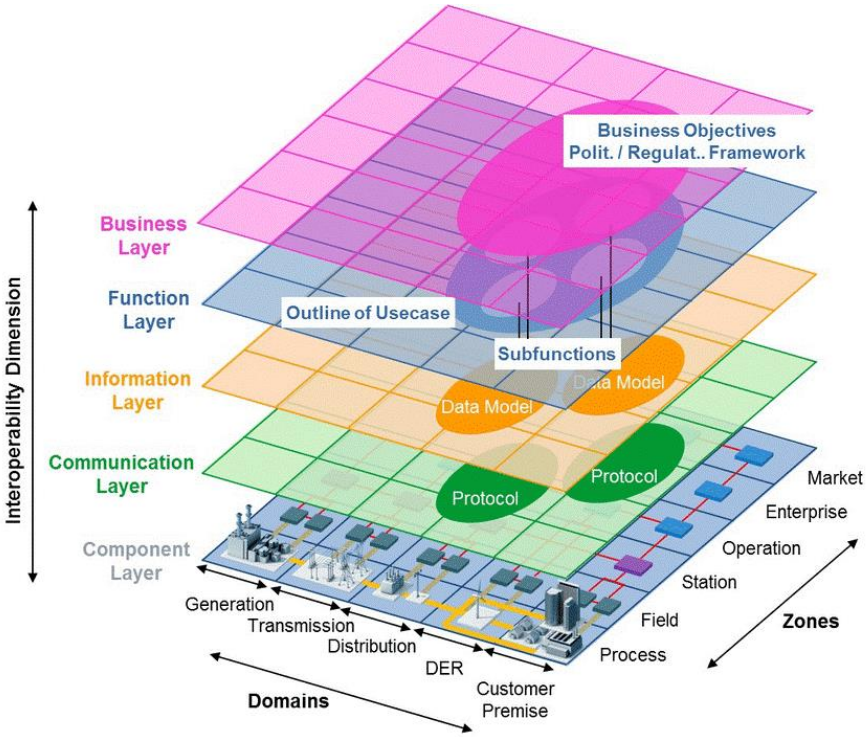


Fig. 1: SGAM (Smart Grids Architecture Model)

Q3. What is the foreseen start date of your project? *

Date dd/mm/yy

Q4. What is the foreseen end date of your project? *

Date dd/mm/yy

Q5. Are you expected to perform a SRA, in your Project Description of Action? *

Yes/No

Q6. If yes, how would you characterize the status of the SRA?

- ❑ *Not yet started. Methodology and scope to be defined*
- ❑ *Not yet started, but the scope and methodology is mostly defined.*
- ❑ *Recently started, but still room to adapt scope and methodology*
- ❑ *Under completion, scope and methodology set.*
- ❑ *Finished*
- ❑ *Other. Please elaborate [Blank space for text]*

Q7. What dimensions/layers are you addressing? You may select more than one item.

- ❑ *Regulatory analysis*
- ❑ *Economic analysis (CBA)*
- ❑ *Business model aspects: market preparedness, market maturity, competition level, ease of doing business*
- ❑ *Stakeholder perspectives*
- ❑ *Software scalability*
- ❑ *Software replicability: open-source, libraries, etc.*
- ❑ *ICT scalability: simulation on latency, bandwidth, etc.*
- ❑ *ICT replicability: modularity, standards, open protocols, etc.*
- ❑ *Hardware (modularity, standardization, plug and play)*
- ❑ *Other. Please elaborate [Blank space for text]*

Q8. What type of methodology have you used? You may select more than one item

- ❑ *Network-related simulations: power flow, reliability analysis*
- ❑ *Emulation/simulation of communication links*
- ❑ *Lab tests/hardware-in-the-loop*
- ❑ *Desk-research*
- ❑ *Stakeholder consultation: structured/semi-structured interviews, surveys, questionnaires*
- ❑ *Other market research techniques*
- ❑ *Other. Please elaborate [Blank space for text]*

Q9. Based on your experience, what are the most important barriers/challenges you face when performing a SRA?

- ❑ *Lack of network data*
- ❑ *Lack of market data*
- ❑ *Hard to identify relevant simulation tools*
- ❑ *Lack of methodological guidelines*
- ❑ *Lack of common standards*
- ❑ *Lack of information on the regulatory framework*
- ❑ *Economic barriers*
- ❑ *Lack of enough resources within the project*
- ❑ *Lack of know-how within the project*
- ❑ *Other. Please elaborate [Blank space for text]*

Annex II – Survey 2

Project Acronym	Project name	Programme	Status	SGAM layers analyzed					Dimensions										
				Component	Communication	Information	Function	Business	Component-hardware	Communication - ICT scalability	Communication - ICT replicability	Information - software scalability	Information - software replicability	Function - use case scalability	Function - use case replicability	Business - regulatory analysis	Business - economic analysis	Business - market analysis	Business - stakeholder perspectives
GRID+	Supporting the Development of the European Electricity Grids Initiative (EEGI)	FP7	Finished	Yes	Yes	Yes	Yes	Yes	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative
GRID4EU	Large-scale demonstration of smart electricity distribution networks with distributed generation and active customer participation	FP7	Finished	No	No	No	Yes	Yes						Quantitative	Quantitative	Qualitative			Qualitative
CLNR	Customer-Led Network Revolution	Other	Finished	No	No	No	Yes	Yes						Quantitative	Quantitative		Quantitative		
SuSTAINABLE	Smart distribution system operation for maximizing the integration of renewable generation	FP7	Finished	No	Yes	Yes	Yes	Yes		Quantitative	Quantitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative		Qualitative
IGREENGrid	IntegratinG Renewables in the EuropEaN Electricity Grid	FP7	Finished	No	No	No	Yes	Yes						Quantitative	Quantitative		Quantitative		
EvolvDSO	Development of methodologies and tools for new and evolving DSO roles for efficient DRES integration in distribution networks	FP7	Finished	No	No	Yes	No	No				Mixed	Mixed						
Integrid	Demonstration of intelligent grid technologies for renewables integration and interactive consumer participation enabling interoperable market solutions and interconnected stakeholders	H2020	On-going	Yes	Yes	Yes	Yes	Yes	Mixed	Mixed	Qualitative	Mixed	Qualitative	Mixed	Qualitative	Qualitative	Quantitative	Quantitative	Qualitative
NOBEL GRID	New Cost Efficient Business Models for Flexible Smart Grids	H2020	Finished	Yes	Yes	Yes	Yes	Yes	Qualitative	Qualitative						Qualitative	Qualitative	Qualitative	Qualitative
WISEGRID	Wide scale demonstration of Integrated Solutions and business models for European smartGRID	H2020	On-going	Yes	Yes	Yes	Yes	Yes	Qualitative	Qualitative						Qualitative	Qualitative	Qualitative	Qualitative
CROSSBOW	CROSS BOrder management of variable renewable energies and storage units enabling a transnational Wholesale market	H2020	On-going	No	No	Yes	No	No					Quantitative						
SMILE	Smart Island Energy Systems	H2020	On-going	No	Yes	Yes	Yes	Yes		Mixed	Mixed		Mixed		Mixed	Qualitative	Qualitative	Qualitative	Qualitative
OpenNode	Open Architecture for Secondary Nodes of the Electricity	FP7	On-going	No	Yes	Yes	Yes	Yes		Mixed	Mixed	Mixed	Mixed	Mixed	Mixed	Qualitative	Qualitative	Qualitative	Mixed
Shar-Q	Joint Call for ICT and Energy	H2020	On-going	No	Yes	Yes	Yes	Yes		Mixed	Mixed	Mixed	Mixed	Mixed	Mixed	Quantitative	Qualitative	Quantitative	Qualitative
INTERFLEX	Local use of flexibilities for an increasing share of renewables on the distribution grid	H2020	On-going	Yes	Yes	Yes	No	No	Mixed	Mixed		Mixed		Mixed					
Mas2tering	Multi-Agent Systems and Secured coupling of Telecom a	FP7	Finished	Yes	Yes	Yes	Yes	Yes	Mixed					Mixed	Mixed	Qualitative	Mixed	Mixed	
inteGRIDy	Integrated Smart GRID Cross-Functional Solutions for Optimized Synergetic Energy Distribution, Utilization & Storage Technologies	H2020	On-going	Yes	Yes	Yes	Yes	Yes	Qualitative	Mixed	Mixed	Mixed	Mixed	Qualitative	Qualitative	Mixed	Mixed	Mixed	Qualitative
UPGRID	Real proven solutions to enable active demand and distributed generation flexible integration, through a fully controllable LOW Voltage and medium voltage distribution grid	H2020	Finished	No	No	No	Yes	Yes						Quantitative		Qualitative	Quantitative	Qualitative	Quantitative
TDX-Assist	Coordination of Transmission and Distribution data eXchanges for renewables integration in the European marketplace through Advanced, Scalable and Secure ICT	H2020	On-going	No	Yes	Yes	Yes	Yes		Mixed	Mixed	Mixed	Mixed	Mixed	Mixed			Qualitative	
EUSysFlex	Pan-European system with an efficient coordinated use of flexibilities for the integration of a large share of RES	H2020	On-going	Yes	Yes	Yes	Yes	Yes	Qualitative	Qualitative		Qualitative		Mixed	Mixed	Mixed	Mixed		Qualitative
Sharing Cities	Smart Cities and Communities solutions integrating energy, transport, ICT sectors through lighthouse (large scale demonstration - first of the kind) projects	H2020	On-going	Yes	No	No	Yes	Yes	Qualitative			Qualitative		Qualitative	Qualitative	qualitative	Mixed		
TDX-Assist	Coordination of Transmission and Distribution data eXchanges for renewables integration in the European marketplace through Advanced, Scalable and Secure ICT	H2020	On-going	No	Yes	Yes	Yes	Yes		Mixed	Mixed	Mixed	Mixed	Mixed	Mixed			Qualitative	
EUSysFlex	Pan-European system with an efficient coordinated use of flexibilities for the integration of a large share of RES	H2020	On-going	Yes	Yes	Yes	Yes	Yes	Qualitative	Qualitative		Qualitative		Mixed	Mixed	Mixed	Mixed		Qualitative
Sharing Cities	Smart Cities and Communities solutions integrating energy, transport, ICT sectors through lighthouse (large scale demonstration - first of the kind) projects	H2020	On-going	Yes	No	No	Yes	Yes	Qualitative			Qualitative		Qualitative	Qualitative	qualitative	Mixed		
INVADE	Smart system of renewable energy storage based on INtegrated EVs and bAtteries to empower mobile, Distributed and centralised Energy storage in the distribution grid	H2020	On-going	No	Yes	Yes	Yes	Yes		Qualitative	Qualitative		Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative

Report developed with the support ofby DOWEL Management
within the INTENSYS4EU Coordination and Support Action
(H2020 Grant Agreement n° 731220)

More information at http://www.h2020-bridge.eu/