PANTERA
Pan European Technology Energy Research Approach

Work Package 1

Deliverable D1.2

Risk Management Report

Grant Agreement No:	**824389**
Funding Instrument:	**Coordination and Support Action (CSA)**
Funded under:	**H2020 LC-SC3-ES-7-2018: Pan-European Forum for R&I on Smart Grids, flexibility and Local Energy Networks**
Starting date of project:	**01.01.2019**
Project Duration:	**48 months**

Contractual delivery date:	**31.03.2019**
Actual delivery date:	**31.03.2019**
Lead beneficiary:	**FOSS**
Deliverable Type:	**Report**
Dissemination level:	**Public**
Revision / Status:	**final**

This project has received funding from the European Union's Horizon 2020 Coordination and Support Action Programme under Grant Agreement No. 824389

Document Information

Document Version: 3

Revision / Status: final

All Authors/Partners

Venizelos Efthymiou/FOSS
Christina Papadimitriou / FOSS
Giorgos Papadopoulos / Suite5
Alexandros Tsitsanis / Suite5
Shafi Khadem / IERC
Mohamed Shalaby / DERlab
Melissa Setakhr / DERlab

Keywords: risk management, mitigation plan

Document History

Revision	Content / Changes	Resp. Partner	Date
0.1	First Draft	FOSS	12.03.2019
0.2	Review	Suite 5	20.03.2019
0.3	Review	Derlab	28.03.2019

Document Approval

Final Approval	Name	Resp. Partner	Date
WP leader	Venizelos Efthymiou Christina Papadimitriou	FOSS	12.03.2019
Reviewer	Giorgos Papadopoulos, Alexandros Tsitsanis	Suite 5	20.03.2019
Reviewer	Mohamed Shalaby / DERlab Melissa Setakhr / DERlab	Derlab	28.03.2019

Disclaimer

Table of Contents

Abbreviations 5
Executive Summary 6
1 Introduction 7
1.1 Scope of the Document 7
1.2 Structure of the Document 7
2 Risk management in PANTERA 9
2.1 Risk Management Methodology 9
2.2 Additional risk management considerations in PANTERA 12
3 Risks of the PANTERA project 13
3.1 Initial PANTERA Risk Analysis 13
3.2 Continuous Risk Assessment 14
3.3 Risks of Work Packages 15
3.3.1 WP1 Risks and mitigation actions 15
3.3.2 WP2 Risks and mitigation actions 17
3.3.3 WP3 Risks and mitigation actions 18
3.3.4 WP4 Risks and mitigation actions 20
3.3.5 WP5 Risks and mitigation actions 21
3.3.6 WP6 Risks and mitigation actions 23
3.3.7 WP7 Risks and mitigation actions 24
3.3.8 WP8 Risks and mitigation actions 26
3.3.9 WP9 Risks and mitigation actions 28
3.4 Risk Interaction and Prioritization 29
4 Conclusions 31
Annex 32
4.1 List of Figures 32
4.2 List of Tables 32
4.3 References 32

Abbreviations

CA	Consortium Agreement
CSA	Coordination and Support Action
DER	Distributed Energy Resource
GA	Grant Agreement
ISO	International Organization for Standardization
NIST	National Institute of Standards and Technology
PANTERA	Pan European Technology Energy Research Approach
PC	Project Coordinator
PCC	Project Coordination Committee
PM	Project Manager
PMBOK	Project Management Body of Knowledge
PMI	Project Management Institute
R&I	Research & Innovation
RMP	Risk Management Plan
SC	Steering Committee
SCN	Subversion
SEI	Software Engineering Institute
SM	Scientific Manager
TM	Task Manager
ToC	Table of Contents
WG	Working Group
WP	Work Package
WPL	Work Package Leader
WPPR	Work Package Progress Report

Executive Summary

This document offers an overview of the risk management methods and tools used, to identify all major potential risks and offer corresponding mitigation plans for the immaculate execution of the PANTERA project.

It is the initial outcome of the efforts made by the PANTERA consortium partners in the context of WP1 “Project coordination and management”, in order to address all known issues related to anticipated risks. Since risk identification and management is a continuous process, it shall be performed throughout the entire project, by continuously verifying key project targets and their status, looking after the manifestation of risk factors and their respective risk events. For each finding, relevant management methods and tools should be utilized to avoid or mitigate their impact.

Hence, Risk Assessment along with Contingency Planning is provided. Detailed tables are presented comprising all identified risks, classified into categories highlighting the most critical of them, i.e. the ones which could have a clear impact on the project and its completion, along with mitigation plans for all identified risks.

1 Introduction

Risk Analysis and Management is a key project management practice to ensure that the least number of unforeseen events occur during the execution of a project. Although it is not possible to predict everything, a well-defined risk management process is the instrument to predict the uncertainties in the projects and minimize the occurrence or impact of these uncertainties.

According to ISO 31000 [1], a risk reflects the effect of uncertainty on objectives while, in alignment with the 5th edition of the PMBOK Guide [2], a project risk is an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives, such as scope, schedule, cost or quality. Risk Management is generally the process of identifying, assessing, responding to, monitoring, and reporting risks and, when performed successfully, provides a number of benefits, e.g.: improving product quality, enabling better use of resources, preventing problems before they occur, and proactively identifying and addressing potential issues.

In this context, applying an effective and iterative method to continuously manage and monitor risks is considered mandatory for the successful implementation of the PANTERA project. In PANTERA, the Risk Management Plan defines how risks associated with the PANTERA project will be timely identified, analyzed, and managed to minimize, monitor, and control the probability and/or impact of unfortunate events or to maximize the realization of opportunities. It outlines how risk management activities will be performed, recorded, and monitored in a systematic manner throughout the life cycle of the project, while providing templates and practices for recording and prioritizing risks, foreseeing the consequences and effectively managing them through appropriate proactive actions.

1.1 Scope of the Document

This document illustrates the overall process for the risk management of the PANTERA project and presents the results of the initial risk analysis conducted by the Consortium partners.

Information included in this deliverable is valuable to all partners for ensuring smooth execution of the project, as risk awareness amongst the PANTERA Consortium constitutes an important additional risk management factor.

With the purpose of assuring that risk-related uncertainty does not deflect the PANTERA project from its objectives as stated in its Grant Agreement [3], the present Risk Management Plan is created by the Project coordinator, with the help of all Work Package leaders and shall be continuously monitored and updated throughout the project. New identified risks will be reported by all partners in the future and handled via higher decision body. Contingency plans include countermeasures or fall-back strategies that allow adapted continuation and reaching the main objectives of the project, will be identified.

1.2 Structure of the Document

The rest of the document is structured as follows:

- *Section 2* presents the risk management methodology followed in the PANTERA project, providing details for all phases adopted to estimate and confront the possible risks, based on well-established industry standards.
- *Section 3* captures the risks of the PANTERA project per Work Package, following the agreed methodology. For every risk, likelihood to occur, impact on the project and exposure are provided, together with symptoms for early identification, mitigation actions and recovery actions. Based on all identified risks and their assessment, both a dependency matrix and a

heat-map matrix are created in order to further evaluate the overall project risk exposure.

- *Section 4* summarizes the Conclusions that can be extracted from the results of the risk management methodology followed.

2 Risk management in PANTERA

2.1 Risk Management Methodology

The PANTERA risk management methodology has been designed on the basis of existing risk management practices and standards, including the Project Management Institute, the National Institute of Standards and Technology, actuarial societies, and ISO standards. In particular, the project risk management approach proposed in the PMBOK guide [2] and the Continuous Risk Management approach developed by the Software Engineering Institute (SEI) of Carnegie Mellon University [3] are mainly leveraged as proven software engineering practices with processes, methods, and tools for managing risks in projects like PANTERA.

Figure 1 Risk Management phases in PANTERA

As depicted in *Figure 1* above, the risk management approach adopted and iteratively applied in PANTERA is deployed in four stages, including:

I. **Risk Identification phase**, that determines which risks are likely to affect the project and extracts their characteristics in a structured manner through internal brainstorming for each work package of the project.

II. **Risk Assessment phase,** aiming at evaluating risks and risk interactions to assess the range of possible project outcomes and the project activities' vulnerability to specific risks. During this phase, the risks are evaluated, correlated and prioritized on the basis of experts'

judgements (namely of the WP Leaders), featuring two risk assessment dimensions, as follows:

- Likelihood, representing the possibility or potential frequency that a considered risk (or unexpected event) may occur. Likelihood is expressed using qualitative terms, e.g.:
  - *Low*: the risk is not likely to occur (<30% chance) during the project lifetime.
  - *Medium*: the risk is relatively likely to occur (30% up to 70% chance) during the project lifetime.
  - *High*: the risk is very likely to occur (>70% chance) during the project lifetime.
- Impact, related to the effect of the risk occurrence on the project (e.g. on its results, performance, cost, or time-plan) and measured in 3 scales:
  - *High*: the effect will strongly disturb the project, and the effort or lead-time to recover will be significant or even too long to reach expected objectives on time.
  - *Medium*: the effect will disturb the project, but will not impact the duration of the project or attainment of objectives.
  - *Low*: the effect will slightly disturb the project, but the project can rapidly recover and return on track.

Risk Exposure is a risk indicator combining the impact and likelihood of the identified risk(s). The following table defines the severity of risks resulting from the impact/likelihood combination.

Risk Exposure		**Risk Impact**		
		Low	**Medium**	**High**
Risk Likelihood	**High**	Medium	High	High
	Medium	Low	Medium	High
	Low	Low	Low	Medium

Table 1 Risk exposure definition table

III. **Risk Response Planning phase**, that processes the planning for risks by creating a strategy to respond appropriately on each occurrence. In PANTERA, diverse responses to threats should be considered, including proactive actions to avoid the risks, mitigation actions to reduce the exposure of the risks, alternatives to transfer the risks and even the acceptance of a risk without taking any action. Risk mitigation focuses on the inevitability of some threats and risks and is used for those situations, where a threat cannot be avoided entirely. Rather than planning to avoid a risk, mitigation deals with the aftermath of a possible threat/risk and the steps that can be taken prior to the event, occurring to reduce adverse, and potentially long-term, effects. In the same context, transferring the risk to project external entities or deciding to accept the impact of a risk without any actions are considered alternatives when a risk arises. When a risk actually occurs, risk contingency and recovery actions should be planned, to correct deviations and get the project activities back on track.
Another important activity during this phase, is to describe in detail possible Risk Symptoms and Triggering Factors for Action, in order to allow the risk owners to early identify indirect manifestations of actual risk events.

IV. **Risk Monitoring and Control phase,** to execute the risk management plan and timely respond to risk events over the course of the project. Risk monitoring and controlling is an iterative process that uses progress status reports to monitor and control risks This phase involves continuously tracking and assessing identified risks, early identifying symptoms for risks that have been ranked as with high and medium exposure, and timely responding to changes in risks' status / exposure over the course of the PANTERA project implementation. To this direction, concrete Risk Contingency / Recovery Actions are already identified and shall be triggered if a risk actually occurs.

V. **Continuous Audit Process** presents the core of the risk management plan and promotes effective open communication within and between all project levels. PANTERA values individual voices and promotes teamwork to support the effectiveness of agreed methodologies to handle risks. Risk Reviews are a mandatory item of milestone meetings and/or regular project meetings, but they can also be executed during separately planned risk review meetings.

In PANTERA, a risk information template has been created (see Table 2 **Error! Reference ource not found.**) and shall be used for identifying new risks, as well as for modifying the status of risks, tracking the status and monitoring the mitigation strategy evolution. Work Package Leaders are responsible for filling in the template for risks related to their respective work packages. It is expected that the perspectives of the WP members are reflected, so different granularity levels shall appear depending on the different focus of each WP. The risks for all work packages are consolidated by the Project Coordinator, who maintains an updated version of the Risk Management Plan for the project.

WP<*i*> "Title of the Work Package" – {Technical | Impact | Management} risks							
Objectives: • To ... • To ... • To ...							
Risks Validity: M<x>-M<y> (WP<i> implementation timeframe) **Risks Owner:** WP<i> Leader (<Organization Short Name>)							
#	***Risk Description***	***Likelihood***	***Impact***	***Exposure***	***Risk Symptoms / Triggering Factors for Action***	***Risk Control & Mitigation Actions*** *(to reduce probability and/or impact)*	***Risk Contingency / Recovery Actions*** *(if the risk actually occurs)*
WP<*i*>-1		{L | M | H}	{L | M | H}	{L | M | H}	•	•	•
WP<*i*>-2					•	•	•
WP<*i*>-3					•	•	•
…					•	•	•
WP<*i*>-*n*					•	•	•

Table 2 Risk Definition Template

2.2 Additional risk management considerations in PANTERA

The PANTERA consortium, recognizing the importance of creating a robust risk management approach, will adhere to the enhanced risk management practices listed below. Their focus is mainly on the methodology towards monitoring and handling potential risks for the project during the project period, to minimize the probability and consequences of adverse events to project objectives:

- To ensure risk monitoring and control, the Project Coordinator in conjunction with the Work Package Leaders will regularly, during the Plenary Telcos and Meetings:
  - reflect the risk table to provide feedback; manifestation of symptoms or risks and actions that need to follow
  - report immediately on any other risks or critical interdependencies they discover during the implementation, to extend the risk table by following the agreed methodology

- In preparation to the biweekly Plenary Telcos, each PANTERA Work Package Leader is requested, to report to the Project Coordinator in written form beforehand, on the progress of the dedicated Work Package. Included in this report are corresponding risks, identified triggering factors, as well as mitigation or recovery actions that took or need to take place to address the risks.

- Work Package Leaders must use the Risk Information Template when identifying new risks as well as modifying the status of risks, tracking the status and monitoring the mitigation strategy evolution. Work Package Leaders should send the Risk Information documents to the Project Coordinator in order for the Risk Management report document to be updated accordingly

- Work Package Leaders immediately report any other identified project risks to the Project Coordinator.

- Work Packages, related Tasks and Milestones are designed, scheduled and will be updated carefully to minimise the number of complex inter-dependencies to ease development and to reduce the possibility of delays.

- The consortium will pay specific attention to risks that have been ranked with high and medium exposure.

- Risk monitoring and control will be continuously monitored and assessed.

3 Risks of the PANTERA project

3.1 Initial PANTERA Risk Analysis

At the very beginning of the PANTERA project, a set of risks associated to the work that will be undertaken in each work package at technical, business and management level has been identified with the collaboration of all WP Leaders.

The following table presents this list of identified risks, assessed and managed at the beginning of the project and is part of the Grant Agreement [3]. This initial list of risks is bound to evolve over time due to the developments of the project and its achievements, including the risks re-evaluation in terms of impact and likelihood. To this end, the role of the Risk Monitoring & Control phase as well as of the iteration of all risk management phases defined in Figure 1 is very crucial.

Risk number	Description of risk	WP Number	Proposed risk-mitigation measures
1	Losing critical staff or partners at crucial points of the project (Low)	WP1	The consortium has enough diversity and expertise to replace them by other qualified partners within the same organization or within the consortium. Also, DERlab can find one of its members to replace.
2	WPs resources not well balanced (Low)	WP1	Monitoring of the work and reallocation of resources in other WPs where necessary
3	Unexpected delays in delivering the project deliverables (Medium)	WP1	Related WP leaders and task leaders will be supported by other resources to produce deliverables on time
4	European entities do not respond positively (low)	WP2	The active participation of the EC will be tactfully engaged to spur interest and support.
5	Lack of information and/ or co-operation from key stakeholders (Medium)	WP3	There is a plethora of information freely available. In addition, the relevant partner(s) have a wide and well-established network so alternative stakeholders can be found, if necessary
6	Not cover adequately the needs of stakeholders (low)	WP4	The planned actions and the formal operation of the Advisory Board will offer the mechanisms to identify the problem early and take appropriate action.
7	Workshops are not well attended and do not offer the planned impact (medium)	WP5	The consortium will utilise the experience gained by members of the Advisory Board especially ETIP SNET who is operating 4 regional workshops every year and build on this experience with quality control throughout.
8	Working groups fall low in activity and fail to deliver planned results (low)	WP6	The consortium considers the functioning of thematic working groups as pivotal in the work of PANTERA. Strong and continuous support will be offered with regular feedback control for appropriate corrective actions.

9	Stakeholders are not engaging in exploitation activities (Low)	WP7	Activities will be designed in a user-friendly manner so as to maximize engagement from all stakeholders. The partners' own networks are quite extended to secure full subscription in the exploitation events.
10	Project outputs are not effectively disseminated thus lessening the likelihood of market rollout (Low)	WP8	Partners are experienced in web based and scientific dissemination methods (articles, conferences). Partners are experienced in other methods of dissemination (workshops, industry events/organizations, targets publications). The responsible partner has a large amount of experience in the area especially from the viewpoint of technology transfer.
11	Failure or difficulty in establishing the PANTERA Collaboration Platform (low)	WP8	The operation of a collaborative platform is critical in the success of PANTERA and for this reason plans are in place to respond in all possible obstacles. Current activity in this direction by stakeholders especially JRC / SETIS will be utilised and extended.

Table 3 PANTERA - Initial Implementation risks and mitigation plans

3.2 Continuous Risk Assessment

The plan is to iterate the four activities analysed in *Chapter 2*, for each Work Package, taking under consideration all its tasks and corresponding deliverables, using the Risk Definition Template. It is the responsibility of Work Package leaders, task leaders and of the Project Coordinator to reiterate this process as many times as needed, keeping the Risk Management Plan updated [3]. This methodology should be applied also to the risks already defined in the project, listed in *Table 3*.

- **Risk Identification:** Determining the risks that may affect the project deliverable and documenting their characteristics. For each risk, an entry should be created using the Risk Definition Table of the corresponding Work Package. Following a unique identifier, the risk event should be captured under the matching *"Risk Description"* column.
- **Risk Assessment:** Various risk attributes should be evaluated to establish values for the probability of the occurrence of the event and the degree of its impact. Those values, as well as the calculated, based on *Table 1* Risk Exposure, should be captured under the *"Likelihood", "Impact" and "Exposure"* columns respectively.
- **Risk Response Planning:** In this phase, plans for preventing risks, or mitigating their adverse effects should be developed, with focus on the ones with the greatest potential to harm the project deliverables. Actions to mitigate risks in order to reduce the probability of occurrence or the impact should be documented on the corresponding column "Risk Control & Mitigation Actions". In the "Risk Contingency / Recovery Actions", responding actions in case of a risk incidence should be captured. Symptoms and Triggering Factors of each risk should be recorded under the "Risk Symptoms / Triggering Factors for Action" column, to allow early identification.
- **Risk Monitoring and Control:** A close look up on the potential risks during the entire project period, is a key activity of the risk monitoring phase. Each risk will be continuously monitored and assessed and the Project Coordinator, with the support of the Work Package leaders should inform all partners when necessary and promptly.

3.3 Risks of Work Packages

The results of the continuous risk assessment process for all project Work Packages, that took place for the creation of the Risk Management Plan deliverable, can be found below.

3.3.1 WP1 Risks and mitigation actions

WP1 "Project coordination and management" – {Technical | Impact | Management} risks							
Objectives: **To ensure an efficient and smooth coordination of the scientific, organizational and technical activities of the project, as well as its overall administration**							
Risks Validity: M1-M48 (WP1 implementation timeframe) **Risks Owner:** WP1 Leader (FOSS)							
#	**Risk Description**	**Likelihood**	**Impact**	**Exposure**	**Risk Symptoms / Triggering Factors for Action**	**Risk Control & Mitigation Actions** (to reduce probability and/or impact)	**Risk Contingency / Recovery Actions** (if the risk actually occurs)
WP1-1	Losing critical staff or partners at crucial points of the project	L	H	M	-No communication feedback -No participation in telcos or physical meetings without prior notice -Stalling of activities	-close interpersonal relationships with partners -regular follow ups -tight management workflow. -effective progress monitoring	The consortium has enough diversity and expertise to replace any of partners lost by other qualified partners within the same organization or within the consortium. Also, DERlab can find one of its members to replace.
WP1-2	WPs resources not well balanced	L	M	L	-difficulties in finishing activities -difficulties in submitting deliverables. -loose or highly tight time frames	-tight management workflow -effective progress monitoring -planning activities before the actual beginning -good cooperation relations among partners	Reallocation of resources in other WPs where necessary
WP1-3	Unexpected delays in delivering the project deliverables (Medium)	L	H	M	-activities/packages were started but no tangible results are achieved -Difficulties in finishing activities -Difficulties in collaboration among partners regarding deliverables	-tight management workflow -effective progress monitoring -planning activities before the actual beginning -good cooperation relations among partners	Related WP leaders and task leaders will be supported by other resources to produce deliverables on time

WP1-4	Cost risk, typically escalation of project costs due to poor cost estimating accuracy and scope creep. Slippages in schedule typically increase costs	L	H	M	-activities i.e workshops, regional desks cost more -partners do not have enough resources to finish activities	-periodic project financial report -effective cost progress monitoring -cost planning before activities start	Reallocation of resources in other WPs where necessary
WP1-5	Performance risk, the risk that the project will fail to produce results consistent with project specifications.	L	H	M	-poor quality of results -poor quality of deliverables -impact is low	-Quality assurance plan -Quality control board establishment -KPIs monitoring	-Reallocation of resources -Activation of procedures regarding putting KPIs on track
WP1-6	Legal risks arise from legal and regulatory obligations, including contract risks and litigation brought against the program.	L	H	M	-difficulties in establishing collaboration among EU initiatives -accusation of wrong data handling	-fully compliant with the european legal framework. -GDPR compliant	-Legal advice -Secure compliance application of international, EU and national law (in particular, EU Directive 2010/63/EU)

3.3.2 WP2 Risks and mitigation actions

WP2 "Pan-European R&I community" – {Technical | Impact | Management} risks							
Objectives: **To identify and establish communication links and then close interactions with R&I stakeholders active in the fields of smart grids, storage and local energy systems.**							
Risks Validity: M1-M48 (WP2 implementation timeframe) **Risks Owner:** WP2 Leader (RSE)							
#	**Risk Description**	**Likelihood**	**Impact**	**Exposure**	**Risk Symptoms / Triggering Factors for Action**	**Risk Control & Mitigation Actions** (to reduce probability and/or impact)	**Risk Contingency / Recovery Actions** (if the risk actually occurs)
WP2-1	European organizations (EERA, ETIP SNET, etc.) do not respond positively	L	L	L	PANTERA gets no feedbacks from these organizations	RSE (WP2 leader), FOSS (project coordinator), DERLab and also the other partners are well positioned with respect to EU organizations	The active participation of the EC will be tactfully engaged to spur interest and support.
WP2-2	Difficulties in identifying stakeholders in the targeted countries	L	M	L	Few stakeholders are identified	All PANTERA parters will contribute to this activity	Leverage EU initiatives and organizations to help in the stakeholder identification
WP2-3	Identified stakeholders do not participate in PANTERA activities	M	M	M	Organised workshops with few stakeholders involved	Stakeholders will be duly informed about PANTERA and the possible benefits in joining workshops	Stakeholders will be asked why they are not participating, actions will then be taken at project level
WP2-4	PANTERA partners do not properly collaborate in identifying stakeholders	L	M	L	PANTERA partners do not propose stakeholders to be contacted	Almost all PANTERA partners are involved in WP2	PANTERA partners will be asked about their possible contributions underlying its importance
WP2-5	Difficulties in sharing information between stakeholders and PANTERA	L	M	L	Stakeholders do not properly participate in PANTERA activities because they are not well informed	Partners in charge of the PANTERA dissemination are also involved in WP2	WP2 will try to find a possible solution together with WP8 (dissemination and communication activities)
WP2-6	Lack of coordination with the other WPs	L	L	L	Activities are not coordinate between WP2 and the other WPs.	Almost all PANTERA partners are involved in WP2	Through PANTERA meetings it would be found a way to collaborate among WPs at best

3.3.3 WP3 Risks and mitigation actions

WP3 "The state of R&I, standardisation and regulation" – {Technical | Impact | Management} risks							
Objectives: **To identify/establish the current state and progress of the R&I, regulations, standardisation activities in the areas of smart grid and then develop an efficient process to address the key challenges at national and EU level and recommend for post project activities**							
Risks Validity: M1-M48 (WP3 implementation timeframe) **Risks Owner:** WP3 Leader (UCC-IERC)							
#	**Risk Description**	**Likelihood**	**Impact**	**Exposure**	**Risk Symptoms / Triggering Factors for Action**	**Risk Control & Mitigation Actions** (to reduce probability and/or impact)	**Risk Contingency / Recovery Actions** (if the risk actually occurs)
WP3-1	Difficulties in getting information on existing and emerging relevant technologies from the identified stakeholders in the low spending countries	M	L	L	Appropriate stakeholders are not identified and conducted properly with relevant questionnaires.	PANTERA partners will be informed in timely manner to identify more stakeholders.	Projects' link and information are mostly freely available. In addition, the relevant partner(s) also have a wide and well-established network so alternative stakeholders can be found, if necessary.
WP3-2	Regulations, code and standards for technology integration in the low spending countries are not well established and identified.	M	L	L	Appropriate stakeholders are not identified and conducted properly with relevant questionnaires.	PANTERA partners will be informed in timely manner to identify more stakeholders.	Some of the RCS info for EU countries are freely available. In addition, the relevant partner(s) also have a wide and well-established network so alternative source can be found, if necessary.
WP3-3	National energy policy and barrier info for the low spending countries are not available	L	L	L	Appropriate stakeholders are not identified and conducted properly with relevant questionnaires.	PANTERA partners will be informed in timely manner to identify more stakeholders. -Regional desks will help on that too.	Most of the EU countries energy policy are freely available. In addition, the relevant partner(s) also have a wide network so alternative source can be found.

WP3-4	Technology, RCS and policy info are not sufficiently collected	L	M	L	Appropriate stakeholders are not identified and conducted properly.	PANTERA partners will be informed in timely manner to identify more stakeholders. -Regional desks support -Workshop will hand questionnaires to stakeholders -Closer cooperation with EU initiatives i.e BRIDGE, ETIP SNET etc	Finding approach will be modified to efficiently identify the key challenges
WP3-5	Best practise examples are not available for the selected technology and solutions	L	L	L	Sufficient R&D projects info are not identified.	-PANTERA partners will be informed in timely manner to identify more projects. -workshop keynote speakers will contacted -advisory committee members will help to that direction	Finding approach will be modified to efficiently recommend the post project activities

3.3.4 WP4 Risks and mitigation actions

WP4 "Key topics and content management" – {Technical | Impact | Management} risks							
Objectives: **To identify and deliver an updated set of topics for dissemination and networking conditions activities in such a way that it will ensure the compliance of projects activities with the stakeholders' needs**							
Risks Validity: M2-M45 (WP4 implementation timeframe) **Risks Owner:** WP4 Leader (SINTEF)							
#	**Risk Description**	**Likelihood**	**Impact**	**Exposure**	**Risk Symptoms / Triggering Factors for Action**	**Risk Control & Mitigation Actions** (to reduce probability and/or impact)	**Risk Contingency / Recovery Actions** (if the risk actually occurs)
WP4-1	Limited feedback to the content from the stakeholders to the survey and workshop due to low interest, expertise and knowledge.	L	L	L	Limited or/and irrelevant feedback from the stakeholders	Involvement of different categories of stakeholders	Making supporting actions as for example organising of webinar (-s) prior to the workshop, personal interviews and additional surveys.
WP4-2	The content and defined topics are very segmented, making it difficult to identify clearly driving forces and gaps.	L	L	L	Segmentation of the topics, limited coherence across different countries.	Continuous monitoring of the defined topics.	Refining of the topics with selected stakeholders.

3.3.5 WP5 Risks and mitigation actions

WP5 "Workshop and dedicated stakeholders meeting organisation" – {Technical | Impact | Management} risks							
Objectives: **To provide the resources and support to PANTERA in order to organize workshops and interaction meetings with stakeholders beyond the Steering Committee and Working Groups members. Thus, reaching a wider range of stakeholders and initiatives through these actions**							
Risks Validity: M1-M48 (WP5 implementation timeframe) **Risks Owner:** WP5 Leader (DERlab e.V.)							
#	**Risk Description**	**Likelihood**	**Impact**	**Exposure**	**Risk Symptoms / Triggering Factors for Action**	**Risk Control & Mitigation Actions** (to reduce probability and/or impact)	**Risk Contingency / Recovery Actions** (if the risk actually occurs)
WP5-1	Workshops are not well attended	L	H	M	The number of registered stakeholder is low.	DERlab will monitor the number and the list of the registered audience on a daily basis since the announcement of the event / workshop and will increase the promotion of the event in case low registration has been noticed.	PANTERA consortium will call the stakeholders in person and invite them to attend the workshop / event.
WP5-2	No interaction between the stakeholders during the round tables	L	H	M	The stakeholders are not interacting and not providing any inputs during the workshop round table.	PANTERA team will make sure that the stakeholders are interested in the topics discussed during the round table and they are willing to participate, by choosing relevant subjects and presenting in an interactive manner.	- PANTERA team will trigger reaction from the stakeholders by involving them and presenting in an interactive manner, to initiate discussion on those topics with the stakeholders. - PANTERA team will motivate the stakeholders to discuss during the round table

WP5-3	Unbalance between the stakeholders who are attending the workshops (e.g. 90% of the stakeholders attending the event have technical background and policy makers aren't present in the workshop)	L	L	L	The registered stakeholders to the workshop are coming from specific field / background and the other fields aren't present/attending the workshop	DERlab will monitor the field of the stakeholders who are attending the workshop and if they noticed unbalance between audiences, it will notify the consortium.	PANTERA team will actively invite the unrepresented stakeholders to the workshop to balance between the stakeholders and have a productive workshop.
WP5-4	Overspending on the workshop	L	M	L	The workshop will cost more than what is planned in the GA	DERlab will create an excel sheet template to plan, control and monitor the experience cost for the workshop.	In case it is noticed during the planning phase of the workshop that it will cost more than planned, the whole consortium will have a telco to discuss how to reduce the costs or better attribute them, until an agreement is reached.
WP5-5	Failure of technical equipment during the workshop	M	M	M	Some of the technical equipment does not function during the workshop (e.g. projector)	DERlab will be present a couple of hours (One day) before the start of the event / workshop and will test all the technical equipment and make sure it is working as expected.	DERlab will make sure to prepare a secondary plan in case of failure of any equipments.
WP5-6	No feedback received from the stakeholders after ending the workshop	M	L	L	PANTERA consortium will send a questionnaire to the stakeholders who attended the workshop to give their feedback on the workshop and how to improve it.	PANTERA team will try to design the questionnaire to be simple and quick to answer.	PANTERA team will contact the stakeholders in person to ask them for feedback.

3.3.6 WP6 Risks and mitigation actions

WP6 "Collaboration working groups (WG)" – {Technical | Impact | Management} risks							
Objectives: **To provide organizational support in order to develop WGs-establishes regional stakeholder desks in target regions, as vehicles to ensure wide participation and involvement of market actors and stakeholders throughout the project and to create local networks**							
Risks Validity: M1-M48 (WP6 implementation timeframe) **Risks Owner:** WP6 Leader (IPE)							
#	**Risk Description**	**Likelihood**	**Impact**	**Exposure**	**Risk Symptoms / Triggering Factors for Action**	**Risk Control & Mitigation Actions** (to reduce probability and/or impact)	**Risk Contingency / Recovery Actions** (if the risk actually occurs)
WP6-1	Incorrect selection of the EU policy review criteria	L	M	L	The analysis does not cover all stakeholder categories' issues	Selection of review criteria based on discussion with partners and relevant stakeholders	Modifying and evolving the approach of review in collaboration with partners
WP6-2	The selected stakeholders have low power or interest to participate in WGs	L	M	L	Inconsistent feedback from stakeholders	Establishing effective method for selecting involved stakeholders	Additional stakeholder interviews, group meetings, active engagement of partners having broad contact network
WP6-3	Failure to propose solutions due to fragmentary information on national projects and policies	L	L	L	Fragmentary national project and policy information	Continues monitoring of stakeholder consultation process	Additional analysis of identified projects by interviews and group meetings of selected stakeholders

3.3.7 WP7 Risks and mitigation actions

WP7 "Methodology and Exploitation Management" – {Technical | Impact | Management} risks							
Objectives: **To deliver a concrete methodology for the future sustainability of the project instruments, beyond the duration of the project**							
Risks Validity: M6-M48 (WP7 implementation timeframe) **Risks Owner:** WP7 Leader (Suite5)							
WP7-1	Stakeholders are not engaging in exploitation activities	M	H	H	Limited active participation and engagement from the stakeholders Low participation on the dissemination activities. Low engagement during workshops. Poor workshop results.	Activities will be designed in a user-friendly manner so as to maximize engagement from all stakeholders. The partners' own networks are quite extended to secure full subscription in the exploitation events.	Re-evaluate the stakeholders list, as well as the workshop content structure. Revisit the Dissemination and Communication activities.
WP7-2	The results of the project are not on the path to be considered useful after the project finishes.	M	H	H	The result of the qualitative and quantitative impact calculation and verification performed within T7.1 is not as high as it was expected.	During the project, data about results will be collected in all work-packages and will be provided as input in the impact assessment toolset within 7.1, to perform an analysis impact model that will include specific indicators as criteria for assessment of the impact, emphasizing on inputs, activities, outputs, outcomes, and impact measures.	Provide feedback to the respective WP leaders to take appropriate recovery actions. Revision of project plans at coordination level and amendments where applicable.
WP7-3	Partners not reacting as expected, lack of communication, deliverables and/or tasks completion is delayed, setting the objectives of the project at risk Covering all tasks of WP7 and the corresponding inputs. The exposure factor varies, depending on each task's	M	M	M	Delays of WP7 tasks. Delays of tasks from other WPs providing input into WP7. Effects on tasks awaiting results from WP7.	Use of further interactive communication means (use the phone when e-mail is not enough) and/or liaise with additional persons in the institution. Ultimately, apply mitigation measures contained in Consortium Agreement	Any problems which cannot be solved bilaterally are referred to PC for mediation and then to the EB. The Consortium Agreement will also provide a framework for underperforming partners and conflict resolution procedures. The consortium is of sufficient strength and diversity for partners to reassign tasks if required.

	input criticality, affecting at the same time, all the required actions or measures that need to be implemented.						
WP7-4	Major changes of technological and/or business trends may influence the exploitation of the results of PANTERA	M	M	M	Projects results are not aligned with the current market trends at any time during the project lifetime.	R&I recommendations and market reform suggestions, towards further advancing and promoting innovation in Smart Grids at pan-European level, enabling the maximization of the multiple benefits. The Innovation Manager will be in charge of periodically reviewing the progress against objectives to assess the current relevance of them along the project life.	Provide input to the respective technical WPs, for them to assess if doable design changes could be done to competitively align results with market trends.

3.3.8 WP8 Risks and mitigation actions

WP8 "Dissemination and Communication activities" – {Technical | Impact | Management} risks							
Objectives: **Communication activities will facilitate the flow and exchange of information within the Platform and externally**							
Risks Validity: M1-M48 (WP8 implementation timeframe) **Risks Owner:** WP8 Leader (DERlab e.V)							
#	**Risk Description**	**Likelihood**	**Impact**	**Exposure**	**Risk Symptoms / Triggering Factors for Action**	**Risk Control & Mitigation Actions** (to reduce probability and/or impact)	**Risk Contingency / Recovery Actions** (if the risk actually occurs)
WP8-1	The project outputs are not effectively disseminated thus lessening the likelihood of market rollout and visibility.	L	M	L	Not receiving any feedback from stakeholders or low response. No activity on the website or social media.	Be active and share relevant content on the project channels. Control and monitor the impact of the dissemination by analysing website and social media analytics.	Ask for the partners and concerned WP for support regarding the target audience. Make use of social media tools to effectively target the right audience (Facebook audiences, Instagram audiences, Linkedin audiences, etc.) by applying relevant filters (geographical, job function, etc,)
WP8-2	The project website and social media posts do not reach the right audience.	L	M	L	Not receiving any feedback from stakeholders or low response. No activity on the website or social media.	Control and monitor the impact of the dissemination by analysing website and social media analytics.	Ask for the partners and concerned WP for support regarding the target audience. Make use of the social media tools to effectively target the right audience (Facebook audiences, Instagram audiences, Linkedin audiences, etc.) by applying relevant filters (geographical, job function, etc,)
WP8-3	The project website and social media are not effectively shared and linked to by all the consortium.	L	M	L	Not receiving any feedback from stakeholders or low response. No activity on the website or social media.	DERlab will always share news and keep up to date all the consortium about updates on the website, social media, events, publications, etc.	Ask the partners for more support and indicate which actions can be taken in order to gain more visibility. Insist on linking PANTERA website and platform on all partners website and channels.

WP8-4	Failure or difficulty in establishing the PANTERA Collaboration Platform.	L	H	H	Technical obstacles or difficulties.	Plans are in place to respond to all possible obstacles. Current activity in this direction by stakeholders especially JRC / SETIS will be utilised and extended.	Close collaboration within the consortium to find the problems and effectively address them. Try to get support, especially from JRC / SETIS.

3.3.9 WP9 Risks and mitigation actions

WP9 "Ethics Requirements" – {Technical | Impact | Management} risks							
Objectives: **To ensure compliance with the 'ethics requirements' set out in this work package as sen in http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/ethics/h2020_hi_ethics-self-assess_en.pdf**							
Risks Validity: M1-M48 (WP9 implementation timeframe) **Risks Owner:** WP9 Leader (FOSS)							
#	**Risk Description**	**Likelihood**	**Impact**	**Exposure**	**Risk Symptoms / Triggering Factors for Action**	**Risk Control & Mitigation Actions** (to reduce probability and/or impact)	**Risk Contingency / Recovery Actions** (if the risk actually occurs)
WP9-1	Pressure to compromise organizational standards	L	H	M	Such pressure is a leading indicator of the potential for future workplace misconduct.	-enable a strong collaboration among partners -having a separate deliverable section regarding ethics	Reporting allows leaders to address and fix ethical issues.The availability of anonymous and/or confidential reporting mechanisms are an important component of promoting an ethical workplace within PANTERA.
WP9-2	Misuse of collected data	L	M	L	the collection of the data can be misused or biased or used for other purposes	- GDPR compliant -Data management plan deliverable -DPO -high security lecel -anonymous information	all actions as described in relative directives for personal data Regulation (EU) 2016/679 Directive (EU) 2016/680

3.4 Risk Interaction and Prioritization

Taking into account the risks identified in the initial analysis in section 3.3, a draft PANTERA risk interaction map is created to illustrate the relations and dependencies between risks that affect their appearance, as depicted in the following table (where the symbol “X” indicates whether the occurrence of the risk identified in each row affects the risks identified in the columns).

Risks	WP1-1	WP1-2	WP1-3	WP1-4	WP1-5	WP1-6	WP2-1	WP2-2	WP2-3	WP2-4	WP2-5	WP2-6	WP3-1	WP3-2	WP3-3	WP3-4	WP3-5	WP4-1	WP4-2	WP5-1	WP5-2	WP5-3	WP5-4	WP5-5	WP5-6	WP6-1	WP6-2	WP6-3	WP7-1	WP7-2	WP7-3	WP7-4	WP8-1	WP8-2	WP8-3	WP8-4	WP9-1	WP9-2
WP1-1		X	X																																			
WP1-2			X		X					X													X							X								
WP1-3				X	X																										X						
WP1-4																							X	X							X						
WP1-5										X		X										X	X								X						
WP1-6															X	X						X														X	X
WP2-1								X																											X		
WP2-2																		X									X		X			X	X	X			
WP2-3											X							X		X	X	X			X		X		X		X	X	X	X	X		
WP2-4																																					
WP2-5													X	X							X				X		X		X			X	X	X	X	X		
WP2-6			X																X			X		X						X	X						
WP3-1																X			X			X				X			X	X		X	X	X	X	X		
WP3-2																X			X			X				X						X	X	X	X			
WP3-3																X			X	X		X				X		X					X	X	X			
WP3-4																			X	X		X				X		X				X	X	X	X			
WP3-5																										X						X						
WP4-1									X		X		X							X	X	X			X								X	X	X			
WP4-2									X						X						X	X							X									
WP5-1									X												X									X						X		
WP5-2											X																												
WP5-3														X	X	X														X						X		
WP5-4				X																																		
WP5-5				X																																		
WP5-6											X		X																	X								
WP6-1														X	X	X				X		X	X							X			X	X	X	X		
WP6-2																					X								X	X			X	X	X	X		
WP6-3															X	X				X			X						X	X						X		
WP7-1											X		X				X			X		X			X				X	X			X	X	X	X		
WP7-2																	X													X			X	X				
WP7-3																	X													X						X		
WP7-4													X	X			X																					
WP8-1											X		X									X							X	X	X	X		X	X	X		
WP8-2											X		X									X							X	X	X				X	X		
WP8-3											X		X									X							X	X	X					X		
WP8-4													X	X			X		X		X	X	X		X					X	X	X						
WP9-1																																						
WP9-2																																						

Table 4 PANTERA Risks Interaction table

Typically, the risks of any Work Package affect the emergence of the risks in the same Work Package while there is a number of risks that have high interactions in terms of:

- “In-dependencies”, indicating risks that are contingent on a high number of other risks (depicted in the columns of **Error! Reference source not found.**) and have thus increased eril of appearance as a repercussion of other risks’ occurrence, e.g. WP7-2 and WP8-4
- “Out-dependencies” suggesting risks that are critical for the project implementation due to the high number of risks that are dependent on them (depicted in the rows of **Error! Reference ource not found.**), e.g. WP2.3 and WP3.1

Risk interactions are further evaluated for the risks with high exposure and the assessments are refined in order to perform an initial prioritization with the help of a heat map. Two (2) number of risks plotted in the 'High' risk level (namely WP7-1: "Stakeholders are not engaging in exploitation activities" and WP7-2: "The results of the project are not on the path to be considered useful after the project finishes") are designated in the red area of the PANTERA risks heat map as depicted in the following Figure 2. Such risks are considered as 'key' risks in terms of reporting and monitoring by the PANTERA Project Coordination Committee.

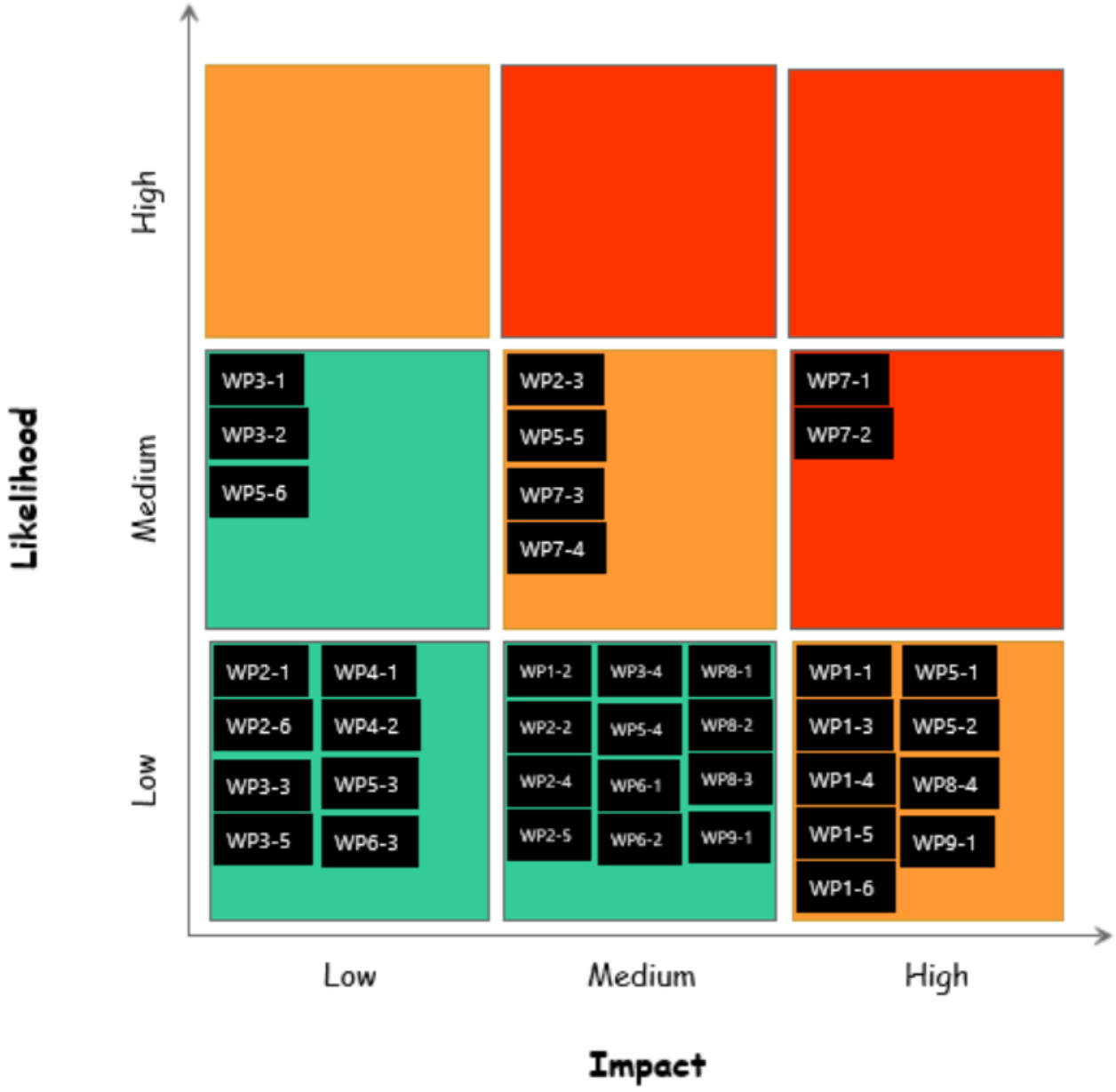

Figure 2 PANTERA Risks Heat Map

4 Conclusions

A risk management methodology is presented in order to analyse the PANTERA project specific information and identifying potential risks during project development. In the stage of analysis, a full list of possible risks is provided, classifying them based on likelihood to occur and impact on the project deliverables. For each item, the risk exposure is determined, allowing the creation of a risk register with clear prioritization. In the second stage mitigation strategies are proposed for each risk, with focus on the ones with high risk exposure. Dependencies between risks are also considered, allowing a

To conclude with, based on the results of the methodology used, the PANTERA project is not risky. However, there are clearly some risks that need to be evaluated and accounted for when designing and executing the PANTERA framework.

Annex

4.1 List of Figures

Figure 1 Risk Management phases in PANTERA 9
Figure 2 PANTERA Risks Heat Map 30

4.2 List of Tables

Table 1 Risk exposure definition table 10
Table 2 Risk Definition Template 11
Table 3 PANTERA - Initial Implementation risks and mitigation plans 14
Table 4 PANTERA Risks Interaction table 29

4.3 References

[1] ISO 31000 – Risk management. Online: *https://www.iso.org/iso-31000-risk-management.html*

[2] A Guide to the Project Management Body of Knowledge (PMBOK® Guide). Online: *https://www.pmi.org/pmbok-guide-standards/foundational/pmbok*

[3] Grant Agreement NUMBER 824389 – PANTERA - H2020 LC-SC3-ES-7-2018: Pan-European Forum for R&I on Smart Grids, flexibility and Local Energy Networks

[4] Audrey J. Dorofee, Julie A. Walker, Christopher J. Alberts, Ronald P. Higuera, Richard L. Murphy and Ray C. Williams, Continuous Risk Management Guidebook, Software Engineering Institute of Carnegie Melon University. Online: http://jodypaul.com/SWE/ContinuousRiskManagement.pdf