



**STORE**

Hybrid Services from Advanced  
Thermal Energy Storage Systems

# **D9.2 Risk and contingency management plan**

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## 1. Executive Summary

HYSTORE mission is to develop and validate an innovative set of thermal energy storage concepts, based on the combination of state-of-the-art technological components: ALL-IN-ONE phase change material (PCM) solution, LOW-TEMP PCM HEATING&COOLING solution, PCM HEATING solution and thermochemical (TCM) HEATING&COOLING solution. The four novel concepts reach different applications in heating/cooling (H/C), DHW configurations, and also establish optimal conditions for the provision of hybrid services - i.e. energy and power - thanks to the development of an intelligent aggregator and an open source multiservice platform.

The main features of HYSTORE are:

- Technological breakthrough of thermal energy storage (TES) with up to 150% energy density and 50% less CAPEX compared to the state of the art.
- Significant reduction of design and installation effort due to predefined and standardized guidelines.
- Allow coupling and integration of TES with network-level aggregators that can be federated both in the context of individual buildings and local energy communities.
- 4 use cases in different climates, both for buildings connected and not connected to district heating/cooling with high impact and replication potential.
- LCOS in line with EU targets from IRENA annual reports and SET-plan. HYSTORE puts TES systems on the path of €0.05/kW/cycle versus about €0.04/kW/cycle in 2030, which is competitive with electric batteries.

The purpose of this deliverable is to report on measures for the detection, analysis and mitigation of potential risks associated with the HYSTORE project. It also proposes a first set of identified risks and mitigation measures, based on those already identified in the project proposal. It is possible that more risks will be identified as the project progresses, therefore this document will be updated periodically on a dynamic basis.

On behalf of Authors  
ARCbcn Team

## 2. Introduction

### 2.1. Scope

The purpose of this document is to outline the systematic process for detecting, analysing, and mitigating potential risks that may be associated with the HYSTORE project. Additionally, a first sets of identified risks and mitigation measures is presented, based on those already identified in the project proposal. It should be noted that this set of measures will be revised and updated in future versions of the document.

Finally, the target audience is consortium members, CINEA advisers and project reviewers.

### 2.2. Relations to other activities in the project

This document outlines the way in which risks will be managed throughout the project. Therefore, it is not specifically related to any other project activity, but to all of them in a non-direct way.

## Abbreviations

CA - Consortium Agreement  
CM - Communication Manager  
CO - Confidential  
D - Deliverable  
DoA - Description of the Action  
EC - European Commission  
FR – Final Report  
GA - Grant Agreement  
GA - General Assembly  
CINEA - European Climate, Infrastructure and Environment Executive *Agency*  
M - Milestone  
PM - Project Manager  
PMT - Project Management Team  
PA – Project Adviser  
PR – Periodic Report  
PRoD – Partner responsible for Deliverable  
RP - Reporting Period  
TL - Technical Leader  
WP - Work Package  
WPL - Work Package Leader

### 3. Risk management approach

The Risk management approach described in this document follows the Risk Management guidelines and best practices provided by international entities, such as the Project management Institute (PMI)<sup>1</sup> and the PRINCE2 Methodology<sup>2</sup>.

The Risk Management Plan describes the approach to mitigate risks and ensure the success of the project, through a systematic process that includes the identification, assessment, management, monitoring and reporting of risks. Starting from a clear definition of the project's objectives and success criteria, the Risk Plan integrates the following actions:

- Definition of risk criteria to foresee or tackle situations which could undermine the scope, objectives, budget, and performance of the project.
- Identification, analysis, and evaluation of the risks.
- Development and implementation of strategies aimed at preventing, containing and eliminating obstacles created by the situation.
- Tracking, review, and report on the evolution of the risk, to improve the management process.

As it is a dynamic assessment process, risk management requires the participation of parties according to the following steps:

- 1. Risk Management Policy:** To define risks' evaluation criteria and best practices.
- 2. Risk Identification:** To apply different identification techniques in order ease the risk identification process. A Risk identification technique could be the "What-if" Technique (SWIFT).
- 3. Risk Analysis:** To determine causes, probabilities, and potential impact of the risks. Techniques such as techniques such as sensitivity analysis, probability analysis and Delphi Method can be applied to prioritize risks.
- 4. Mitigation measure (MM):** To define measures aiming at reducing, limiting, or neutralizing any negative impact of a risk.
- 5. Risk Monitoring and Reporting:** To monitor and review the risk profile, updating the risk register.

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<sup>1</sup> PMI Risk Management <https://www.pmi.org/learning/library/risk-management-9096>

<sup>2</sup> PRINCE2 Wiki, Risk Management Approach <https://prince2.wiki/management-products/risk-management-approach/>



## 3.1. Risk management policy

Risk management criteria and principles are described in this chapter, along with roles and responsibilities.

### 3.1.1. Guiding principles

1. Each task manager is responsible for managing the risks related to his own tasks. He/she will be responsible for the risks of the specific task. Identified risks will be mitigated by involving higher level leaders, in order: Task leader, Delivery leader, Work package leader, Project Management Team.
2. Risk prioritization is realized according to the relevance of its impact. Risk reassessment is performed twice a year, in parallel with the project reporting.
3. A detailed documentation of the risks will be performed, including history, mitigation measures and evolutions. At the end of each project phase, a review of the documentation will be carried out to analyse the lessons learned and improve the risk management.

### 3.1.2. Risk Criteria

1. Identification:
  - Probability of Occurrence rating (%)
  - Impact Score (1-9)
  - Area categorisation (Technical, Financial, etc.)
2. Analysis
  - Review of potential risks' information such as historical data and revision of the ongoing tasks.
  - Establishment of Risk Level values (severity) according to the probability level and impact score defined during the identification of risks stage.
  - The impact will be reflected in
    - The objectives of the task/project
    - The deadline
    - The budget
  - Three levels of risk prioritisation (Low, Medium, High), according to a table of risk priority settings.
3. Mitigation measure
  - After a risk identification, a mitigation measure plan will be elaborated to effectively respond to such event.
  - A risk register will be elaborated including:
    - Approaches to control, avoid, minimize, or otherwise mitigate the risk.
    - Mitigation measure, in form of steps to be taken if the risk eventually occurs.
    - Risk ID
    - Category
    - Report Date
    - Description of the Risk Origin or Cause

- Probability
- Impact
- Prioritization
- Date of activation and date of deactivation
- Owner
- Current status

#### 4. Monitoring and reporting

- Monitoring and reporting of risks will follow the format asked by the EC for the reporting period reports – form A.

### 3.1.3. Roles & Responsibilities

1. Risk Steering Committee is responsible for:
  - Developing and implementing the risk management policy for the project.
  - Assigning and enforcing roles and responsibilities regarding the RP.
  - Approving the RP.
  - Participating in the risk management process and taking ownership of risk mitigation.
  - Making the final decision on risk actions.
2. Risk Manager is responsible for leading the risk management process, sponsoring risk identification activities, facilitating communication, and ensuring the Risk Database is maintained and updated. The Risk Manager is also responsible for providing the Risk Steering Committee with recommendations and statuses on risk actions.
3. Risk Owners are the members of the team responsible for managing individual risks.

## 3.2. Risk Identification

The identification of project risks will be a joint effort of all project members. The consortium partners will apply different risk identification techniques, e.g. by using the "What-if" technique (SWIFT), by brainstorming or simply by direct observation. For each milestone, those responsible for the work package and the tasks involved will describe the internal and external events that may influence the achievement of the proposed objectives. This analysis will also consider experience from other projects, published metrics and data, review of project information including plans, analyses and designs, and checklists.

## 3.3. Risk identification Criteria

Each risk will be rated according to its probability and the possible impact on the project. The rating will be developed at three levels: Objectives, Budget and Deadlines.

### 3.4. Risk Analysis

The purpose of the risk analysis is to determine the causes of the risks and estimate their probability and potential consequences or impacts on the project's objectives, schedule, and resources (Table 1). The prioritization of each risk will be based on the analysis and its potential impact on the project using techniques such as sensitivity analysis, probability analysis and the Delphi method.

As a result of the risk analysis, it will be possible to measure the severity of the risk, translated into its level. The level of the risk will be calculated through its probability of occurrence (0 - 0.9) and its impact on objectives, budget/resources, and timelines (0 - 9) (Table 2). This will allow effective prioritization of the risk through the probability and impact matrix (Table 3 and Table 4).

Table 1. Probability Rating, Impact Score and Categories

Probability of Occurrence rating (%)	Impact Score (1-9)	Categories
Unlikely (0,1 – 0,3)	Low (1 - 3)	Administrative and Management Risk. Technological Risks.
Moderately Likely (0,3– 0,5)	Moderate (4– 6)	Market Risks. Financial Risks.
Highly Likely (0,5 – 0,9)	High (7 – 9)	Contractors and Subcontractors and suppliers risks. Human Resources Skills. Team Structure and performance. Environmental Risks: legal, commercial, political, social, economic, natural, infrastructure, etc. Pilot Specific Risks.

Table 2. Risk Levels

			Probability of occurrence		
			Unlikely	Moderately Likely	Highly Likely
Impact score	Low	Objective	Very low	Very low	Low
		Deadline	Very low	Very low	Low
		Budget	Very low	Very low	Low
	Moderate	Objective	Low	Medium	High
		Deadline	Low	Low	Medium
		Budget	Low	Medium	High
	High	Objective	High	Very high	Very high
		Deadline	Medium	High	High
		Budget	High	Very high	Very high

Table 3. Risk Prioritization

Priority	Description
<b>H</b>	<b>Highest priority.</b> If this type of risk is detected, special care will be taken, and all efforts and resources will be directed to avoid or solve it in the shortest time. If needed, extra resources will be directed to assist with the implementation of the resolution.
<b>M</b>	<b>Medium Priority.</b> Appropriate efforts and resources will be destined to avoid, mitigate, or solve the risk timely.
<b>L</b>	<b>Lower Priority.</b> Adequate efforts and resources will be designed to avoid, mitigate, or solve the risk timely.

Table 4. Risk Priorities setting (Probability and Impact Matrix)

			Probability of occurrence		
			Unlikely	Moderately Likely	Highly Likely
<b>Impact score</b>	Low	Objective	L	L	L
		Deadline	L	L	L
		Budget	L	L	L
	Moderate	Objective	L	M	H
		Deadline	L	M	H
		Budget	L	M	H
	High	Objective	M	H	H
		Deadline	M	H	H
		Budget	M	H	H

### 3.5. Risk Mitigation measures

Risk mitigation techniques will be implemented to prevent or decrease the likelihood of potential risks. These measures will be devised to restrict or nullify any adverse consequences of a specific risk if it does occur. This will involve outlining a series of actions to address the issue effectively. To monitor risks and respond promptly to any incidents, a Risk Register containing all the relevant information will be implemented, as outlined in Table 5.

Table 5. Risk Register Template

<b>Risk ID:</b> <#>	<b>Short description:</b> <Description of the origin or cause of the risk>		
<b>Priority:</b> High / Medium / Low		<b>Activated:</b> Yes (Red) /No (Green)	
<b>Report Date:</b> <risk was registered>	<b>Category:</b> <e.g. technological>	<b>Probability:</b> <e.g. Low>	<b>Impact:</b> <e.g. Moderate>
<b>Risk level:</b> <e.g. Low>			
<b>Description of the Risk:</b> <There is a Risk that [Risk Source] causes [Consequences] that impacts [Project specific objectives, schedule, resources ...]>			
<b>Mitigation Measure:</b> <Describe the actions that will be taken to deal with the situation if this risk factor becomes a problem.>			
<b>Activation date:</b> <State the date the mitigation measure implementation was begun.>		<b>Deactivation deadline:</b> <State a date by which the mitigation measure is to be implemented.>	
<b>Current Status:</b> <Describe the status and effectiveness of the risk mitigation actions as of the date of this report.>			

### 3.6. Risk monitoring and reporting

In case of identification of a new risk or changes detected in the status of a risk, these will be recorded and updated. As this is a living document, it will be updated and revised in parallel to the development of the Project, serving both as a risk database and as a risk monitoring document that records any useful information for risk management. To provide adequate control and ensure the correct development of the project, each risk owner will regularly monitor the evolution of the assigned risk. Risk monitoring and reporting shall conform to the reporting format requested by the EC and represented in Table 6, Table 7 and Table 8 below.

Table 6. Foreseen Risks template

<b>Risk Number</b>	<b>Risk Description</b>	<b>Involved Work Packages</b>	<b>Proposed mitigation measures</b>
Read Only	Read Only	Read Only	Read Only

(The table is read-only and it is provided as a reference for the State of Play in Table 8.)

Table 7. Unforeseen risks template

<b>Risk Number</b>	<b>Risk Description</b>	<b>Involved Work Packages</b>	<b>Proposed mitigation measures</b>

Table 8. States of the Play for Risk Mitigation template

<b>Risk Number</b>	<b>Period</b>	<b>Did your risk materialize?</b>	<b>Did your risk materialize?</b>	<b>Comments</b>
		[YES/NO]	[YES/NO]	

## 4. Risk registers database

Table 9 provides a first list of the risks identified at the proposal level, together with their impact, risk level and priority given. It also indicates the risks that have been activated during the period under review.

### 4.1. Risk register summary table.

Table 9. Risk register summary table.

ID#	Type of Risk	Impact	Risk Level	Risk Priority	Activated
R1	Delays of key deliverables.	Administration / Management	Med	High	
R2	Conflict amongst the partners. Withdrawal.	Administration / Management	Low	Med	
R3	IPR conflict risk.	Administration / Management	Med	Med	
R4	Financial Risk – bankruptcy of any of the partners.	Administration / Management	Low	Med	
R5	Radio-frequency technology not suitable for full-scale prototype.	Technological	Low	High	
R6	Storage technologies not well integrated with the grid.	Technological	Med	Med	
R7	Tools provided are not based on the cloud nor web APIs.	Technological	Low	High	
R8	Not enough time to integrate the tools and technologies.	Technological	Low	Med	
R9	Not compatible of different software developed by partners.	Technological	Low	Med	
R10	Facilities are inappropriate to demonstrate the ICT solution.	Technological	Low	Low	
R11	Raw materials costs increasing or difficult supply.	Technological	High	High	
R12	Alternative solutions come first into the market.	Market	Med	Med	
R13	HYSTORE solutions not accepted by the market.	Market	Med	Med	
R14	Variability in economic and legal aspects and incentives across	Market	Med	Low	

	regions.			
R15	Low stakeholders' engagement.	Market	Med	Low
R16	Storage solutions installation having problems in term of space and safety compatibility.	Pilot Specific	Low	Low
R17	Buildings chosen prove to be inappropriate to demonstrate the storage solutions.	Pilot Specific	Low	High
R18	Delays due to missing permits or tendering issues.	Pilot Specific	Med	High
R19	Data privacy issues to be ensured and conserved.	Pilot Specific	Low	Low

## 4.2. Risk Register

<b>Risk ID:</b> R1	<b>Short description:</b> <i>Delays of key deliverables.</i>		
<b>Priority:</b> <i>High</i>		<b>Activated:</b> <i>No</i>	
<b>Report Date:</b> <i>01/01/2023</i>	<b>Category:</b> Administration / Management	<b>Probability:</b> <i>Low</i>	<b>Impact:</b> <i>Moderate</i>
<b>Risk level:</b> Medium			
<b>Description of the Risk:</b> Delays in providing/submitting key deliverables and/or project milestones.			
<b>Proposed Mitigation Measure:</b> During the tasks' duration planning, enough time has been allocated to each specific activity, according to the efforts involved in each task. Milestones are placed to proactively control the higher risk technical portion of the work program where interdependencies may become critical. Moreover, in the event the deadline cannot be met/ a provisional draft will be realised allowing any interdependency actions to be carried out. Milestones are placed to proactively control the higher risk technical portion of the work program where interdependencies may become critical.			
<b>Activation date:</b> -		<b>Deactivation deadline:</b> -	
<b>Current Status:</b> -			

<b>Risk ID:</b> R2	<b>Short description:</b> <i>Conflict amongst the partners. Withdrawal.</i>		
<b>Priority:</b> <i>Medium</i>		<b>Activated:</b> <i>No</i>	
<b>Report Date:</b> <i>01/01/2023</i>	<b>Category:</b> Administration / Management	<b>Probability:</b> <i>Low</i>	<b>Impact:</b> <i>Moderate</i>
<b>Risk level:</b> Low			

<b>Description of the Risk:</b> Conflict amongst the partners which could even result in some of them withdrawing.	
<b>Proposed Mitigation Measure:</b> Each partner has a clear and defined role. Each partner has scientific and/or commercial interests. WP7 will deliberately treat project foreground (exploitable results) along the project length to minimise conflict potential. Conflict resolution measures clearly assigned and agreed upon in the Consortium Agreement.	
<b>Activation date:</b> -	<b>Deactivation deadline:</b> -
<b>Current Status:</b> -	

<b>Risk ID:</b> R3	<b>Short description:</b> IPR Conflict Risk		
<b>Priority:</b> Medium		<b>Activated:</b> No	
<b>Report Date:</b> 01/01/2023	<b>Category:</b> Administration / Management	<b>Probability:</b> Low	<b>Impact:</b> Moderate
<b>Risk level:</b> Med			
<b>Description of the Risk:</b> Some partners may not agree with the IPR rules, with negative impact on the exploitation and dissemination of the results.			
<b>Proposed Mitigation Measure:</b> Deliberate task on IPR management under leadership of R2M. A first analysis of IPR- related issues will be performed early in the project via a first internal version of the Exploitable Results Table (later D7.1) CA guidelines. Moreover, the Project Management Team will take appropriate action for protecting, sharing, and developing the intellectual property rights of the project. This will have to follow the H2020 rules and regulations on knowledge and intellectual property rights.			
<b>Activation date:</b> -		<b>Deactivation deadline:</b> -	
<b>Current Status:</b> -			

<b>Risk ID:</b> R4	<b>Short description:</b> Financial Risk – bankruptcy of any of the partners.		
<b>Priority:</b> Medium		<b>Activated:</b> No	
<b>Report Date:</b> 01/01/2023	<b>Category:</b> Administration / Management	<b>Probability:</b> Low	<b>Impact:</b> Moderate
<b>Risk level:</b> Low			
<b>Description of the Risk:</b> Financial Risk that could imply the bankruptcy of a partner, which could have an impact in quality, time, cost, scope and resources.			
<b>Proposed Mitigation Measure:</b> All partners are financially sound to the knowledge of the Coordinator. Several partners do operate in the engineering sector which has been volatile. That market is showing signs of improvement and within it, sustainability aspects are the growth areas. Moreover, partners with similar profile will be involved to apply the provisions of the Grant Agreement (GA). Consortium has sufficient strength and diversity so that other partners can assume more tasks besides their own ones.			



<b>Activation date:</b> -	<b>Deactivation deadline:</b> -
<b>Current Status:</b> -	

<b>Risk ID:</b> R5	<b>Short description:</b> <i>Radio-frequency technology not suitable for full-scale prototype.</i>		
<b>Priority:</b> High		<b>Activated:</b> No	
<b>Report Date:</b> 01/01/2023	<b>Category:</b> Technological	<b>Probability:</b> Med	<b>Impact:</b> Moderate
<b>Risk level:</b> Low			
<b>Description of the Risk:</b> Radio-frequency technology proven at lab scale but not suitable for full-scale prototype.			
<b>Proposed Mitigation Measure:</b> The main risk is related to the real overall efficiency of the system and to possible technical issues (such as geometrical dimension/ maximum rated voltage/ overall cost) in the implementation of the pilot unit. With the aim of using electrical energy coming from renewable sources, silica grains (positioned in a part of the volume) will be charged with metallic particles to increase their electrical conductivity: thanks to high voltage techniques it will be possible to deliver heat to the interested volume by means of current heating. High attention will be paid on the bushing to avoid electrical discharge and on the metallic particles density to avoid non-uniform heating.			
<b>Activation date:</b> -		<b>Deactivation deadline:</b> -	
<b>Current Status:</b> -			

<b>Risk ID:</b> R6	<b>Short description:</b> <i>Storage technologies not well integrated with the grids.</i>		
<b>Priority:</b> Medium		<b>Activated:</b> No	
<b>Report Date:</b> 01/01/2023	<b>Category:</b> Technological	<b>Probability:</b> Med	<b>Impact:</b> Moderate
<b>Risk level:</b> Med			
<b>Description of the Risk:</b> Thermal energy storage technologies not able to integrate properly into the grids.			
<b>Proposed Mitigation Measure:</b> Strong commitment of all partners in the development of easy to integrate technologies will lead to their realization following the general specifications from WP1. Clear and agreed technical specifications and operative requirements will be defined before the actual constructions in relevant WPs. No deviation from requirements previously agreed within M12 will be accepted/ nevertheless further technologies adaptation activities could be arranged postponing 3-4 months the demonstration monitoring phase also beyond project end.			
<b>Activation date:</b> -		<b>Deactivation deadline:</b> -	
<b>Current Status:</b> -			

<b>Risk ID:</b> R7	<b>Short description:</b> <i>Tools provided are not based on the cloud nor web APIs.</i>		
<b>Priority:</b> High		<b>Activated:</b> No	
<b>Report Date:</b> 01/01/2023	<b>Category:</b> Technological	<b>Probability:</b> Med	<b>Impact:</b> Moderate
<b>Risk level:</b> Low			
<b>Description of the Risk:</b> Tools provided are not based on the cloud nor web APIs.			
<b>Proposed Mitigation Measure:</b> STAM and MASTON can and will undergo the effort of developing such webAPIs of specific tools in order to successfully integrate them within HYSTORE platform.			
<b>Activation date:</b> -		<b>Deactivation deadline:</b> -	
<b>Current Status:</b> -			

<b>Risk ID:</b> R8	<b>Short description:</b> <i>Not enough time to integrate the tools and technologies.</i>		
<b>Priority:</b> Medium		<b>Activated:</b> No	
<b>Report Date:</b> 01/01/2023	<b>Category:</b> Technological	<b>Probability:</b> Low	<b>Impact:</b> Moderate
<b>Risk level:</b> Low			
<b>Description of the Risk:</b> Not enough time to integrate the tools and technologies.			
<b>Proposed Mitigation Measure:</b> 30 months are planned for technological integration in WP2/ WP3 and WP4. The process will be closely monitored; intermediate phases will provide check points to ensure schedule respect and any anticipated delays will be discussed during the General Assembly meetings.			
<b>Activation date:</b> -		<b>Deactivation deadline:</b> -	
<b>Current Status:</b> -			

<b>Risk ID:</b> R9	<b>Short description:</b> <i>No compatibility of different software developed by partners.</i>		
<b>Priority:</b> Medium		<b>Activated:</b> No	
<b>Report Date:</b> 01/01/2023	<b>Category:</b> Technological	<b>Probability:</b> Low	<b>Impact:</b> Moderate
<b>Risk level:</b> Low			
<b>Description of the Risk:</b> Not compatible of different software developed by partners.			
<b>Proposed Mitigation Measure:</b> All software and operating systems developed in HYSTORE will be ensured as open-source/ and can be customized by introducing simple API play-			

and-connect methods. In addition/ the aggregation operating system will be developed considering detailed national and regional regulations and legal requirements to make sure the regulatory aspects are also met.	
<b>Activation date:</b> -	<b>Deactivation deadline:</b> -
<b>Current Status:</b> -	

<b>Risk ID:</b> R10	<b>Short description:</b> <i>Facilities are inappropriate to demonstrate the ICT solution.</i>		
<b>Priority:</b> Low		<b>Activated:</b> No	
<b>Report Date:</b> 01/01/2023	<b>Category:</b> Technological	<b>Probability:</b> Low	<b>Impact:</b> Moderate
<b>Risk level:</b> Low			
<b>Description of the Risk:</b> Facilities are inappropriate to demonstrate the ICT solution.			
<b>Proposed Mitigation Measure:</b> MASTON will deploy the necessary ICT infrastructure to meet the demands of the developments thanks to its strong expertise and skills. In this sense/ the risk will be detected early in the project and the validation plan will seek to operate ICT solution on a smaller scale focusing on a specific part of a facility.			
<b>Activation date:</b> -		<b>Deactivation deadline:</b> -	
<b>Current Status:</b> -			

<b>Risk ID:</b> R11	<b>Short description:</b> <i>Raw materials costs increasing or difficult supply.</i>		
<b>Priority:</b> High		<b>Activated:</b> No	
<b>Report Date:</b> 01/01/2023	<b>Category:</b> Technological	<b>Probability:</b> Low	<b>Impact:</b> Moderate
<b>Risk level:</b> High			
<b>Description of the Risk:</b> Raw materials costs increasing or difficult supply.			
<b>Proposed Mitigation Measure:</b> Raising costs trend of overall raw materials is expected for the future raw materials/ not only the bio-based ones but also traditional (e.g., aluminium/ concrete & ceramics...). Budget flexibility has already been considered to consider these issues. Moreover, all the core materials (TCM/ PCM...) needed for the project are widely abundant and can be outsourced from different markets.			
<b>Activation date:</b> -		<b>Deactivation deadline:</b> -	
<b>Current Status:</b> -			

<b>Risk ID:</b> R12	<b>Short description:</b> <i>Alternative solutions come first into the market.</i>		
<b>Priority:</b> Medium		<b>Activated:</b> No	

<b>Report Date:</b> 01/01/2023	<b>Category:</b> Market	<b>Probability:</b> Low	<b>Impact:</b> Moderate
<b>Risk level:</b> Med			
<b>Description of the Risk:</b> Alternative solutions come first into the market.			
<b>Proposed Mitigation Measure:</b> HYSTORE will follow a scheduled progress to guarantee minimal risks. However, continuous supervision of the market and IPR will be made by the Innovation Leader to help decision making process and ensure the exploitation of results (WP7).			
<b>Activation date:</b> -		<b>Deactivation deadline:</b> -	
<b>Current Status:</b> -			

<b>Risk ID:</b> R13	<b>Short description:</b> <i>HYSTORE solutions not accepted by the market.</i>		
<b>Priority:</b> Medium		<b>Activated:</b> No	
<b>Report Date:</b> 01/01/2023	<b>Category:</b> Market	<b>Probability:</b> Low	<b>Impact:</b> Moderate
<b>Risk level:</b> Med			
<b>Description of the Risk:</b> HYSTORE solutions not accepted by the market.			
<b>Proposed Mitigation Measure:</b> Innovative business models will be investigated (First business model at M30) to meet the best interaction with the stakeholders/ the market and the end users. Continuous supervision of the market will be made to provide support for the business model definition.			
<b>Activation date:</b> -		<b>Deactivation deadline:</b> -	
<b>Current Status:</b> -			

<b>Risk ID:</b> R14	<b>Short description:</b> <i>Variability in economic and legal aspects and incentives across.</i>		
<b>Priority:</b> Low		<b>Activated:</b> No	
<b>Report Date:</b> 01/01/2023	<b>Category:</b> Market	<b>Probability:</b> Low	<b>Impact:</b> Moderate
<b>Risk level:</b> Med			
<b>Description of the Risk:</b> Variability in economic and legal aspects and incentives across regions.			
<b>Proposed Mitigation Measure:</b> HYSTORE will assess and evaluate legal regulations and incentives in detail within WP1/ develop flexible and modular models that can address variability. Monitoring activities will foresee any change in the incentives and legal aspects which will be translated to the consortium for adaptation.			
<b>Activation date:</b> -		<b>Deactivation deadline:</b> -	

<b>Current Status:</b> -
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<b>Risk ID:</b> R15	<b>Short description:</b> <i>Low stakeholders' engagement.</i>		
<b>Priority:</b> Low		<b>Activated:</b> No	
<b>Report Date:</b> 01/01/2023	<b>Category:</b> Market	<b>Probability:</b> Low	<b>Impact:</b> Moderate
<b>Risk level:</b> Med			
<b>Description of the Risk:</b> Low stakeholders' engagement.			
<b>Proposed Mitigation Measure:</b> Use of different techniques/ tools and channels and support engagement and encourage interest in the actions. Extensive experience from recent European projects results and publications as own experience guarantee the use of efficient resources to encourage and attain high levels of engagement/ participation and collaboration. Expert group from CNR will deploy the engagement strategy already from the beginning of the project tailored according to site-specific cases.			
<b>Activation date:</b> -		<b>Deactivation deadline:</b> -	
<b>Current Status:</b> -			

<b>Risk ID:</b> R16	<b>Short description:</b> <i>Storage solutions installation having problems in term of space and safety compatibility.</i>		
<b>Priority:</b> Low		<b>Activated:</b> No	
<b>Report Date:</b> 01/01/2023	<b>Category:</b> Pilot Specific	<b>Probability:</b> Low	<b>Impact:</b> Moderate
<b>Risk level:</b> Low			
<b>Description of the Risk:</b> Storage solutions installation having problems in term of space and safety compatibility.			
<b>Proposed Mitigation Measure:</b> Specific tasks for the analysis of regulatory framework requirements have been included in the project (WP1-7). In particular, within WP1 and WP8 local stakeholders, including technicians and end users, will be involved in the design process.			
<b>Activation date:</b> -		<b>Deactivation deadline:</b> -	
<b>Current Status:</b> -			

<b>Risk ID:</b> R17	<b>Short description:</b> <i>Buildings chosen prove to be inappropriate to demonstrate the storage solutions.</i>		
<b>Priority:</b> High		<b>Activated:</b> No	
<b>Report Date:</b> 01/01/2023	<b>Category:</b> Pilot Specific	<b>Probability:</b> Low	<b>Impact:</b> Moderate
<b>Risk level:</b> Low			

<b>Description of the Risk:</b> Buildings chosen prove to be inappropriate to demonstrate the storage solutions.	
<b>Proposed Mitigation Measure:</b> 2 of the pilots chosen are within university campus own by HYSTORE partners and allow several alternative solutions within the same climatic and use case conditions for testing. The pilots in Spain and Austria also includes several multi-purpose areas that can be used for proper matching of the technologies.	
<b>Activation date:</b> -	<b>Deactivation deadline:</b> -
<b>Current Status:</b> -	

<b>Risk ID:</b> R18	<b>Short description:</b> <i>Delays due to missing permits or tendering issues.</i>		
<b>Priority:</b> High		<b>Activated:</b> No	
<b>Report Date:</b> 01/01/2023	<b>Category:</b> Pilot Specific	<b>Probability:</b> Low	<b>Impact:</b> Moderate
<b>Risk level:</b> Med			
<b>Description of the Risk:</b> Delays due to missing permits or tendering issues.			
<b>Proposed Mitigation Measure:</b> 2 of the pilots chosen are within university campus own by HYSTORE partners and therefore tendering processes are simplified/ the pilot in Austria is owned by PINK and has already been used for similar purposes in the past/ the pilot in Spain is owned by CRM and managed by ARC who is aware of buildings conditions. Specific tasks have been foreseen within WP1 and WP6 to collect all data well in advance of the installation of HYSTORE thus allowing proper scheduling of all tendering and formalities. Moreover, the validation plan will seek to install and operate the storage solution on a smaller scale focusing on a specific part of a facility easing the burden of the construction permits and tendering process.			
<b>Activation date:</b> -		<b>Deactivation deadline:</b> -	
<b>Current Status:</b> -			

<b>Risk ID:</b> R19	<b>Short description:</b> <i>Data privacy issues to be ensured and conserved.</i>		
<b>Priority:</b> Low		<b>Activated:</b> No	
<b>Report Date:</b> 01/01/2023	<b>Category:</b> Pilot Specific	<b>Probability:</b> Low	<b>Impact:</b> Moderate
<b>Risk level:</b> Low			
<b>Description of the Risk:</b> Data privacy issues to be ensured and conserved.			
<b>Proposed Mitigation Measure:</b> During the data collections/ each task in WP4 and WP5 will go through a complete data privacy auditing/ including also developing methods of minimizing the needed data using decentralized optimization methods. In this case/ we will ensure that both technical and non-technical issues with respect to data privacy are respected. In additional/ one of the key motivations of developing data analytics on edge is to preserve data privacies without sending all data to the cloud or BMS systems. The innovation itself will apply data privacy concerns.			

<b>Activation date:</b> -	<b>Deactivation deadline:</b> -
<b>Current Status:</b> -	

## 5. Risk reporting (EC format)

### 5.1. Foreseen risks

Table 10. Foreseen Risks

ID#	Description of Risk	Involved WPs	Mitigation measure
R1	Delays of key deliverables. P: Med/ S: High	WP1 WP2 WP3 WP4 WP5	In the event the deadline cannot be met/ a provisional draft will be realised allowing any interdependency actions to be carried out. Milestones are placed to proactively control the higher risk technical portion of the work program where interdependencies may become critical.
R2	Conflict amongst the partners. Withdrawal. P; Low/ S: High	WP8 WP9	Each partner has a clear and defined role. Each partner has scientific and/or commercial interests. WP8 will deliberately treat project foreground (exploitable results) along the project length to minimize conflict potential. Conflict resolution measures clearly assigned and agreed upon in the Consortium Agreement.
R3	IPR conflict risk. P: Low/ S: High	All	Deliberate task on IPR management under leadership of R2M. Detailed IPR management defined during CA. R2M will provide continuous guidance for managing IPR definition and conflicts.
R4	Financial Risk/ bankruptcy of any of the partners. P: Low/ S: Med	WP9	All partners are financially sound/ but in case of bankruptcy of any partner/ the rest of the Consortium will assume the tasks of the partner leaving the project/ or a new partner would be invited to join the Consortium.



R5	Storage technologies not well integrated with the grids. P: Med/ S: Med	WP2 WP3	Strong commitment of all partners in the development of easy to integrate technologies will lead to their realization following the general specifications from WP1. Clear and agreed technical specifications and operative requirements will be defined before the actual constructions in relevant WPs. No deviation from requirements previously agreed within M12 will be accepted/ nevertheless further technologies adaptation activities could be arranged postponing 3-4 months the demonstration monitoring phase also beyond project end.
R6	Radio-frequency technology not suitable for full-scale prototype. P: Low/ S: High	WP2 WP3 WP6	The main risk is related to the real overall efficiency of the system and to possible technical issues (such as geometrical dimension/ maximum rated voltage/ overall cost) in the implementation of the pilot unit. With the aim of using electrical energy coming from renewable sources, silica grains (positioned in a part of the volume) will be charged with metallic particles to increase their electrical conductivity: thanks to high voltage techniques it will be possible to deliver heat to the interested volume by means of current heating. High attention will be paid on the bushing to avoid electrical discharge and on the metallic particles density to avoid non-uniform heating.
R7	Tools provided are not based on the cloud nor web APIs. P: Low/ S: High	WP3 WP4	STAM and MASTON can and will undergo the effort of developing such webAPIs of specific tools in order to successfully integrate them within HYSTORE platform.
R8	Not enough time to integrate the tools and technologies. P: Low/ S: Med	WP2 WP3 WP4	30 months are planned for technological integration in WP2/ WP3 and WP4. The process will be closely monitored; intermediate phases will provide check points to ensure schedule respect and any anticipated delays will be discussed during the General Assembly meetings.

R9	Not compatible of different software developed by partners. P: Low/ S: Med	WP4 WP5	All software and operating systems developed in HYSTORE will be ensured as open-source/ and can be customized by introducing simple API play-and-connect methods. In additional/ the aggregation operating system will be developed considering detailed national and regional regulations and legal requirements to make sure the regulatory aspects are also met.
R10	Facilities are inappropriate to demonstrate the ICT solution. P: Low/ S: Low	WP6	MASTON will deploy the necessary ICT infrastructure to meet the demands of the developments thanks to its strong expertise and skills. In this sense/ the risk will be detected early in the project and the validation plan will seek to operate ICT solution on a smaller scale focusing on a specific part of a facility.
R11	Raw materials costs increasing or difficult supply. P: High/ S: High	WP5	Raising costs trend of overall raw materials is expected for the future raw materials/ not only the bio-based ones but also traditional (e.g. aluminium/ concrete & ceramics...). Budget flexibility has already been considered to take into account these issues. Moreover/ all the core materials (TCM/ PCM...) needed for the project are widely abundant and can be outsourced from different markets.
R12	Alternative solutions come first into the market. P: Med/ S: Med	All	HYSTORE will follow a scheduled progress to guarantee minimal risks. However/ continuous supervision of the market and IPR will be made by the Innovation Leader to help decision making process and ensure the exploitation of results (WP7).
R13	HYSTORE solutions not accepted by the market. P: Low/ S: Low	All	Innovative business models will be investigated (First business model at M30) to meet the best interaction with the stakeholders/ the market and the end users. Continuous supervision of the market will be made to provide support for the business model definition.

R14	Variability in economic and legal aspects and incentives across regions. P: Med/ S: Low	WP1	HYSTORE will assess and evaluate legal regulations and incentives in detail within WP1/ develop flexible and modular models that can address variability. Monitoring activities will foresee any change in the incentives and legal aspects which will be translated to the consortium for adaptation.
R15	Low stakeholders' engagement. P: Med/ S: Low	WP6/7/ 8	Use of different techniques/ tools and channels and support engagement and encourage interest in the actions. Extensive experience from recent European projects results and publications as own experience guarantee the use of efficient resources to encourage and attain high levels of engagement/ participation and collaboration. Expert group from CNR will deploy the engagement strategy already from the beginning of the project tailored according to site-specific cases.
R16	Storage solutions installation having problems in term of space and safety compatibility. P: Low/ S: Low	WP6	Specific tasks for the analysis of regulatory framework requirements have been included in the project (WP1-7). In case of problems for compatibility local National technical committees will be interrogated for specific consultancy.
R17	Buildings chosen prove to be inappropriate to demonstrate the storage solutions. P: Low/ S: High	WP6	2 of the pilots chosen are within university campus own by HYSTORE partners and allow several alternative solutions within the same climatic and use case conditions for testing. The pilots in Spain and Austria also includes several multi-purpose areas that can be used for proper matching of the technologies.
R18	Demo site leaving. P: Med/ S: Low	WP6	Demonstration sites are embedded in the project from start bring a wealth of data and experience. Demo sites being the main beneficiaries of the tools are unlikely to leave. In case a demonstrator leaves the project/ partners network will seek to quickly incorporate another demo site.

R19	Delays due to missing permits or tendering issues. P: Med/ S: High	WP6	2 of the pilots chosen are within university campus own by HYSTORE partners and therefore tendering processes are simplified/ the pilot in Austria is owned by PINK and has already been used for similar purposes in the past/ the pilot in Spain is owned by CRM and managed by ARC who is aware of buildings conditions. Specific tasks have been foreseen within WP1 and WP6 to collect all data well in advance of the installation of HYSTORE thus allowing proper scheduling of all tendering and formalities.
R20	Data privacy issues to be ensured and conserved. P: Low/ S: Low	all	During the data collections/ each task in WP4 and WP5 will go through a complete data privacy auditing/ including also developing methods of minimizing the needed data using decentralized optimization methods. In this case/ we will ensure that both technical and non-technical issues with respect to data privacy are respected. In additional/ one of the key motivations of developing data analytics on edge is to preserve data privacies without sending all data to the cloud or BMS systems. The innovation itself will apply data privacy concerns.

## 5.2. Unforeseen risks

No unforeseen risks.

## 5.3. State of play for risk mitigation

Table 11. State of play for risk mitigation

ID#	Period	Did you apply risk mitigation measures?	Did your risk materialize?	Comments
R1	M1-M6	NO	NO	
R2	M1-M6	NO	NO	
R3	M1-M6	NO	NO	
R4	M1-M6	NO	NO	
R5	M1-M6	NO	NO	

## D9.2 Risk and contingency management plan

R6	M1-M6	NO	NO	
R7	M1-M6	NO	NO	
R8	M1-M6	NO	NO	
R9	M1-M6	NO	NO	
R10	M1-M6	NO	NO	
R11	M1-M6	NO	NO	
R12	M1-M6	NO	NO	
R13	M1-M6	NO	NO	
R14	M1-M6	NO	NO	
R15	M1-M6	NO	NO	
R16	M1-M6	NO	NO	
R17	M1-M6	NO	NO	
R18	M1-M6	NO	NO	
R19	M1-M6	NO	NO	
R20	M1-M6	NO	NO	

## 6. Conclusions

This report provides a set of procedures and work processes to identify and mitigate risks during the project.

A first set of foreseen risks is provided together with mitigation measures plan according to analysed risk priority and impact on the project. No risk has been activated. This Deliverable will be updated on project month 30.

## OUR TEAM



University College Dublin  
An Coláiste Ollscoile, Baile Átha Cliath



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