Energy Efficiency Performance-Tracking Platform for Benchmarking Savings and Investments in Buildings

Report on interoperability with external platforms

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Authors:	CIMNE - **Stoyan Danov, Eloi Gabaldon**

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Peer reviewed by:

Partner	Reviewer
Joule	Michael Pachlatko
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Abbreviations and Acronyms

Acronym	Description
API	Application Programming Interface
DDQS	DEEP Data Quality Supervisor
EEI	Energy Efficiency Investment
EEM	Energy Efficiency Measure
ENDQS	EN-TRACK Data Quality Supervisor
ENPA	EN-TRACK Platform Administrator
eQBD	eQuad Business Developer
eQPA	eQuad Platform Administrator
ESCO	Energy Service Company
ENUser	EN-TRACK User
DEEP	De-risking Energy Efficiency Platform
SEA	Sustainable Energy Asset

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1 Executive summary

The document reports on the development of interoperability of EN-TRACK with external platforms with a view towards the development of integrated services.

It covers the foreseen interoperability with the eQuad and DEEP platforms and the envisaged services are described as use cases, each designed for a specific functionality. Starting from the identified necessities and business context, the use cases are focused from the perspective of development and operation. Each use case description comprises objectives, involved actors, the necessary pre-conditions, and the steps for technical implementation and operation.

In relation to eQuad, a platform offering financial and technical assessment of energy efficiency projects and access to investors, EN-TRACK has defined three joint services that could be automated between EN-TRACK and eQuad, adding value to both platforms:

- Incorporation of data from eQuad into EN-TRACK
- Exporting of benchmarking data from EN-TRACK to eQuad
- Enabling access from EN-TRACK for financial assessment of new projects with eQuad

In relation to DEEP, an open database for de-risking of energy efficiency investments, two value-added services based on interoperability with EN-TRACK are defined:

- Obtaining of benchmarking data from DEEP in EN-TRACK
- Uploading of data from EN-TRACK to DEEP

The interoperability of data will benefit all platforms through data sharing and reusing of the collected data, setting a core of an ecosystem of complementary tools supporting energy efficiency investments. It will extend the data gathering capabilities of EN-TRACK, enable in eQuad access to benchmarking and new customers, and ensure continuous growth of the DEEP database, providing at the same time opportunities for cross-marketing among the platforms.

The development of integrated services requires technical implementation and appropriate commercial agreements which will be pursued within the scope of the project. The current document aims to provide a starting point for definition of services of mutual interest. As a public document, it is also useful as an example for definition of joint services with other platforms in the future.

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2 Background

Energy efficiency, particularly in buildings, has been highlighted as one of the most cost-effective means for the EU to address climate change, delivering not only energy savings and carbon reductions, but also providing numerous non-energy related ancillary benefits, such as improving the wellbeing and/or productivity of building occupants.

One of the principal challenges to increasing energy efficiency investments (EEI) is the lack of empirical data on the actual energy and cost savings they achieve. In recent years there has been a rapid increase in the generation of building and energy data, due to both technological developments and market and policy drivers. However, this data is still hard to access, aggregate, share and utilize because it is being housed in many decentralized databases, and in different formats. Consequently, only a small part of this information can be analysed, compared and benchmarked to produce reliable empirical evidence on the performance of the EEI necessary to decision-makers and investors.

Currently there are a variety of tools offering services supporting decision making on EEI. However, due to the lack of comparability and interoperability with other tools, it is difficult for these tools to achieve the critical mass of users for them to successfully take-off commercially. In this context, open-source software, common frameworks, standards and interoperability have been identified as tools have proven to successfully address this barrier and stimulate tremendous advances in other similar areas such as big data solutions.

EN-TRACK aims to contribute to meeting these challenges by creating an operational database, supporting portfolio benchmarking analysis built on available data from smart-metering and other sources, and by enabling an interoperable ecosystem of building energy efficiency data and tools. The driving motivation of all this work is to support technical and financial decision making in refurbishment of the existing building stock in order to make this a more mainstream financial activity.

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3 Introduction

EN-TRACK gathers massive data on the performance of energy efficiency investments (EEI) in buildings by enabling data acquisition from a variety of sources, including third party databases and tools. By offering services, such as building energy performance monitoring, benchmarking, and evaluation of the impact of investments, EN-TRACK enables its users with a powerful solution for collating data and information and obtaining valuable insights into the operational and energy performance characteristics of their buildings. Furthermore, it encourages users to become active data providers, thus fostering collection of empirical building performance and investments data from building owners on continuous manner.

EN-TRACK uses a standards-based open data model for internal data harmonisation. The good alignment of its data model with other external data platforms enables the possibility of exchanging data and developing joint services with these other platforms. This represents a first step to establishing an ecosystem of interoperable and complementary tools supporting EEI in buildings and further extending the access to new data.

This report addresses the interoperability of EN-TRACK with external platforms from the business and functionality perspectives with particular focus on the potential for integration with the eQuad and DEEP. Both platforms are active on the market providing services related to energy efficiency investments. The eQuad platform supports due diligence, standardised pre-financing analysis, and access to investors for energy efficiency projects. DEEP (De-risking Energy Efficiency Platform) provides a pan-European track record of market evidence for the risks and benefits from energy efficiency investments. EN-TRACK has complementary features to both platforms, offering significant potential synergies.

The development of integrated services with these platforms requires technical implementation on both sides, and appropriate commercial agreements, which will both be pursued within the scope of the project. This document provides a starting point for this process, by defining services of mutual interest and identifying the scope of the necessary technical implementation. As a public document, it is also useful as an example that can be used to facilitate the definition of joint services with other platforms in the future. The description of the concrete technical implementation and the related to it documentation is beyond the scope of this report.

The interoperability-based services of EN-TRACK with eQuad and DEEP are defined as use cases. The use cases describe the specific functionalities to be implemented and are intended to serve as a part of the specifications for the technical implementation. Each use case is presented in the following structure: Context and necessities, Objective, Main actors, Pre-conditions, and Use case implementation and operation.

The document is structured in the following way.

- Section 4 defines the interoperability services with eQuad.
- Section 5 defines the interoperability services with DEEP.
- Section 6 provides conclusions and outlines next steps.

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4 Interoperability with eQuad

eQuad is a platform that was created through the EU funded initiative SEAF H2020. The SEAF project aimed to significantly lower the entry barriers to finance for small to medium projects, by combining existing tools and protocols, namely Joule Assets' market valuation tool, the risk assessment methodology from insurance company HSB and the Investor Confidence Project's energy performance protocols. These three service tools have been integrated into an all-in-one, easy to use, single source valuation and risk assessment framework, the eQuad platform.

eQuad helps European sustainable energy assets (SEA) project managers (ESCOs, project developers) access appropriate project finance while lowering upfront due diligence costs for investors. The aim of the eQuad platform is to match SEA projects to appropriate financing solutions, which suit specific business needs as quickly as possible. Through eQuad, Joule Assets strategically vet project portfolios for investors within the Joule Assets investor network, representing hundreds of millions of Euros of ready-to-deploy capital. These projects are then bundled appropriately and presented to suitable investors.

Before projects are presented to potential investors, preliminary financial and technical due diligence is completed; contract review is performed prior to meeting an investor. This ensures that projects are eligible and meet a fund's specific investment criteria, thereby smoothing the path to and expediting successful investment. This technical and financial due diligence largely takes place in the platform as the users are required to upload all necessary documentation in eQuad for review and approval by Joule Assets.

The purpose of the interoperability of EN-TRACK with eQuad is, on the one hand, to use eQuad as a source for energy efficiency project data for EN-TRACK and, on the other hand, to provide joint services with added value for both platforms. In this way, EN-TRACK users will have a one stop shop for building insights and accessing financing solutions for potential project finance.

This section defines the use cases from which the needs for alignment of data and implementation of data exchange are derived. In eQuad, this will require certain updates to the platform to ensure alignment with the data entry and taxonomies.

The interoperability between platforms reinforces the cross-marketing capabilities among EN-TRACK and other external platforms offering synergistic services, further contributing to the overall goal of extending the services and the data gathering at wide scale. The interoperability with eQuad also provides further opportunities for connecting EN-TRACK with other platforms within Joule Assets' ecosystem.

4.1 Use case 1: Incorporation of data from eQuad into EN-TRACK

Context and necessities

eQuad gathers energy efficiency project information in a systematic way, evaluates technical and financial feasibility following standard quality assuring procedures, helping

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the projects achieve financing. Well substantiated projects are presented to investors and appropriate financing schemes are suggested.

In contrast, EN-TRACK gathers data on performance of EEI in buildings, and offers benchmarking services for de-risking and decision support for both building owners and financial institutions. The data coming from different sources comprises real operational data and projected data that is internally verified and classified according to its source, characteristics, and accuracy, ensuring full traceability.

eQuad operates at the European scale and is a valuable source of data for EN-TRACK.

Objective

The objective of this use case is to ensure the information from the projects evaluated in eQuad can feed EN-TRACK and increase its database for benchmarking of energy efficiency investments.

Main actors

- eQuad platform administrator (eQPA): responsible for the maintenance of the platform and the access to the database.
- eQuad business developer (eQBD): responsible for the customers, the definition of new services and the customer data control.
- EN-TRACK platform administrator (ENPA): responsible for the maintenance of the platform and the access to the database.
- EN-TRACK data quality supervisor (ENDQS): responsible for checking and controlling the quality of data incorporated in the platform.

Pre-conditions

The pre-condition is the identification of the relevant data fields of eQuad and appropriate mapping of them to the EN-TRACK data model. This is done as a preliminary step using a template with a description of each field in the EN-TRACK data model where the essential fields for a complete data entry are indicated.

Use case implementation and operation

The data exchange will be enabled as an automated service between both platforms.

The functionality is implemented and operated in the following steps:

1) The ENPA implements the eQuad's API client in the EN-TRACK platform.
2) The eQBD designs necessary platform adaptations.
3) The eQPA implements the above platform adaptations which will enable interoperability.
4) The ENPA implements the transformations from the eQuad format to the EN-TRACK's data model following the mapping provided on a template.

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5) The eQPA enables access to the eQuad data authorised from the eQBD for sharing with EN-TRACK.

6) First the data from eQuad obtained from EN-TRACK are allocated in the raw data storage database (HBASE) of the platform in the original eQuad format. Next, a data transformation to the EN-TRACK data model is applied and the transformed data is allocated in the harmonised database of EN-TRACK (Neo4J). Then, the new entry data is analysed for consistency and completeness and made available for validation and approval from the ENDQS in the EN-TRACK User Interface.

7) The ENDQS revises the data for completeness and consistency and approves them. Once the data are approved they are incorporated for use in the EN-TRACK benchmarking. Inconsistent or incomplete data is reported by the ENDQS to the eQPA. The corrected and completed data in eQuad are obtained again through the API.

   Alternative flow: The incomplete or inconsistent data can be filled or edited in the EN-TRACK User Interface or obtained again through the API once they have been corrected and updated in eQuad.

4.2 Use case 2: Exporting benchmarking data from EN-TRACK to eQuad

Context and necessities

The eQuad platform performs evaluation of engineering projects and pre-qualifies them for investment. A project in eQuad can be regarded as a package of actuations or EEMs together with the related investments.

EN-TRACK gathers large quantity of actual data on the performance of EEI in buildings and provides performance benchmarking of EEMs covering the energy, financial and emissions savings through a set of metrics (energy, cost and carbon saving intensities, NPV, IRR, payback, etc.)

The incorporation of benchmarking data from EN-TRACK will ensure compatibility of eQuad with pan-European benchmarks for realistically contrast the performance of evaluated projects, thus enhancing eQuad and improving the investor confidence.

Objective

The objective of this use case is to make available benchmarking data from EN-TRACK in the eQuad platform. The benchmarking data will be obtained as a statistical summary of the distribution of the specific performance indicators for a population of EEMs in EN-TRACK expressed through a set of values (mean, median, minimum, lower quartile (Q1), upper quartile (Q3) and maximum value).

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Main actors

- eQuad platform administrator (eQPA): responsible for the maintenance of the platform and the access to the database.
- eQuad business developer (eQBD): responsible for the customers, the definition of new services and the customer data control.
- EN-TRACK platform administrator (ENPA): responsible for the maintenance of the platform and the access to the database.
- EN-TRACK data quality supervisor (ENDQS): responsible for checking and controlling the quality of data incorporated in the platform.

Pre-conditions

Pre-condition is the definition of the indicators that need to be benchmarked in eQuad. The EEMs composing the eQuad projects should be mapped to the EEM taxonomy of EN-TRACK.

As the benchmarking in EN-TRACK is produced separately for each EEM type, each request of (benchmarking) data from EN-TRACK should include the list of EEMs comprised in the eQuad project to be benchmarked.

This also requires certain user input to be developed within the eQuad platform in order to enable the interoperability with EN-TRACK. This includes:

- Site area (m^2)
- Year of construction
- Building ownership
- Building use type

These are examples of data points which eQuad currently do not host and that will need to be implemented in order to enable the integration with EN-TRACK. When the data mapping of EN-TRACK and eQuad is complete it is likely that additional similar items will appear for development.

The indicators relevant for the eQuad platform were identified in the EN-TRACK deliverable D1.3 and are highly investor oriented:

- Energy Use Saving Intensity (EUSI) [kWh/m2/yr]
- Energy Cost Saving Intensity (ECSI) [€/m2/yr]
- Emissions Saving Intensity (ESI) [gCO_2/m2/yr]
- Normalised Investment Cost (NIC) [€/m2]
- Avoidance Cost (AC) [€/kWh]
- Simple Payback (SP) [years]
- Net Present Value (NPV) [€]
- Profitability index (PI)
- Internal Rate of Return (IRR) [%]

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The data to be exported on the above indicators are cross sectional benchmarking and simple tracking.

The above indicators exist in a yet to be designed EN-TRACK benchmarking space within eQuad, which will allow investors to interact with the EN-TRACK data directly in the financial proforma section where they are introduced to the project in question.

Use case implementation and operation

The data exchange will be enabled as an automated service between both platforms. A specific API will be developed for this purpose.

The functionality is implemented and operated in the following steps:

1) The indicators for the particular visualisation in eQuad to be benchmarked against EN-TRACK are defined by the eQBD. The eQBD will then need to identify additional data points to be developed in eQuad to enable this benchmarking and the eQPA will implement these development items.
2) The specific criteria for selecting the population from the EN-TRACK database against which the eQuad project needs to be benchmarked is defined by the eQBD. The selection criteria are applied for each EEM type included in the eQuad project. The criteria include:
    - Location criterion: Location of the population of EEMs against which the project needs to be benchmarked. The possible location options are: postal code, city, country, or all (for all EEMs of the same type in the EN-TRACK database, regardless of the location in which they have been implemented). This will be benchmarked on a country basis with the option of adding other countries as well.
    - Time criterion (optional): A time range of EEMs to be included in the selection (e.g. EEMs applied from 2018 to 2022).
    - Building construction type
    - Building use type
    - Building age
3) The eQPA implements the necessary changes to eQuad data points and develops an API for obtaining benchmarking data from EN-TRACK that includes all the necessary data for a request (list of EEM types included in the project, selection criteria – location, time range, …)
4) The ENPA implements the transformations from the EN-TRACK's EEM taxonomy to the eQuad's EEM taxonomy following the mapping provided by the eQBD.
5) The ENPA implements the API client and the extraction of benchmarking data from EN-TRACK.
6) The ENDQS checks and validates the implementation and the quality of the data.
7) The eQBD designs the separate EN-TRACK benchmarking space within eQuad in the investor interface and shares visualisations with eQPA.
8) The eQPA implements the visualisation of benchmarking in the eQuad platform.
9) The eQBD approves the data reception and accepts the visualisation in eQuad.

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4.3 Use case 3: Enabling access from EN-TRACK for financial assessment of new projects with eQuad

Context and necessities

eQuad offers web-based platform for the introduction of data for project pre-financing evaluation. The enabling of access to the platform from EN-TRACK aims to facilitate the pre-qualification of new projects in buildings that have been already defined in the EN-TRACK database. The data in EN-TRACK refers to already implemented projects whose performance is to be evaluated, and only part of the existing data can be reused for the pre-qualification of new projects in eQuad. These data comprise the building and building owner description, location, as well as energy consumption data.

The service will enable users of EN-TRACK to more easily evaluate the feasibility of new projects in their buildings by transferring the necessary and available data to the eQuad platform. Once the project set-up is initiated from EN-TRACK with the transfer of data, the necessary further information will be completed within the eQuad platform.

This integrated service between both platforms is intended to raise user awareness about other related services, improve the user experience of using EN-TRACK and also increase the number of potential eQuad's users.

Objective

The objective of this use case is to make EN-TRACK data available in the eQuad platform to facilitate the introduction of data for project pre-qualification for financing.

Main actors

- eQuad platform administrator (eQPA): responsible for the maintenance of the platform and the access to the database.
- eQuad business developer (eQBD): responsible for the customers, the definition of new services and the customer data control.
- EN-TRACK platform administrator (ENPA): responsible for the maintenance of the platform and the access to the database.
- EN-TRACK data quality supervisor (ENDQS): responsible for checking and controlling the quality of data incorporated in the platform.
- EN-TRACK user (ENUser): user of the EN-TRACK platform with available building data that can be exported to eQuad.

Pre-conditions

The pre-condition is the mapping of the fields from the EN-TRACK data model that can be used as a project entry data in eQuad. The required entry points for eQuad are:

- Site data
- EEM data

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- Financial data
- Due diligence documentation

The above should be pulled from EN-TRACK to the extent possible, with the assumption that due diligence documentation will rather be introduced directly in eQuad with perhaps the exception of energy audits.

Use case implementation and operation

The data exchange will be enabled as an automated service between both platforms. A specific API will be developed for this purpose.

The functionality is implemented in several steps:

1) The eQBD indicates the data fields from the EN-TRACK data model that can be used in eQuad and maps them to the corresponding eQuad fields over a mapping template provided by the EDQS.
2) The eQBD defines user roles and hierarchy and develops a user structure including the EN-TRACK user.
3) The eQPA creates a user sign on and designs user permissions within the platform in order to develop the user roles within eQuad according to the previous step by eQBD.
4) The ENPA jointly with eQPA develop an API for exposing the data from EN-TRACK to eQuad.
5) The ENPA enables functionality in the EN-TRACK User Interface for the user to export building data to eQuad.
6) The ENUser exports the data for the building for which he intends to develop an investment project to eQuad.
7) The ENUser continues to complete the additional necessary data by registering on the eQuad platform and authenticating himself with the EN-TRACK user details to access the exported data in eQuad.
8) The eQBD evaluates the data provided and either approves or rejects the project for investor introduction.

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5 Interoperability with DEEP

The De-risking Energy Efficiency Platform (DEEP) is an open-source database for energy efficiency investments performance monitoring and benchmarking that provides detailed analysis and evidence on the performance of energy efficiency investments to support the assessment of the related benefits and financial risks.

The main objective of the DEEP is to better understand the real risks and benefits of energy efficiency investments based on market evidence and track record.

DEEP was launched by the Energy Efficiency Financial Institutions Group (EEFIG) in 2016 and is the largest pan-European database containing over 11,000 buildings related energy efficiency projects.

EN-TRACK is fully aligned with the objectives of DEEP for gathering and disclosing large scale data on actual performance of EEI. Due to its building-centred approach, EN-TRACK complements DEEP with building energy use benchmarking, more detailed EEI benchmarking output, and capabilities for tracking the performance of buildings over the time. These features engage the building owner in the provision of data, making the data gathering a continuous process.

DEEP already has an API for exposing anonymised benchmarking data to external platforms and this will be used for the implementation of use case 1 for interoperability with EN-TRACK presented below. A ,yet to be enabled, functionality in the DEEP API for accepting data from external trusted platforms will allow the implementation of presented below use case 2.

5.1 Use case 1: Obtaining of benchmarking data from DEEP in EN-TRACK

Context and necessities

The DEEP platform is the largest database for EEI in buildings in Europe. Benchmarking data from DEEP is available for downloading through an existing API. The incorporation of data from DEEP in the EN-TRACK platform will help in the launching phase of the project to fill some initial benchmarking data gaps from countries that are not covered by the EN-TRACK project, improving the user experience and helping the adoption of EN-TRACK across Europe. In a later stage, the benchmarking data from DEEP can enrich the EN-TRACK services by incorporating cross-country comparisons that would allow assessing the influence of aspects such as climate, energy prices and country-specific socio-cultural differences on the energy savings and the return of investments.

Objective

The objective of this use case is to make available data from DEEP in the EN-TRACK platform in order to fill initial data gaps and improve the EN-TRACK user experience, paving the way to extending the services to other European countries.

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Main actors

- EN-TRACK platform administrator (ENPA): responsible for the maintenance of the platform and the access to the database.
- EN-TRACK data quality supervisor (ENDQS): responsible for checking and controlling the quality of data incorporated in the platform.

Pre-conditions

Pre-condition is the existing DEEP API and the mapping of the DEEP data fields to the EN-TRACK data model.

Use case implementation and operation

The data exchange will be enabled as an automated service between both platforms. The service will use the existing API of DEEP for data exchange and the existing mapping of EN-TRACK to DEEP.

The functionality is implemented in the following steps:

1) The ENPA implements a DEEP's API client in the EN-TRACK platform.
2) The ENPA implements the transformations from the DEEP format to the EN-TRACK's data model following the mapping of fields.
3) The ENDQS revises the obtained data and approves its incorporation in the EN-TRACK services

5.2 Use case 2: Uploading of data from EN-TRACK to DEEP

Context and necessities

The massive gathering of data on the performance of EEI in buildings and their sharing with DEEP is one of the principal objectives of EN-TRACK. In the following years EN-TRACK aims to become one of the largest data providers to DEEP.

EN-TRACK already provides data to DEEP using its Excel template. However, the expected increased and data quantity gathered by EN-TRACK requires more agile and automated exchange. This is also in line with the intentions of DEEP to enable an API for automated data upload by part of trusted data providers.

Objective

The objective of this use case is to enable automated data upload from EN-TRACK to DEEP.

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Main actors

- EN-TRACK platform administrator (ENPA): responsible for the maintenance of the platform and the access to the database.
- EN-TRACK data quality supervisor (ENDQS): responsible for checking and controlling the quality of data incorporated in the platform.
- DEEP data quality supervisor (DDQS): responsible for checking and controlling the quality of data incorporated in the platform.

Pre-conditions

Pre-condition is the enabling of DEEP API's functionality for accepting data from external providers and the mapping of the DEEP data fields to the EN-TRACK data model.

Use case implementation and operation

This service will be implemented by DEEP to enable automated data uploading by part of trusted partners.

The functionality on the EN-TRACK side is the following:

1) The ENPA implements the provided by DEEP API for uploading data from EN-TRACK.
2) The ENPA implements the transformations from the EN-TRACK data model to the DEEP data fields following the mapping (D1.5).
3) The ENPA establishes schedule and procedure for periodic upload of EN-TRACK data to DEEP trough the provided API. The procedure will incorporate automated data quality control and the use of unique identifiers for control of non-repeatability of the data.
4) The DDQS revises the obtained data and approves its incorporation in the DEEP database.

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6 Conclusions and next steps

The present report identifies and defines prospective use cases for joint services of EN-TRACK with the eQuad and DEEP platforms based on the interoperability of data between them enabled from the alignment over the EN-TRACK's open data model. The use cases focus on the envisaged functionalities and implementation steps. Use cases are presented in a structured form, starting with the context and necessities to be addressed and outlining the objective, main actors, required pre-conditions, and finally, the implementation and operation of the use case, indicating the contribution of each actor.

The presented use cases are a starting point for the definition of the interoperability services that will be defined in the scope of the project. In parallel, the mapping of the DEEP and the eQuad data fields to the EN-TRACK data model is being developed, as it represents an essential pre-condition for the implementation. Both EN-TRACK and DEEP are open-source projects and the mapping of DEEP to EN-TRACK is an open document included in the public deliverable D1.6. eQuad is a proprietary platform supported by Joule Assets and the mapping of eQuad data fields is developed internally as part of the implementation work.

Next step is the implementation of the services, expected to be completed by month 26 of the project (January 2023) and followed by pilot testing. The putting into operation of the services is expected towards the end of the project (months 34-36) after achieving commercial agreements between the platforms.

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