Case Management Model Design for Obtaining Documentation Using FieldWork 4 RES Application in Renewable Energy Sources Projects

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Abstract – **FieldWork 4 RES is an application in the final stage of production as part of the Development of an integrated asset management solution and support for investment processes in the design, planning, and implementation of renewable energy construction projects. The purpose of the FieldWork 4 RES system is to provide application support for the activities of planning and realization of projects ranging from the construction of infrastructure projects to property maintenance projects. During this process, part of the activity relates to the collection and recording of project documentation, depending on the type of project and legal regulations. This paper deals with the module design for obtaining project documentation. It is based on the communication between FieldWork 4 RES, Camunda, and OfficePoint. The case management model is presented and all its parts are defined.**

Keywords – renewable energy; CMMN; fieldwork4res; camunda;

I. Introduction

FieldWork 4 RES is an application that will be used for the planning, preparation, realization, and maintenance of renewable energy sources assets. It will also apply to other business processes which deal with investment and project planning, managing contractors and contracts, financial management, ensuring profitability, procurement of needed documentation, material and inventory supervision, Building Information Management (BIM) application, digitization, and automation of business processes in general, etc.

The European Commission states that a large amount of energy from renewable sources has been successfully implemented in the EU Member States, however, there is still a significant number of obstacles that slow down further development of renewable energy sources projects, which could affect the EU's 2030 and 2050 climate target. As stated in [1], almost 25% of all existing barriers are related to administrative and grid connection processes, where these obstacles appear in all EU markets. Observing the mentioned barriers, renewable energy installations are affected by a share of 83%, the heat sector by 13%, and the transport sector by only 4%. Renewable energy installations are affected the most by administrative barriers, especially wind power (44%) and solar power (23%), as shown in Figure 1. Thus, document management systems (DMS) come to their full potential.
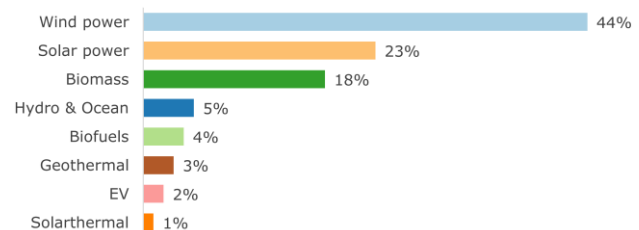
Figure 1. The impact of administrative barriers on RES project development [1]

Issues in regulatory processes and document management systems are very common in today's business, energy, traffic, and other sectors. This paper presents the case management model used together with applications FieldWork 4 RES and OfficePoint (both products of IT Sistemi). It is a unified solution for optimized documentation obtainment mainly used for renewable energy construction projects, but it is also applicable to many others asset management solutions.

The paper deals with the part of the application that oversees obtaining documentation for RES projects. Through the system, the user will be informed about the current phase of the project, documents that need to be obtained, submitted requests whose processing is in progress, the expiration of already issued permits, etc. The focus is on the necessary and obtained documentation, and not on the order in which the documents are obtained within a particular phase. The system is flexible so it can support different types of projects and at the same time enables the user to easily enter the necessary changes even in the event of a change in legislation.

II. CASE MANAGEMENT AND DOCUMENT MANAGEMENT SYSTEM

A. Case Management Model and Notation (CMMN)

Case Management Model and Notation (CMMN) is a graphical approach used in work methods based on solving cases that require different activities that can be achieved in an unpredictable arrangement in response to changing situations. Using an event-driven method and the case file concept, CMMN expands the limits of what can be developed with Business Process Modeling and Notation (BPMN), including less designed work efforts and those determined by expert workers. BPMN represents a visual "flowchart-like" methodology used to map out the various steps involved in a business process from start to finish. As a critical component of Business Process Management, it provides a visual representation of the entire sequence of business activities and information flows required to execute the process. The primary objective of BPMN is to devise ways to enhance efficiency, accommodate changes in circumstances, and gain a competitive edge by creating models that identify process improvements. Applying a combination of BPMN and CMMN allows clients to deal with a wider selection of work techniques [2][3].

The main goal of CMMN is to define a general meta-model and representation for modeling and graphical expression of the case. A case primary includes tasks performed in relation to the subject in a certain situation to accomplish the preferred result. The situation usually includes data that informs and drives actions recorded in the case [3].

CMMN deals with defining tasks whether they are applicable or what are the subsequent assignments necessary, considering the condition of the case. Decisions and flow can be controlled by events or new details that constantly occur through the duration of the case, for instance the delivery of new documents, accomplishment of certain barrels, or achievement of certain milestones. The individual tasks that are planned and carried out in the context of a case may themselves be predefined procedural processes, but the total case can't be coordinated by a predefined sequence of tasks. Model and notation are used to express case models in the usual notation for a certain type of case, and the resulting model can subsequently be instantiated for handling a specific case instance [3].

B. Camunda

Camunda is an open-source and free Java-based framework used for various workflow, case management modeling, and decision-making automation systems. It allows the user to create BPMN processes and decision tables. It also allows the execution of process models as so-called process instances. During the execution of the model, a rule engine can automatically calculate decisions.

A CMMN consists of the following basic components:

- Case plan

- Roles
- Case plan items
- Tasks
- Stages
- Case file
- Case file items
- Criteria
- Event listeners [4].

C. Document Management System

A document management system refers to systems that manage certain processes with documents to organize them. A basic part of digital document management is the conversion of paper documents into electronic files on a computer. After digitization, every document is available on the computer, through the computer network, document management system, and to all other users. Many organizations around the world use document management systems on a daily basis instead of paper archives. Documents entering the DMS are scanned (as a rule, documents created outside the parent organization) or uploaded as electronic documents (documents created and available in electronic form). The system saves these files where the user indexes the document. Indexing is describing a document with terms that will later make these documents searchable. To access documents, a hierarchical structure of document organization or a search engine built into the system is used. Which documents can be read and which actions can be performed on them depends on the rights assigned to the user or group of users by the DMS administrator [5]–[7].

DMS consists of basic 5 components [8]–[10]:

- Entry: Scanning documents in paper form.
- Storage: the storage system contains documents in electronic form and provides additional security mechanisms to protect documents from loss.
- Indexing: provides a good description of documents, quick and easy future access, and search.
- Retrieval: the system keeps track of the arrangement of files on the media and enables quick retrieval using an index.
- Access: documents are available to those who need them, and access is limited to authorized users.

D. Communication Architecture

The basic concept used for obtaining documentation is based on the communication protocols between frontend application, case management, and content storage.

The main components, shown in Figure 2, are:

- FieldWork 4 RES (referred to as FW4RES in the following text) – frontend application
- Case management module – Camunda (CMMN + BPMN)
- OfficePoint (referred to as OP in the following text) – content storage, DMS

The communication protocols are as follows:

- FieldWork – Case management (user actions): in the FW user interface, the user is provided with a series of actions necessary to be able to fully manage the project and its parts. The actions themselves are implemented in the case management (CM) module.
- FieldWork – OfficePoint (create/update content): the user creates or edits documents through the FieldWork interface, and the content is stored in OfficePoint.

validations carried out in the CM module. (Codebook represents a list of mandatory documents that are created in various phases of the project).

- Case management – FieldWork (update project state): if necessary, the CM updates the project status or some project metadata in FW using the FW REST API.
- Case management – OfficePoint (create/update content): the CM module communicates with the OfficePoint application to create the necessary items. Based on the actions implemented in CM,
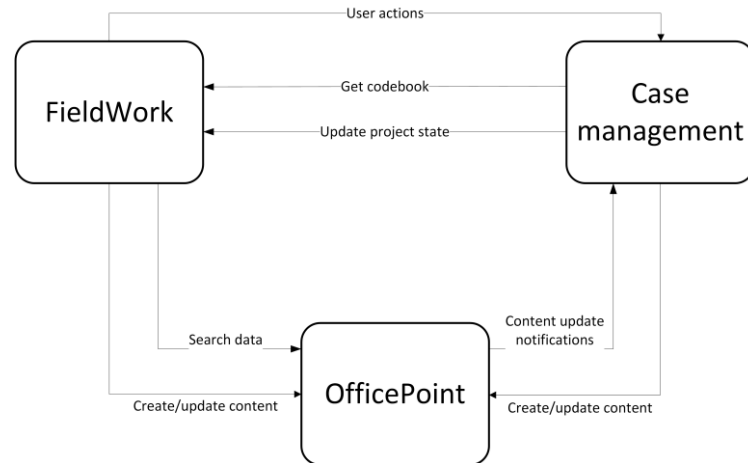

Figure 2. Communication protocols concept for data retrieval

- FieldWork – OfficePoint (search data): FieldWork retrieves and searches data from OP to display to the user. For example, when it is necessary to display all phases of a project or all documents within a particular phase.
- Case management – FieldWork (get codebook): through the FW representational state transfer (REST) application, various codebooks are retrieved that are used for calculations and

the documentation stored in OP can be managed.

- OfficePoint – Case management (content update and notifications): OfficePoint triggers notifications to the CM module in moments when content is updated. CM internally decides which events to react to and which actions are necessary at those moments.

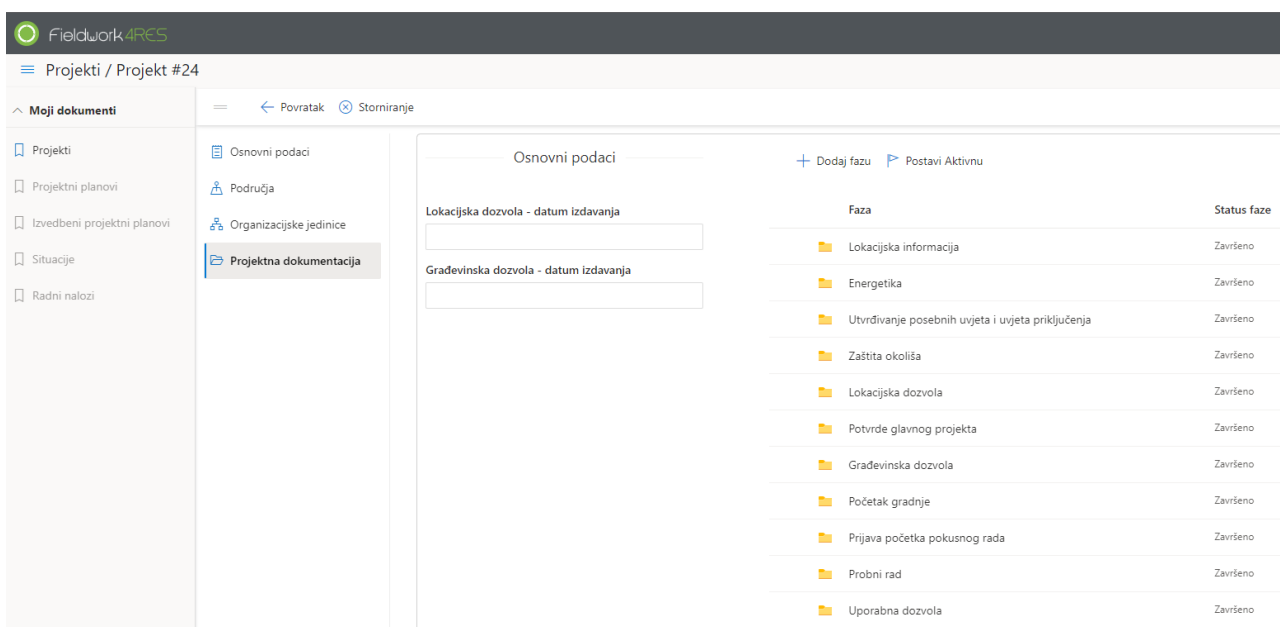The FieldWork 4 RES interface is shown in Figure 3.

Figure 3. Screenshot from the FieldWork 4 RES interface

III. PROJECT DOCUMENTATION

Obtaining the project documentation is based on communication between FW4RES, OfficePoint, and Camunda. The necessary requirements for instantiating the Camunda case plan are as follows:

- List of Mandatory Documents – the codebook contains a list of all mandatory documents that can be created in various phases of the projects. Certain criteria are used to define under which conditions which document is mandatory. For example, the document is mandatory for the phase of obtaining a building permit, or the document is mandatory if it is a 100 MW (or higher) power plant, etc. It is

  o Milestone(s)

  o Stage and Discretionary Stage

  o Criteria

  o Entry criteria

  o Exit criteria

  o Case file

  o Planning table

An example of a CMMN model, made in Camunda, is shown in Figure 4.

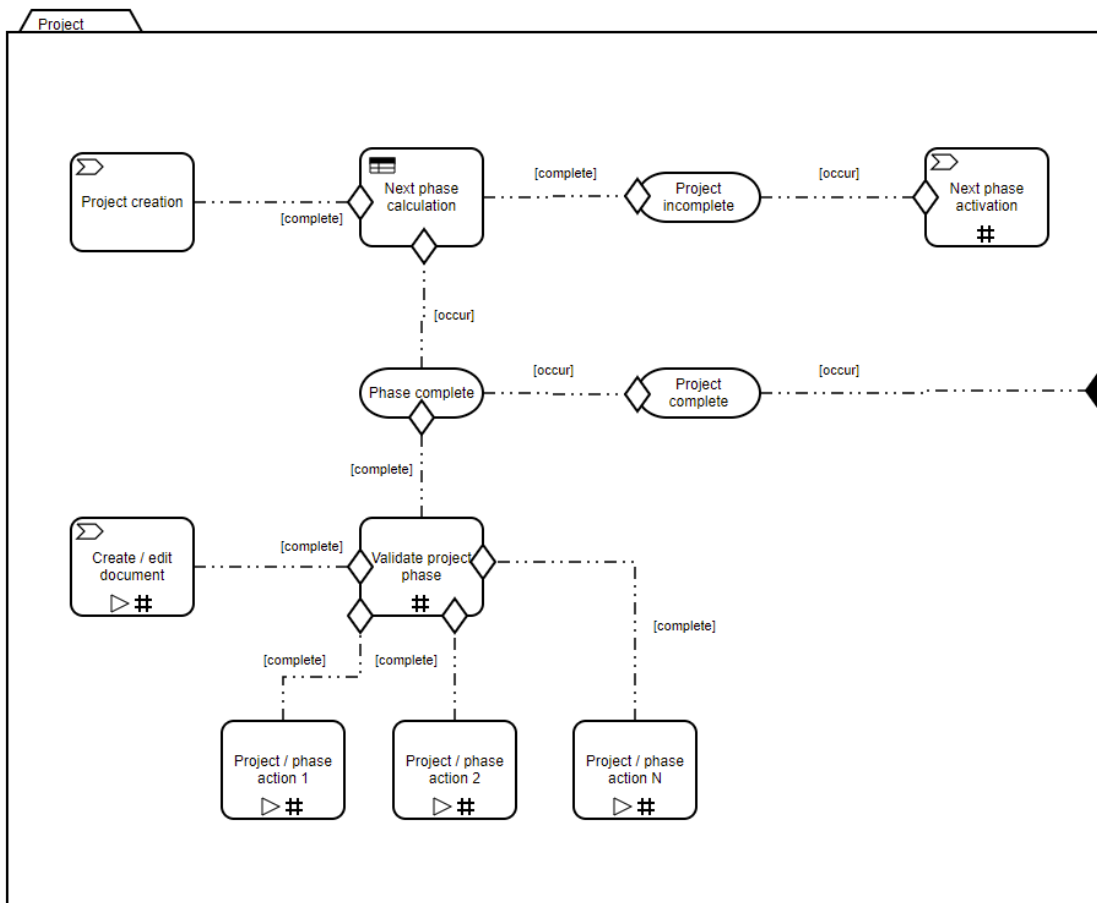After all the necessary input requirements are met, the

Figure 4. Screenshot from Camunda representing the CMMN model

necessary to enable simple and quick changes in the rules to meet the needs of the client or changes in legislation, without the need to create and deploy a new version of the system or individual components.

- Creating a new CMMN model in Camunda – a new project created in Camunda represents a graphical notation of a CMMN model or a case plan. It consists of:

  o Tasks (human tasks, process tasks, case tasks, discretionary tasks)

  o Event listeners (timer event listener, user even listener)

Camunda case plan instance can be initiated. The structure of the case plan is as follows:

- Starting the Camunda case instance – when a case management instance is created, the "Project creation" action is started, which creates all the necessary files in OP, where all the documents are later created by the users. The mandatory project phases and documents are calculated using complex logic implemented in various codebooks.

- Calculation of the project phase – depending on the type of project (e.g., construction of a wind farm, construction of a residential building, etc.), required metadata is stored in Camunda variables

to enable decisions to be made as the process progresses. An integral part of the project is a Decision Model and Notation (DMN) calculation table, which decides on the phase sequence depending on all current inputs.

- Submitting requests and adding documents – each created document corresponds to a specific document type predefined in OP. Based on the document type and the internal business logic, various rules are applied, and the required processes are started. Some of the processes are fully automated, but others may require additional user actions to be completed.

- Project completion and reactivation – the project may be considered complete when all phases have been completed or when a major obstacle has occurred that has prevented full completion. One of the impediments may be the inability to obtain some of the permits, or perhaps a lack of funding. In either case, it is not necessary for a case management instance to "live", there for it is set to be closed. If circumstances change at some point in the future, there is always a way to reactivate the old case instance or create a new one.

Furthermore, the system of notifications will be available in the FW4RES for the user to be informed of certain events. There will be two types of notifications:

- Type 1 – after the expiration of the legal deadline for obtaining a solution, the user can be notified to check if there are any changes.

- Type 2 – expiration of expired licenses - N days before the expiration or on the day of the expiration, inform the user so that he can submit a request for the extension of the corresponding license.

Last of all, each stage of the project documentation obtainment process is secured since it depends on specific criteria before moving forward. If the criteria are not met, documentation obtainment is paused, canceled, or restarted, depending on the criteria type. The whole process is ready to be updated and improved further (e.g., integration with external services).

IV. CONCLUSION

Despite the digitization and automation of business processes, obtaining the necessary documentation for various construction projects is still relatively slow. The administrative processes in which the documentation is obtained, such as numerous permits, remain a very critical and time-consuming issue. This is a significant constraint, especially in the construction of RES power plants such as wind farms and solar power plants, but also in other large projects that are being stalled because of administrative issues. The paper describes the basics of CMMN and DMS, which, in communication with FieldWork 4 RES, greatly facilitate the previously mentioned issues.

In the future, it is planned to implement a system of notifications and integration with external systems such as e-Permits. The user will have full up-to-date documentation in one place with no need of going to external services and websites. Also, the notification system will allow the user to stay alert for important events such as the expiration date of a certain document, various deadlines, and other upcoming related to project events.

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