Interreg
Alpine Space
e-SMART
EUROPEAN REGIONAL DEVELOPMENT FUND

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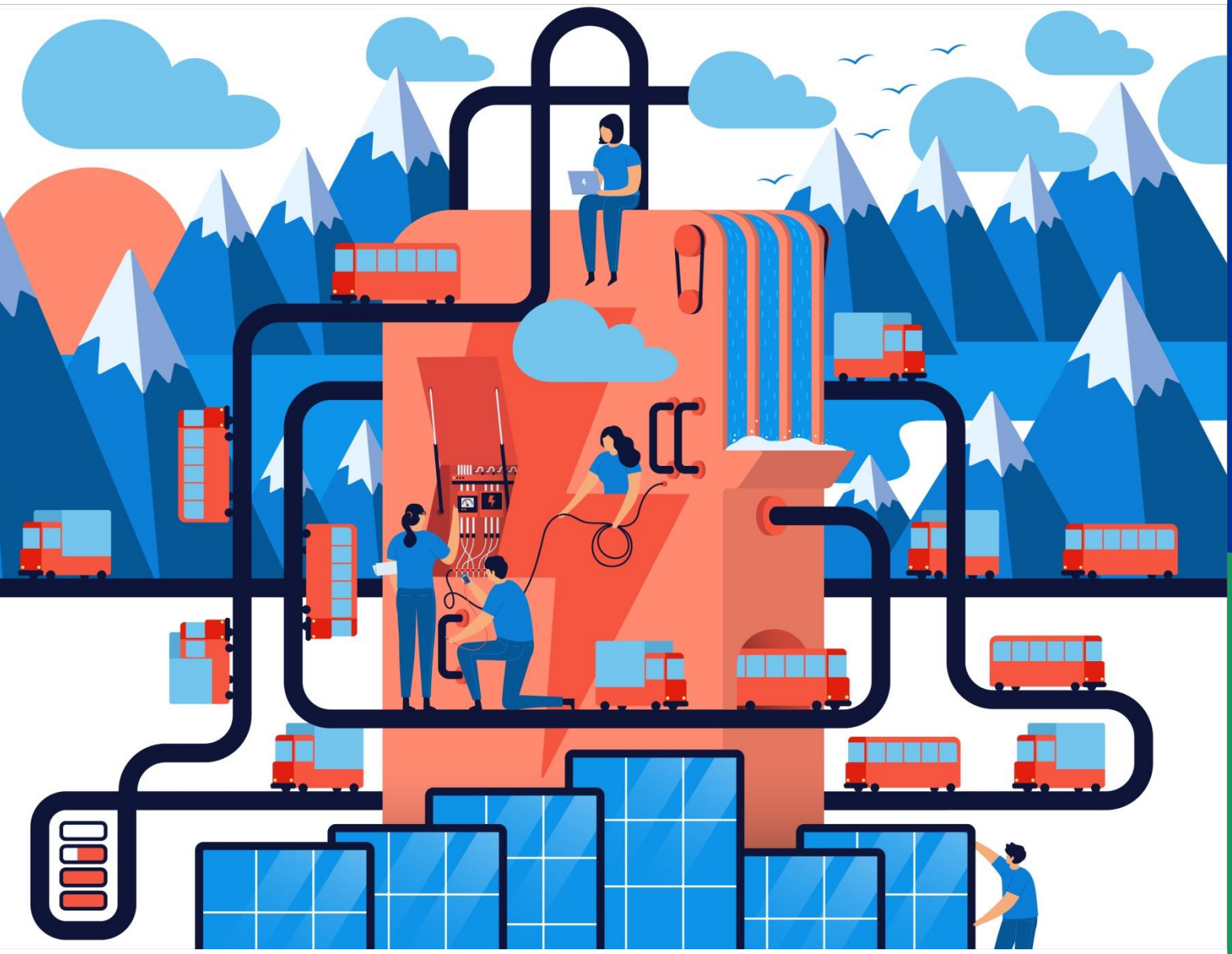

e-SMART TRAINING MATERIAL

Electrifying Local Public Transport in rural areas: From idea to operation

This project is co-financed by the European Regional Development Fund through the Interreg Alpine Space programme.

The e-SMART project

While electrification of private transportation has continued to expand constantly, ambitions should move forward towards electric vehicles solutions in Last-Mile-Logistics (LML) and the Local Public Transport (LPT), with electricity generated from renewable energy sources.

The decarbonisation of the transport sector and particularly the mass deployment of electric vehicles need truly interoperable roll-outs of electric vehicle charging infrastructures powered by renewable energy as well as an intelligent charging management to prevent peak loads. This is especially important in the Alpine Space, where mobility and transport have always played a significant role.

The e-SMART project addresses this challenge: Bringing developments in e-mobility in LML and LPT together and improving the electric vehicle ecosystem building up on the concept of smart-territorial relationships.

Find out more about the e-SMART project:
www.alpine-space.eu/projects/e-smart

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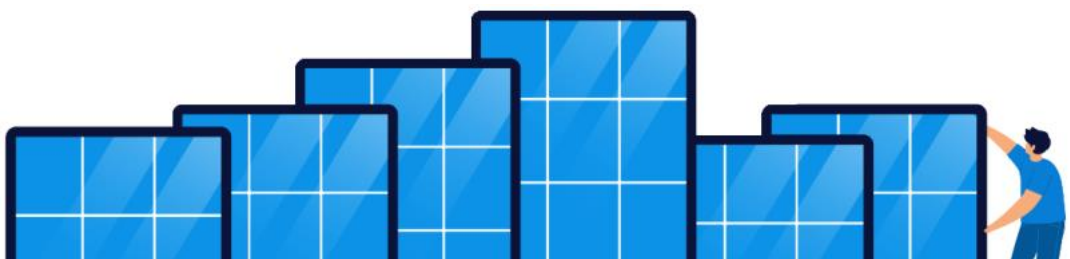

Objective

This Training Material aims to show the step-by-step procedure to introduce electric busses in the Local Public Transport.

The introduction of the MVV (Munich Verkehrs- und Tarifverbund GmbH (MVV, Linked Transport and Tariff System) regional bus line 232 in the municipality of Unterföhring in the county of Munich gives an example to illustrate the process from the identification of ideas to the start of operations. This is an application example for smaller towns and municipalities in the alpine region since the introduction of an electric bus system still represents an innovative project and challenges all involved stakeholders with new tasks.

The idea to electrify the MVV regional bus line 232 originates from the political mandate of the County of Munich to promote climate-friendly public transport. In addition, the municipality of Unterföhring had also signaled its interest in such a project at an early stage and showed a willingness to get involved.

The influence of the different stakeholders and their area of responsibility as well as the individual steps of electrification are presented.

The goal of municipality, the County and the MVV was to work together with our transport companies, the manufacturers, the energy suppliers and all other stakeholders to learn how the electrification of public transport can be succeeded outside larger cities with private, medium-sized transport companies in a competitive environment.

The sources of the data and information are the County of Munich, department of Local Public Transport and the final report published by the VCDB (VerkehrsConsult Dresden Berlin GmbH) in July 2020.

1. Introduction

Against the backdrop of the debate on air pollution control and climate protection, local public transport is increasingly taking on a pioneering role by relying more and more on alternative drive systems. Cities and transport companies in Germany are converting their regional bus transport to electric drive technologies. Currently, of the approximately 50,000 vehicles in the local public transport in Germany, around 1.4 percent are electric buses and plug-in hybrids (absolute: 676).

More than half of these vehicles were added in 2020. Moreover, there are already concrete, publicly known plans for another nearly 4,800 e-buses. These are some of the key findings of the latest e-bus radar from auditing and consulting company PricewaterhouseCoopers (PwC).

With a population of around 350,000, the County of Munich is the most populous district in Bavaria. It is located in the center of the administrative district of Upper Bavaria and surrounds the city of Munich to the north, east and south. The administrative seat is the state capital of Munich, which is itself a district-free city and therefore not part of the County. Besides important state tasks, the county is a local self-government with own tasks as well as some tasks assigned by the state by law. Some of the own tasks are voluntary, like the local public transport. Therefore, it plans, organizes and secures the MVV regional bus transport.

As part of its climate protection strategy, the County of Munich is committed to promoting electric mobility in the local public transport. Back in 2014, it commissioned the Munich Transport and Tariff Association (MVV) to explain the conditions under which electric buses operate in the MVV's regional bus transport.

To this end, the Fraunhofer Institute for Transportation and Infrastructure Systems (IVI) has been assigned with a study to analyze all 46 MVV regional bus routes operating in the County of Munich. The results included the MVV regional bus line 232 (Unterföhring local bus) was found to be suitable and was analyzed in more detail with regard to complete electrification. In 2016, the County and the municipality of Unterföhring made the decision to implement the project. The project started in September 2016 and ended in August 2020.

2. Stakeholder Involvement

The project required many parties to be involved: In addition to the County of Munich and the municipality of Unterföhring as partners in the agreement, the MVV as the association of public transport authorities and thus the organizer of the transport service, was also involved in the project. For the implementation of the project, the municipality of Unterföhring commissioned a project manager to implement the project in a technically coordinated manner. In the course of the tendering process for the operating service, the transport company to be entrusted with the operation of the line was selected. With the award of the vehicles and infrastructure, the system manufacturers and operators joined the project.

Figure 1: Stakeholder

3. Steps to emission-free bus fleets in municipalities

The conversion of a bus line to electric operation is a profound and multi-layered process. This overall project takes place step by step and can be divided into five phases - from the initial idea of wanting to procure an electric bus, through testing the feasibility of implementation, to successful system conversion.

The **idea** has its origin in the overall climate strategy of the County of Munich to promote climate-friendly local public transport and the high interest of the municipality of Unterföhring. This was followed by the formal decision by the two leading parties. The focus was on the development of concrete project goals, the definition of responsibilities in the project, and the identification of an initial implementation strategy.

The **feasibility study** evaluated the use of electric buses from an operational, technical, economic and environmental point of view. The study revealed requirements and instructions for action with regard to the equipment of the bus-

ses and the related charging infrastructure. In addition, the economic and ecological impacts of the system conversion were shown.

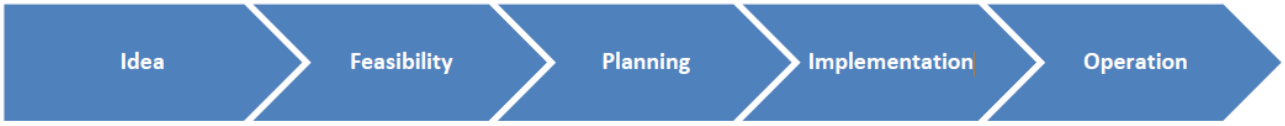

Figure 2: Phases of the system conversion

The core of the **planning** was the determination of the content-related project timeline and its scheduling. In the course of this, operator models were investigated, interested transport companies were advised and the electric bus system consisting of vehicles and infrastructure was designed. The design of the charging infrastructure included the investigation of the suitability of the possible charging locations, the network connection, the dimensioning and installation of the chargers, as well as clarification of the on-site installation conditions.

Between the planning and the implementation the search for the most suitable manufacturer takes place within the framework of a regular Europe-wide **tender**. After this the procurement of the system components required for electric bus operation (e-busses, charging infrastructure on-site, opportunity charging infrastructure) takes place.

The focus of the **implementation** phase was on checking the specifications, factory testing of the individual system components, training the staff with regard to the new system, delivery installation and commissioning of the entire system with subsequent transfer to trial operation. After a successful trial, the entire system can be transferred to regular **operation** with passengers.

4. A Project Check-List

1. Situation analysis : Decision-making, goals
   - Kick-Off Meeting
   - Tech workshops
   - Scope of investigation

2. Concept study: Operational, technical, economic and ecological evaluation
   - Line network analysis
   - Energy consumption
   - Operating concept
   - Investment costs
   - Environmental impact
   - Transformation strategy

3. Project: Determine the project roadmap for system conversion
   - System configuration
   - Operating conditions
   - Identify funding possibilities

4. Procurement: Design and planning of all system-relevant components
   - Technical specifications
   - Specification
   - Production and delivery
   - Funding application

5. System introduction: Integration of alternative bus system
   - Commissioning
   - System acceptance test
   - Test operation
   - Regular operation
   - System evaluation
   - Funding statement

5. Outlook

The example of the MVV regional bus line 232 shows that the introduction of e-buses, even under the special conditions of the MVV regional bus service, is possible. The electric bus system has met with a great deal of approval from the residents so far.

The project duration from the start of the planning to the successful completion of the project was about four years. This time frame is also recommended for future projects of this kind to ensure a safe start-up of operations.

Now that the MVV regional bus line 232 has kicked off a zero-emission bus service, further lines in the Munich County are to be converted to zero-emission operation. Lines in the other seven MVV districts are currently being examined for their suitability. The MVV and the participating districts are confident about a future with zero-emission local public transport.

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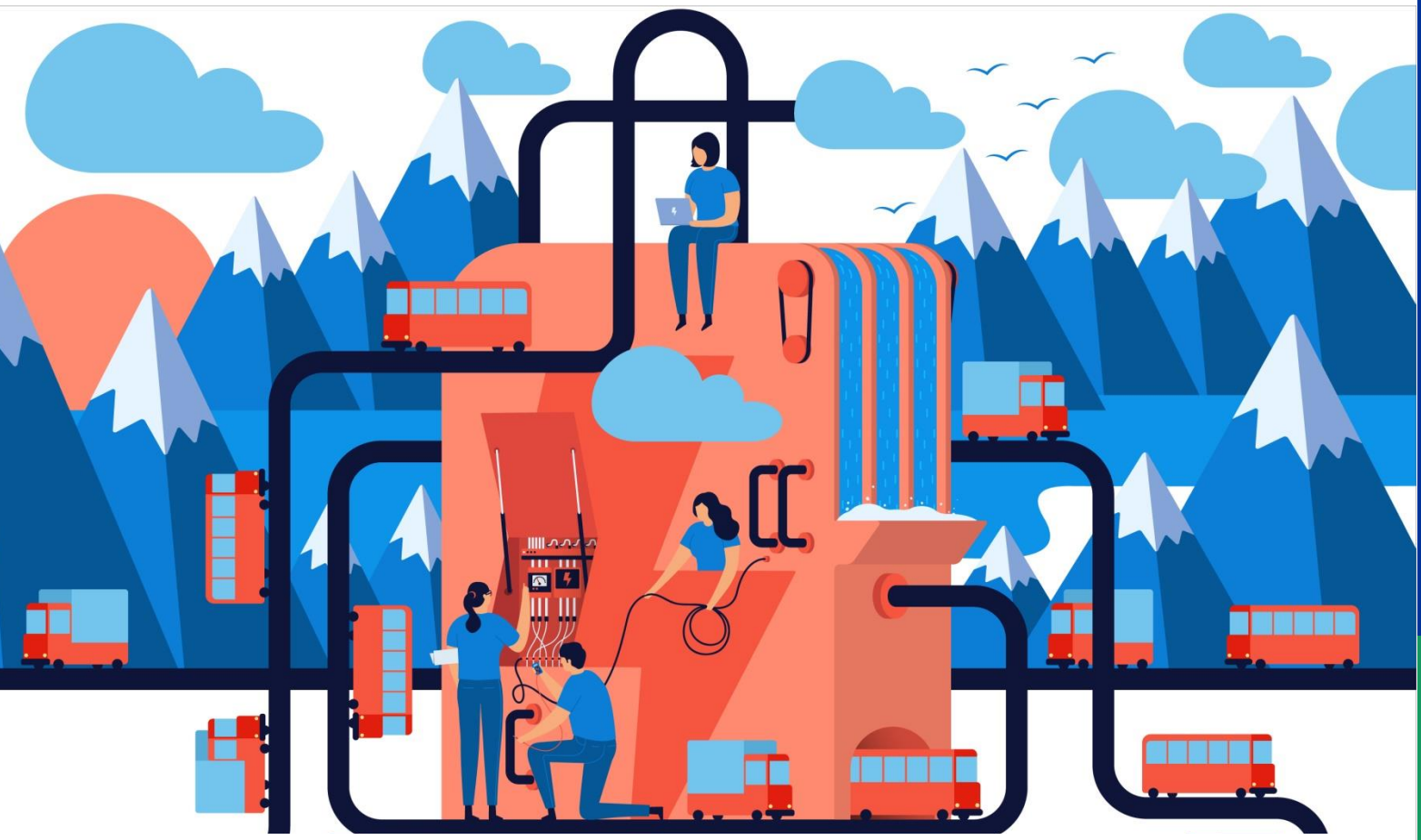

Imprint

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