



Life3H

Making Hydrogen Valleys a reality

NEWSLETTER

N.2 - October 2024



The **LIFE3H** project has received funding from the LIFE programme of the European Union [LIFE 20 ENV/IT/000575]

Hello,

The LIFE3H consortium is pleased to send you the second issue of the project newsletter. The aim is to provide updates on the main results, challenges, events, news, and content of particular interest. Through brief articles, the newsletter seeks to engage local communities and stakeholders potentially interested in the project, as well as to network with all organizations, universities, associations, and industries working in the sector and believing in the potential of hydrogen.

This issue is published after a particularly intense period in which the project partners faced a series of challenges that required the redefinition of activities and budget to achieve the set objectives and lay the groundwork for the realization of a truly integrated Hydrogen Valley in central Italy.

The need to reschedule the project, both in terms of activities, budget, and timelines, arose from issues related to the availability and characteristics of by-product hydrogen at the three sites; the availability and characteristics of the areas identified for the construction of the stations; the time required for permits and authorizations; and the need to strengthen the alignment and coordination of activities with other ongoing initiatives and projects in the three regions, including financial resources, to ensure greater sustainability of project activities also from an “after-life” perspective. All of this led to the formalization of a project amendment characterized, as mentioned above, by a redefinition of project activities and timelines, which included, among other things, the convergence of resources from other funding sources into the same LIFE project, demonstrating the commitment of the involved partners to LIFE3H. Moreover, a new partner, Civitavecchia Fruit & Forest Terminal SpA (CFFT), has joined for the Civitavecchia demonstrator.

CFFT, a company wholly owned by Noord Natie, provides storage, handling, and shipping services at the Port of Civitavecchia. As part of the LIFE3H project, CFFT will make strategic areas available for the construction of the hydrogen refueling station (HRS) in Civitavecchia, handle the procurement of refueling stations and permits, and provide personnel for their management. Additionally, the company is willing to host hydrogen buses within its facilities.

The challenges and issues addressed, as mentioned in this newsletter, are certainly an important achievement of the project as they highlight critical points to pay attention to in the construction of a Hydrogen Valley. They will undoubtedly be a topic of discussion and debate during stakeholder meetings planned within the project, as well as in meetings and working groups attended by the LIFE3H partners. Last but not least, the newsletter focuses on the experience and activities of the company Rampini, a project partner responsible for building two buses for the Civitavecchia demonstrator.

The LIFE3H Consortium



The LIFE3H project has received funding from the LIFE Programme of the European Union [Life 20 ENV/IT/000575]

www.life3h.eu

THE LIFE3H PROJECT

LIFE3H overall objective is to set-up, demonstrate and exploit 3 Hydrogen Valley (HV) starting from the implementation of clean H2 buses fuelled with surplus H2 coming from local industrial productions thus closing the economical circle locally. The project will demonstrate new transport solutions to increase air quality by reducing emissions, facilitate mobility, economic growth & environmental sustainability in urban and natural areas.

The sites for setting up the Hydrogen Valley are:

- The historical City of Terni;
- Port of Civitavecchia;
- Altopiano delle Rocche in the Regional Park Sirente Velino.

LIFE3H specific objectives are:

- Build up the first 3 Italian HVs laying the basis of one transregional HV;
- Develop common & sustainable road Local Public Transport mobility;
- Implement integrated local policies & regulatory approaches for widespread deployment of Hydrogen Refuelling Stations and Fuel Cell vehicles;
- Increase circular economy by storing and using H2 waste from local industries like steel mills and chlorine-soda plants;
- Create a standard smart sustainable mobility management system;
- Develop a Hydrogen Valley implementation strategy allowing future expansion in the project sites and replication in other sites;
- Raise citizens' awareness & improving policy commitment to spread sustainable hydrogen-based mobility and improve air quality.

RAMPINI S.p.A.: FROM A CRAFT WORKSHOP TO A PIONEER IN SUSTAINABLE MOBILITY

The history of RAMPINI S.p.A. began in 1945 in Passignano sul Trasimeno, Umbria. Starting as a small craft workshop, the company has evolved into a leader in the design and production of common and special vehicles. Today, RAMPINI S.p.A. is renowned throughout Europe for its range of zero-emission buses, offering innovative solutions in the Mini and Midi segments.

The company produces six- and eight-meter electric buses, known for their range and capacity to carry a significant number of passengers. RAMPINI S.p.A.'s main strength lies in its design excellence, which has enabled it to secure a leading position in the market.

The company places great emphasis on valuing human resources and using advanced technological tools, maintaining strict control over the quality of the final product. The significant presence of specialized technicians reflects its ongoing commitment to research and development.

Looking to the future, RAMPINI S.p.A. is committed to respecting the environment, focusing on "zero-emission" technologies and sustainable, efficient production processes. Environmental sustainability and reducing the ecological impact of the company's activities are fundamental principles guiding the company towards a better future.

The current headquarters of RAMPINI S.p.A. covers an area of approximately 80,000 square meters, of which 20,000 are indoor facilities divided into various departments. This space has allowed the company to further develop its know-how, focusing on the production of specific vehicles that represent the synthesis of skills acquired over the years. Today, RAMPINI S.p.A. is one of the most important companies in Italy's small and medium-sized industrial sector.

RAMPINI S.p.A. is a key partner in the LIFE3H project, thanks to its advanced knowledge in the hydrogen mobility sector. Specifically, RAMPINI S.p.A. will supply two HYDRON minibuses that will operate in Civitavecchia.



The LIFE3H project has received funding from the LIFE Programme of the European Union [Life 20 ENV/IT/000575]

www.life3h.eu

INNOVATION AND SUSTAINABILITY: THE FUTURE OF MOBILITY WITH THE RAMPINI HYDRON

The RAMPINI HYDRON is a unique minibus that, in just 8 meters, combines the advantages of electric propulsion with the sustainability of hydrogen. This vehicle is a symbol of RAMPINI S.p.A.'s innovation in the field of electric mobility. The HYDRON, powered by hydrogen, produces zero emissions and offers a range of up to 400 kilometers. It is the only hydrogen bus in this length category, designed to carry up to 48 passengers, with easy access for people with disabilities.

Compared to other hydrogen bus models, the HYDRON stands out for its superior performance and modern design, tailored to meet the needs of both passengers and drivers. This ultra-modern bus combines a high-performance battery with a fuel cell to power the traction system. This innovative combination addresses the debate between battery and hydrogen supporters, positioning RAMPINI S.p.A. as the first manufacturer to offer a compact midibus with a suitably sized battery and a hydrogen "range extender."

The company's eFlow architecture reduces hydrogen consumption by 16% and provides peak power up to 90% higher than competitors. The excess heat from the fuel cell is used to heat the passenger compartment. The fuel cell has an estimated lifespan of 10,000 hours, making it well-suited for intermittent use.



Advanced Technology: Hy4Drive

The fuel cell management is entrusted to the Hy4Drive technology, fully developed by RAMPINI S.p.A. This electronic system offers four different modes for operating the fuel cell:

1. Range Extender: Maximizes daily mileage by combining energy from both the battery and the fuel cell.
2. Pure Hydrogen: Uses only hydrogen power, with the batteries functioning as support.
3. Pure Electric: Operates as a battery-electric vehicle, ideal when the hydrogen tank cannot be refueled.
4. Hybrid Custom: Allows customization of energy usage based on specific operational needs.

With continuous innovation and a strong commitment to sustainability, RAMPINI S.p.A. positions itself as a leader in the mobility of the future, offering solutions that improve air quality and promote sustainable economic growth.



The LIFE3H project has received funding from the LIFE Programme of the European Union [Life 20 ENV/IT/000575]

AVEZZANO DEMO

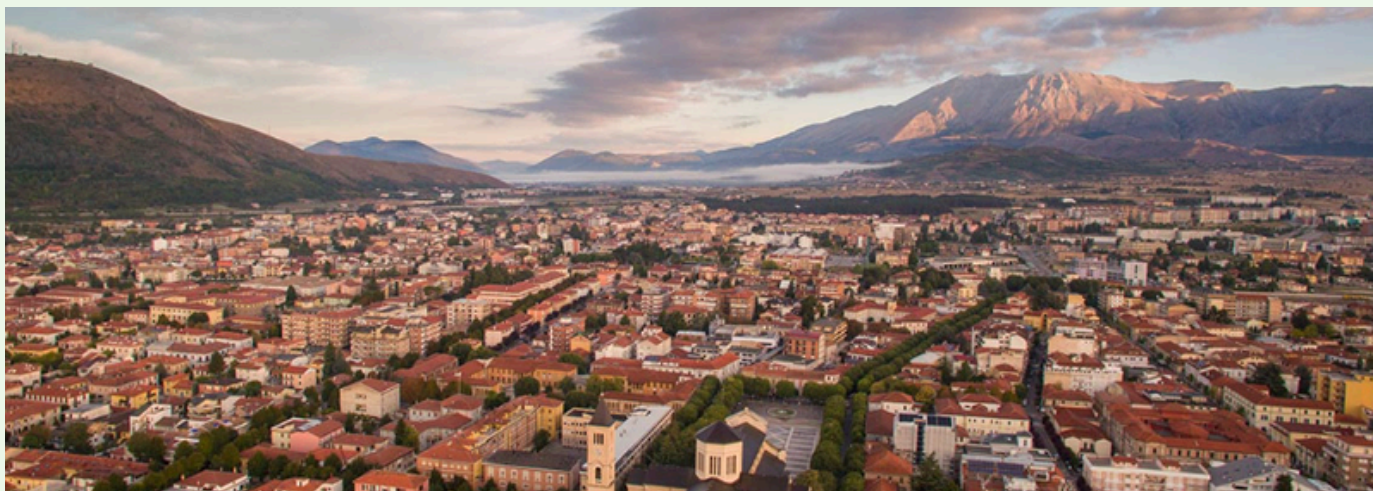
Avezzano is a city of approximately 40,000 inhabitants located in the Abruzzo region, in central Italy, within the province of L'Aquila. Surrounded by the majestic Apennine mountains, Avezzano is known for its fertile Fucino plain, an agricultural area reclaimed in the 19th century. Today, Avezzano is a vibrant economic and commercial hub in the region, with an important industrial center and a pivotal transportation system that facilitates connections to Rome and other cities.

The demo project involves the creation of a new suburban line by TUA, consisting of a shuttle service on the Rocche plateau between the ski resorts of Ovindoli (Magnola) and Rocca di Cambio (Campo Felice), operated with two 12-meter hydrogen buses. Refueling will take place in Avezzano near the Logistics Hub, close to the highway exit. The hydrogen refueling station (HRS) will be constructed by Greenture (formerly S4M) and managed by TUA. The hydrogen will be supplied by Società Chimica Bussi, as a by-product of industrial processes.

The main challenges of the project revolve around the use of industrial by-product hydrogen in fuel cell-powered electric motors. These motors require very high purity standards, with strict limits on impurities in the fuel. Traditionally, hydrogen is produced via steam reforming, a well-established process in the transportation sector. However, the adoption of industrially sourced hydrogen places this project at the cutting edge of the sector, with the potential to innovate the hydrogen technology market.

Another aspect of challenge and innovation is the use of these buses on a suburban, non-urban route in a mountainous environment. After refueling, the buses must first reach the plateau from the valley, facing more demanding climatic and geographical conditions compared to traditional urban routes. This makes the entire transport system an experimental scenario of great value, with the potential to extend the use of hydrogen technologies to other geographically complex areas.

Lastly, the strategic location of the refueling station (HRS) in Avezzano represents a key point for the future development of hydrogen mobility in Abruzzo and central Italy. This infrastructure has the potential to create synergies between public and private stakeholders, accelerating the spread of hydrogen technologies and strengthening Abruzzo's role as a pioneer region in sustainable mobility. The creation of a network of HRS stations, along with projects like this demo, could indeed form a solid foundation for the expansion of hydrogen technologies on a regional and national scale, paving the way for a zero-emission future.



TERNI DEMO

Terni is a city located in the Umbria region, in central Italy. With a population exceeding 100,000, it is the second-largest city in the region. The city has a strong industrial tradition that continues to influence its economy. However, Terni is also famous for its natural beauty and historical monuments, such as the Cascata delle Marmore, one of the tallest artificial waterfalls in Europe, created by the Romans to divert the waters of the Velino River into the Nera River. The abundance of water in the area also contributed to the development of numerous hydroelectric plants and later to a large steel production and processing plant.

The Terni demo involves the introduction of two 12-meter hydrogen buses into the public transport service (TPL) managed by Busitalia. These buses will serve the city's longest urban line, which connects the hospital to the western suburbs, transporting between 500 and 600 passengers daily. The buses will be refueled at a station to be located by the Municipality of Terni in the Maratta area.

One of the first and most important challenges faced by the Municipal Administration was identifying a suitable site for the Hydrogen Refuelling Station (HRS). Thanks to the joint efforts of technicians and experts, a municipal area already designated for industrial development in the urban planning instrument (PRG) was identified in Via Arnaldo Maria Angelini. This site offers adequate dimensions and meets the safety distances required by hydrogen plant fire prevention regulations. The proximity of the area to the local public transport depot (TPL) provides an additional logistical advantage, as it facilitates vehicle storage.



Although the site is located in a flood risk zone, the decision was made to proceed with the installation of the HRS, including the construction of an embankment of about 2 meters to ensure hydraulic safety. This intervention, despite its high costs, was designed with an innovative and sustainable approach. The administration initiated procedures to use soil and rocks excavated from other city construction sites, reducing costs and minimizing the environmental impact of the project.

As for the refueling of hydrogen-powered vehicles, the city of Terni will rely on by-product hydrogen from the Linde Gas Italia plant at the Acciai Speciali Terni steelworks. Thanks to the proximity of the two sites, hydrogen will be transported by tanker trucks, ensuring efficient supply. The production capacity of the Linde Gas Italia plant currently exceeds the demand of the steelworks, allowing the excess to be allocated to the new refueling station.

However, the new industrial plan of Acciai Speciali Terni and the recent energy crisis could lead to an increase in hydrogen use in production processes, potentially affecting the availability of hydrogen for the project. In response to this challenge, the project partners are already working on long-term solutions, such as the development of a hydrogen self-production system. This initiative would ensure independence from external suppliers and make the city self-sufficient in meeting its energy needs in the hydrogen mobility sector.



The LIFE3H project has received funding from the LIFE Programme of the European Union [Life 20 ENV/IT/000575]



CIVITAVECCHIA DEMO

Civitavecchia is a picturesque port city located along the Tyrrhenian coast of central Italy, about 80 kilometers from Rome. With a history dating back to Roman times, today Civitavecchia is best known for its strategic port, which serves as one of the main maritime hubs in the Mediterranean. The port of Civitavecchia is a key point for cruise traffic, welcoming millions of passengers each year from the numerous cruise ships that stop here.

The LIFE 3H project, developed in the Lazio region, includes the creation of a Hydrogen Valley in Civitavecchia. This ambitious project involves the use of two hydrogen buses for a special transport service dedicated to cruise ship passengers and for public transportation within the port of Civitavecchia. The management of this new form of sustainable mobility is entrusted to Port Mobility, a public utility company that, under an agreement with the Port Authority of Civitavecchia, is responsible for mobility services within the port area.

The two hydrogen buses, supplied by Rampini S.p.A., are 8 meters long and can carry up to 48 passengers. These buses will primarily be used to connect the cruise terminal with the Civitavecchia railway station, covering a 2.5 km route in about 15 minutes. This service operates in sync with the docking of cruise ships, from 8:30 AM to 6:30 PM, serving approximately 550,000 passengers annually.

On days when no cruise ships are present, the buses will be used for public transportation within the port, on a 12.5 km circular route. This service operates from 5:30 AM to 11:00 PM, every day of the year, with an average speed of 20 km/h. The continuous operation of the buses will be ensured by a hydrogen refueling station, which will be located in Civitavecchia's commercial zone.

Despite the importance of this project, its implementation has encountered several significant challenges. One of the main difficulties has been obtaining the necessary permits for the hydrogen refueling station (HRS). Italian regulations, particularly stringent when it comes to hydrogen, are not yet fully aligned with the European legislative framework. This has made the approval process lengthy and fragmented, requiring ongoing dialogues and coordination between the project team and local authorities. However, the project team has tackled these complexities with dedication, adopting a collaborative approach with local entities to expedite the process and ensure compliance with all regulations.

Another challenge lies in securing economically sustainable agreements for hydrogen supply. Unlike other cities involved in the LIFE3H project, such as Terni or Avezzano, Civitavecchia does not have local industries capable of producing or distributing hydrogen as a by-product. This represents a significant barrier, as sourcing hydrogen requires the involvement of external suppliers and high transportation costs. Currently, efforts are underway to find more sustainable and cost-effective solutions, including the possibility of establishing long-term agreements with national and international suppliers.

Despite these challenges, the project has received strong support at both regional and local levels, and the partnership is exploring all possible options to overcome the obstacles. Once completed, this project will not only help reduce CO2 emissions related to port transportation but will also serve as a model of sustainable mobility that can be replicated in other urban and port contexts.

EVENTS

In this section, we present a summary of the recent events and activities that have characterized 2024. The LIFE3H project continues to make significant strides toward the integration of hydrogen as a clean and sustainable energy carrier. Discover more about the highlights and collaborations that are driving change!

LIFE Securdomino Networking Event a Pisa

On April 11, 2024, a Networking event was held at the School of Engineering of the University of Pisa, organized by the coordinators of the LIFE Securdomino project. The event was attended by Professors Leonardo Tognotti and Gabriele Landucci from UNIPI (Securdomino project), Dr. Rozenn Marechall (Intrepid project), and Professor Giovanni Maria Piacentino (LIFE AUGIA project). The LIFE3H project was presented by Dr. Gianpaolo De Blasis from UNEEDIT.

Hydrogen Expo di Piacenza

From September 11 to 13, 2024, the Municipality of Terni participated in the Hydrogen Expo in Piacenza, one of Italy's leading events for innovation in the hydrogen sector. During the event, Terni, represented by Dr. Marta Frittella, reaffirmed its active role as a partner in the LIFE3H project, emphasizing the city's commitment to sustainable and zero-emission energy solutions. The Expo provided an important opportunity to strengthen collaboration with other industry players and promote the adoption of green technologies.



PA OK! Together to Create Public Value

On September 12, 2024, the Territorial Meeting for the presentation of the contest "PA OK! Together to Create Public Value" was held, promoted by the Abruzzo Region, the Department of Public Administration, and Formez PA. One of the central moments of the event was the speech by Pierpaolo Pescara, Director of the Department of Territory and Environment of the Abruzzo Region, who presented the LIFE 3H project.



The LIFE3H project has received funding from the LIFE Programme of the European Union [Life 20 ENV/IT/000575]

www.life3h.eu

RESEARCH AND PUBLICATIONS

The LIFE3H project is not limited to practical implementation but also leads significant academic research. In this section, we present the latest studies and publications from our university partners. These research efforts, presented at international conferences and published in prestigious scientific journals, contribute to optimizing fuel cell bus fleet management and developing economic models for refueling stations. Continue reading to explore the discoveries and innovations shaping the future of sustainable mobility.

University of Perugia

- AEIT 2023 International Conference: The paper titled "Management Optimization of Fuel Cell Electric Buses Fleet in Urban Areas" was published online on IEEExplore. [Link al paper](#).
- ICECET 2024 International Conference: During the conference the paper titled "Genetic Algorithm Optimization of Fuel Cell Electric Bus Fleet Operation for Carbon-Neutral Districts" was presented. The paper will soon be available on IEEExplore. [Link alla conferenza](#).
- E. Ciotti, M. Tritoni, D. Pelosi and L. Barelli, "Management Optimization of Fuel Cell Electric Bus Fleet in Urban Areas," 2023 AEIT International Annual Conference (AEIT), Rome, Italy, 2023, pp. 1-6, doi: 10.23919/AEIT60520.2023.10330322.
- D. Pelosi, E. Ciotti, M. Tritoni and L. Barelli, "Genetic Algorithm Optimization of Fuel Cell Electric Bus Fleet Operation for Carbon-Neutral Districts," 2024 International Conference on Electrical, Computer and Energy Technologies (ICECET, Sydney, Australia, 2024, pp. 1-6, doi: 10.1109/ICECET61485.2024.10698335.
- D. Pelosi, M. Longo, G. Bidini, D. Zaninelli, L. Barelli, "A new concept of highways infrastructure integrating energy storage devices for e-mobility transition," Journal of Energy Storage 2023, 65, 107364, doi: 10.1016/j.est.2023.107364

Guglielmo Marconi University

- In May 2024, the paper titled "On-site Hydrogen Refuelling Station Techno-Economic Model for a Fleet of Fuel Cell Buses" was published in the prestigious journal International Hydrogen Energy. [Link al paper](#).

University of L'Aquila

- Journal Article:
 - Ciacetta F, Di Pasquale M., D'Ovidio G., Fabri G., Ometto O, Villante C. "Performance simulation of hydrogen-electric transit bus running in a mountain environment". European Transport \ Trasporti Europei (2022), pp 90, 2022. DOI: 10.48295/ET.2023.90.9, ISSN 1825-3997.
- Conference Proceedings Contribution:
 - Pescara P., Barchiesi C., Ciamponi D., Di Pasquale M., D'Angelo L.M., Antonini G., D'Ovidio G. "Hydrogen for Sustainable Mobility: Ongoing Experiences from the Italian LIFE3H Project". Proceedings of the 27th Transport Means 2023 International Conference - Volume 1, pp. 347-352, Oct. 2023, Palanga, Lithuania.
- Master's Thesis:
 - Master's Thesis Student: Stefano Rotolante. "Modello energetico di un veicolo elettrico a fuel cell". Supervisor: Prof. Giuseppe Fabri, Co-supervisor: Prof. Antonio Ometto. A.A. 2022/2023.



Life3H

Making Hydrogen Valleys a reality

www.life3h.eu

PARTNERSHIP



PROJECT
COORDINATOR



SOCIETÀ
CHIMICA
BUSSI S.p.A.



CITRAMS
CENTRO INTERDISCIPLINARE ALLE
TRASPORTI E INNOVAZIONE SOSTENIBILE



Autorità di Sistema Portuale
del Mar Tirreno Centro Setentrionale



PORTMOBILITY



rampini



TUA

TRASPORTO
UNICO
ABRUZZESE



UNeed.IT
MATCHING YOUR INTERESTS



A.B. 1988
unipg
UNIVERSITÀ DEGLI STUDI DI PERUGIA



Università degli Studi
Guglielmo Marconi