Proposal title:

"Advanced direct biogas fuel processor for robust and cost-effective decentralized hydrogen production" BioRobur^{Plus}

Topic: FCH-02-2-2016. Development of compact reformers for distributed bio-hydrogen production

Funding scheme: Collaborative project

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Duration: 48 months (Amendment)

Deliverable: Quantified impacts and market potentials for the BioRobur^{plus} system and its components, including a disclosable version.

Organization name of lead contractor for this deliverable:

Hysytech S.r.l.

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Versions and Changes

Version	Date	Changes	Author
1	25.10.2021	Deliverable Draft	Freddy Liendo
2			
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Contents

1 Executive Summary

The present delivery aims to assess the feasibility of the Biorobur^{plus} project from the economic point of view. The analysis was carried out considering the integration of the individual subsystems into a functioning overall system and related to the plant validation tests outcomes. The analysis was focused on the feasibility of the Integrated oxidative steam reforming (OSR) process of biogas that is being developed in the framework of the Biorobur^{plus} project in a European context.

A preliminary market analysis was carried out followed by OPEX and CAPEX calculations. The calculations and statements in this deliverable are based on CAPEX and OPEX calculations. Some sensitivities were done varying different parameters, such as, amortization time (10 years), larger production scales, biogas cost. All these assumptions allowed reaching the European targets of production costs of H_2 (5.5 €/kg). Thus, it was possible to perform a SWOT analysis, which will be useful as input for the Exploitation Road map (PUEF) to be submitted in the D6.8.

2 Introduction: Technoeconomic analysis considerations

2.1 Technologies and systems for renewable hydrogen production

Hydrogen is a flexible energy carrier that can be produced from any regionally prevalent primary energy source. Moreover, it can be effectively transformed into any form of energy for diverse end-use applications. However, its production plays a critical role to determine how properly it fulfils the sustainable and environmentally friendly fuel criteria. Currently, the largest use of hydrogen is in industry and refining as a by-product from industrial plants and as a product from reforming of natural gas, liquefied petroleum gas and coal gasification.

Renewable hydrogen can be produces from reforming, electrolysis, and fermentation processes. A technology benchmarking will be performed between the following process:

- The electrolysis process consists of using an electrical current to split the molecules of water into its main building blocks, i.e., hydrogen and oxygen. The process is currently regarded as the ideal technology for producing sustainable hydrogen. This is provided that sustainable electricity is used. However, the current electricity mix, which is for a large part still coal-based, means the production of hydrogen via electrolysis is even more carbon intensive than production from natural gas using SMR.

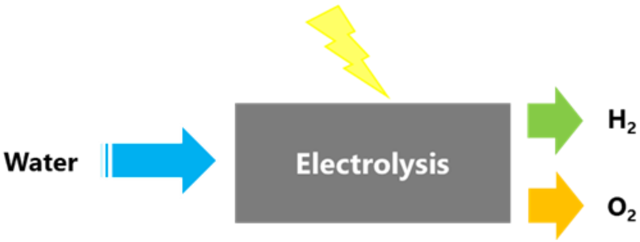

Figure 1. Electrolysis process. Input and Output flows.

- Hydrogen production from fermentation process. Dark anaerobic fermentation is one of the most promising processes for the bio-hydrogen production. It’s possible to use a wide variety of inexpensive feedstocks as the organic fraction of municipal wastes, fruit and vegetables-based market wastes. This process is carried out by anaerobic bacteria belonging to Clostridia species, highly concentrated in anaerobic digested sludge.

Figure 2. Dark fermentation process. Input and Output flows.

• BioRoburplus technology is based on the hydrogen production from biogas via oxidative steam reforming (OSR) reaction. The peculiar feature of OSR approach lies in the fact that heat is directly provided within the reactor, through partial oxidation of the biogas supported by heat recovery on the feed gas streams This eliminates the need of indirect heating within the reformer, and increases the flexibility of the plant, otherwise characterized by several temperature interval constraints and heat transfer limitations in thermally-coupled equipment.

BioRoburplus project will demonstrate the capacity of bio-hydrogen production from biogas in a cost competitive and sustainable manner thereby replacing traditional industrial routes with a novel approach by exploiting all possible energy integration means, as well as innovative structured catalysts and control means to achieve not only cost-competitiveness but also durability and environmental viability.

Figure 3. Fuel processor unit. Input and Output flows.

A technical-economic-environmental comparison of BioRoburPlus technology with competitive technologies and systems for renewable hydrogen production (direct bio hydrogen production from fermentation and electrolysis concepts) will be performed in the next months when more experimental data of BioRoburplus technology will be available.

2.2 Preliminary market analysis

As mentioned before, BioRoburplus project targets on the development of a complete fuel processor for the direct conversion of biogas into hydrogen. Thus, the current and projected biogas production has been analyzed in order to estimate properly the dimension of the related impact of the BioRoburplus project.

2.2.1 Biogas production in Europe: status, future perspectives

The number of biogas plants in Europe has greatly increased. Between 2009 and 2016, the total number of biogas plants rose from 6,227 to 17,662 installations [1]. According to the EBA (European Biogas Association), there were at least 17.439 biogas plants in Europe at the end of 2015, which is a 3 % year-on-year increase (16,834) and 17,662 unit at the end of 2016 (Figure 4). Every EU country has a biogas energy recovery, but about 75 % of the output is concentrated in three countries, Germany (8 Mtoe), the UK (2.4 Mtoe) and Italy (2 Mtoe), as is possible to see in the Figure 2. They are followed by the Czech Republic and

France running neck and neck with about 0.6 Mtoe each. Germany is the undisputed No. 1 biogas producer country with 10,846 biogas plants [2]. Furthermore, it is estimated that 16,093.6 ktoe of biogas primary energy was produced in 2016 in the European Union. The landfill biogas (17.2 % in 2016) and wastewater treatment plant shares (8.7 % in 2016) have been falling steadily.

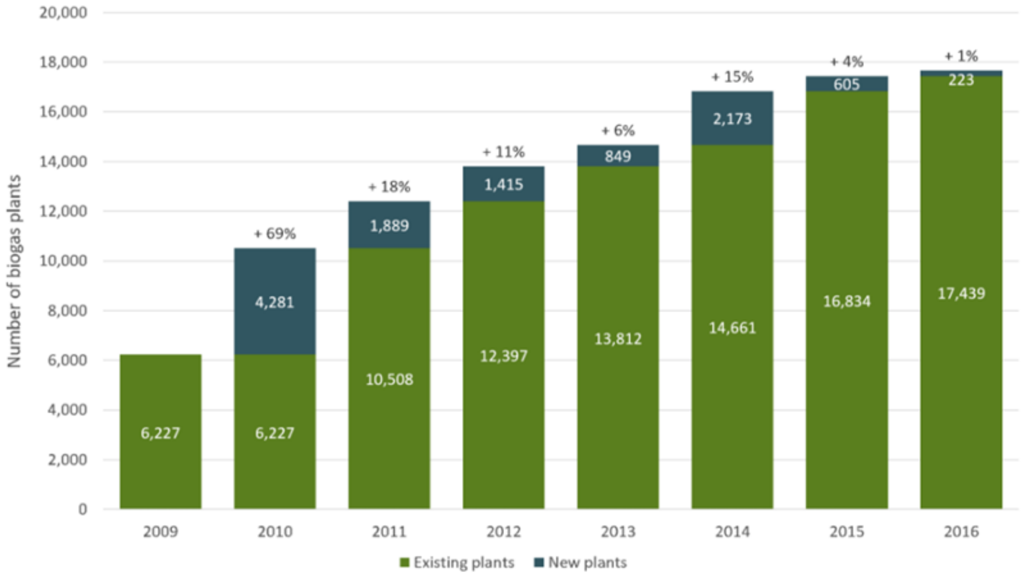

Figure 4. Evolution of the number of biogas plants in Europe (adopted from [1]).

Figure 5 shows how this scenario is declined at a national level, with Germany and Italy (heavily represented in the BioRoburplus partnership) holding the most important production of biogas from decentralized sites and organic waste valorization. A more sustainable policy of (local) waste valorization plays in favour of a significant growth of this type of biogas production facilities as opposed to landfills. The BioRoburplus technology for the cost-effective production of hydrogen from biogas aims at gaining significant market penetration in this perspective, starting from Countries like Germany, the UK or Italy, but with great application opportunities all over Europe owing to the flexibility of its components which are expected to fit several different biogas sources.

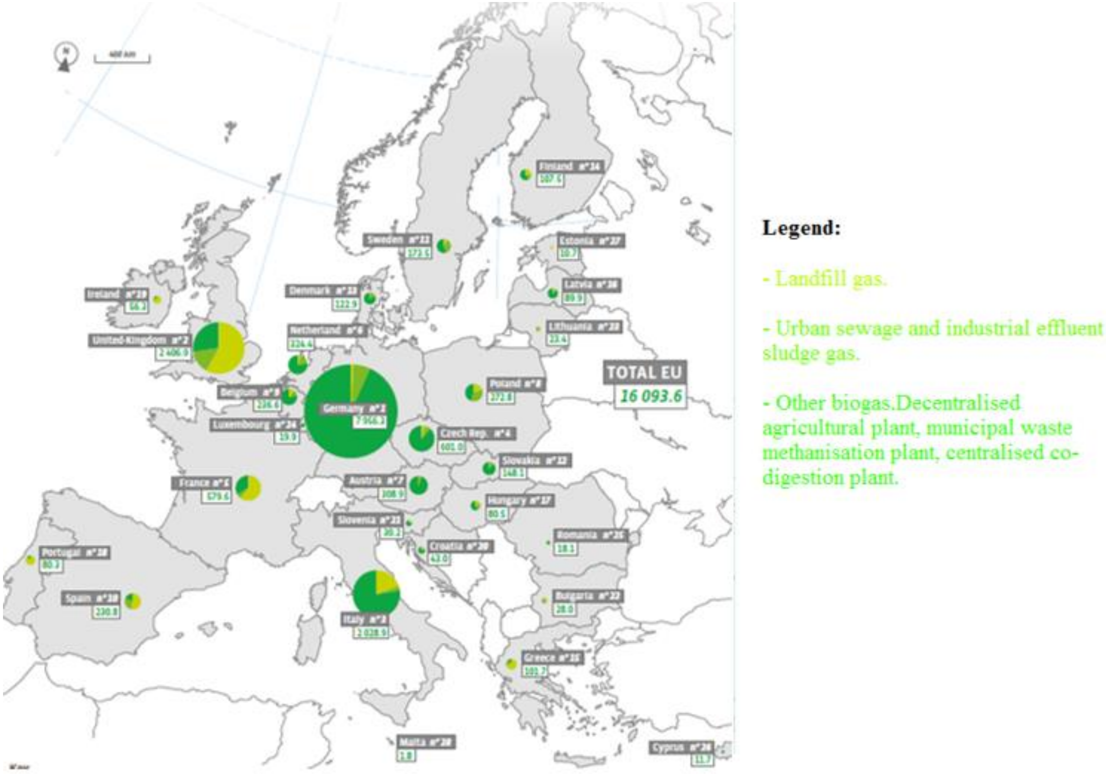

Figure 5. Map of installed biogas plants in Europe 2017 (Source: EurObserv'ER 2017 [2]**)**

The potential biogas production for the EU28 in 2030 is calculated to be 28.8 and 40.2 Mton in the growth and accelerated growth scenarios respectively. This is about 1.9 and 2.7 times larger than the biogas production in 2014 (Eurostat data). Clearly, these results show that there is a considerable growth potential of biogas from digestion of waste streams if the right policies and regulations are put in place.

In Europe, the highest percentage of the total production of biogas comes from the many small-scale digesters producing small quantities of biogas (50-200 Nm3/h) which exactly matches the BioRoburplus concept and gives an immediate idea of its huge potential penetration in the hydrogen economy perspective. In this context, the BioRoburplus technology, capable of processing at high efficiency just-desulphurized biogas for pure hydrogen generation purposes is expected to provide a significant impulse to the growth of the decentralized biogas generation, well beyond the already interesting level achieved in Countries like Germany or Italy, also on the grounds of specific incentives.

Another application opportunity which should provide impact to the BioRoburplus systems is the use as renewable hydrogen production units connected to small local biogas distribution networks hosting small biogas production sites and various users including industries utilizing biogas in their production purposes all over the year and hydrogen production and distribution facilities employing the BioRoburplus technology.

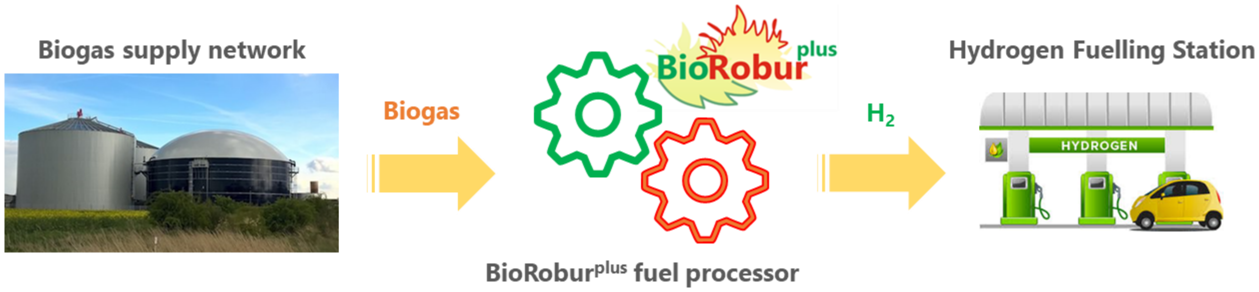

Figure 6. Possible scenario: Networking using BioRoburplus technology in the distributed energy market.

2.3 Hydrogen market opportunities

Currently, the largest use of hydrogen is in industry and refining as a by-product from industrial plants and as a product from reforming of national gas, liquefied petroleum gas and coal gasification. Hydrogen can link different energy sectors and energy transmission and distribution networks, and thus increase the operational flexibility of future low-carbon energy systems. Hydrogen is a flexible energy carrier that can be produced from any regionally prevalent primary energy source. Moreover, it can be effectively transformed into any form of energy for diverse end-use applications (Figure 7).

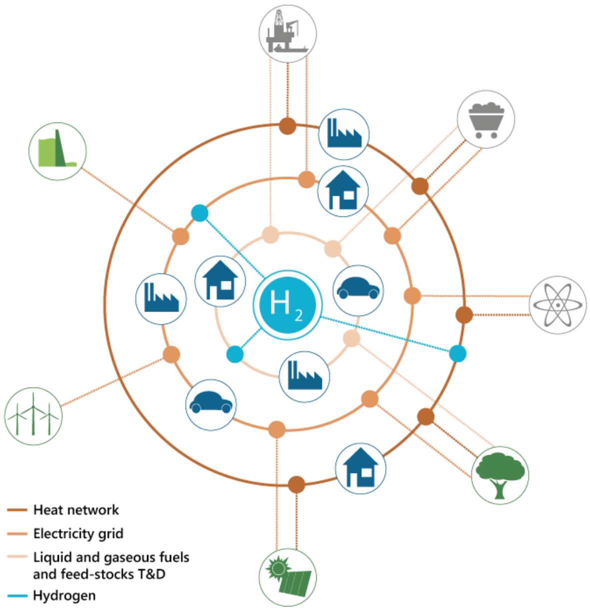

Figure 7. H_2 has a portfolio end-use (taken from IEA website [3]**)**

Hydrogen has been identified as a central pillar of the required energy transition, in the last study performed by Hydrogen Council . The hydrogen scaling up study outlines a comprehensive and qualified long-term potential of hydrogen and a roadmap for deployment, which shows seven major roles that hydrogen can play in this transformation (Figure 5).

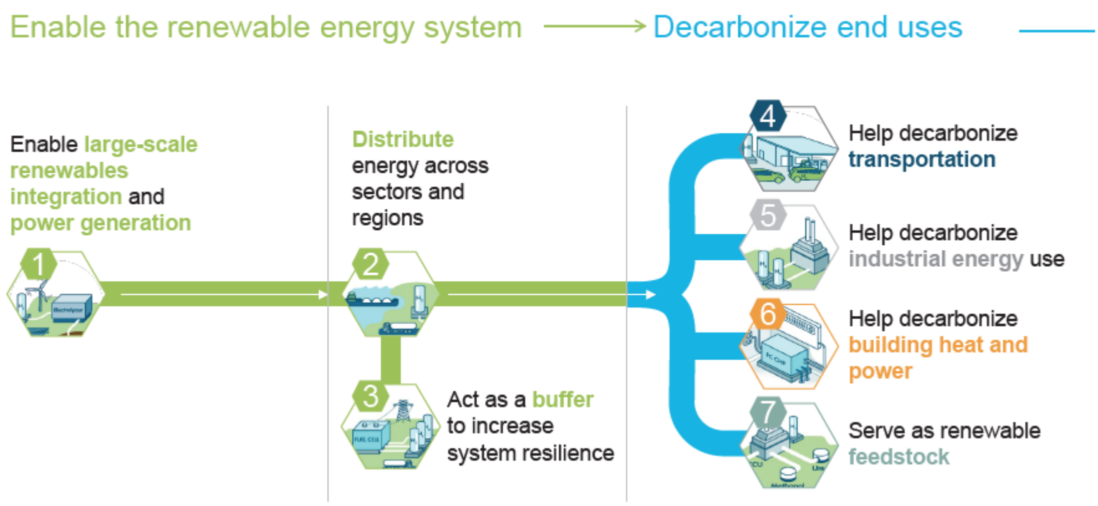

Figure 8. Roles of the hydrogen in the energy transition (Source: Hydrogen Council [4]**).**

Across all seven roles, hydrogen could account for 18% of total final energy consumed by 2050.

Figure 9. Hydrogen vision for 2050 (Source: Hydrogen Council [4]**).**

This would reduce annual CO_2 emissions by roughly 6 Gt compared to today's technologies and contribute roughly 20% of the additional abatement required to limit global warming to two degrees Celsius. Its deployment potential would avoid the consumption of more than 20 million barrels of oil per day compared to today's energy composition. It would radically decrease the need and energy required to transport fossil fuels across the world and increase self-reliance and energy security. Alongside its environmental benefits, the hydrogen economy could create opportunities for sustainable economic growth. The study envisions a market for hydrogen and hydrogen technologies with revenues of more than $2.5 trillion per year and creating more than 30 million jobs by 2050 [5,6].

As a result, it is obvious that there is a positive trend for the hydrogen application in the energy transformation required to limit global warming to two degrees Celsius. Hence, the timing for the demonstration of BioRobur^plus technology is very good.

The most bankable business cases so far identified for BioRobur^plus technology, in the short- and medium-term could involve mobility and industry feedstock as primary applications.

Transportation sector

Deployment of hydrogen mobility is currently strongly politically driven. Many EU Member States have published ambitious national roadmaps on hydrogen mobility. Most roadmaps estimate an exponential growth of hydrogen mobility after 2020 [5]. The most ambitious roadmaps are Germany, France, Scandinavia, Italy, and UK.

EU-wide	2017	2020	2025
# FCEV	600	4 000	800 000
# Buses	85	575	1 800
# HRS	85	740	1 500
H_2 demand (t/yr) *	550	3 650	120 500
Equiv. Electrolyser (MW baseload/yr)	3	21	690

*Assuming FCEV 0.5 kg/d and buses 20 kg/d @ 270 days

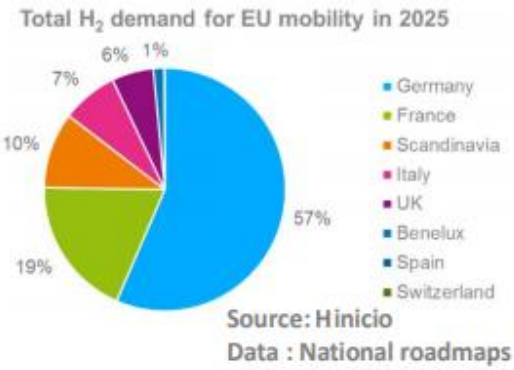

Figure 10. EU Hydrogen mobility deployment projection in 2017-2020-2025 [5]**.**

On the demand side, the Hydrogen Council sees the potential for hydrogen to power about 10 to 15 million cars and 500,000 trucks by 2030. Current global announcements for investment in more than 5,000 hydrogen refuelling stations have been done in California, North-eastern US, Germany, Denmark, France, Netherlands, Norway, Spain, Sweden, UK; Dubai; China, Japan, South Korea

Industry Feedstock

Chemical and petrochemical industries use about 25 EJ worth of fossil fuels as feedstock each year and about 8 EJ of hydrogen; most of which is produced from natural gas, oil, or coal. Hydrogen is used as renewable feedstock in 30% of methanol and about 10% of steel production. Almost all the hydrogen is used in refineries and in the production of fertilizers and other chemicals (Figure 11).

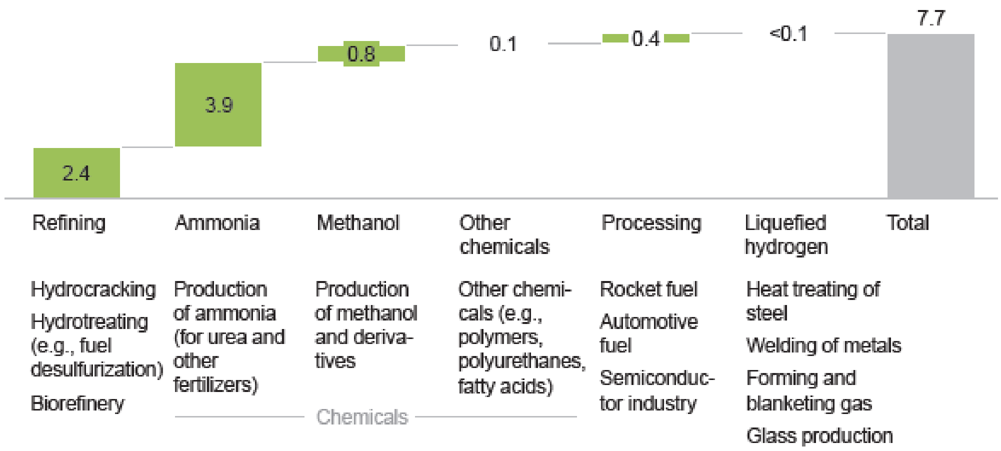

Figure 11. Total hydrogen use, 2015 estimate, EJ (Source: hydrogen council [4]**).**

This briefly economic analysis of the hydrogen market indicates that increased hydrogen demand is expected in the near future.
Overall, the study predicts that the annual demand for hydrogen could increase tenfold by 2050 to almost 80 EJ in 2050 meeting 18% of total final energy demand in the 2050 two-degree scenario.

3 Technoeconomic analysis and project assumptions

3.1 Biogas cost and quality

The biogas quality depends on the biomass source employed for its production. 4 main biological matrixes employed in the European market can be identified. The landfills, energy crops, municipal solid waste (MSW) and agroindustry scraps. Biomass is constituted by 3 main components: water, powder and volatile solids. The latter determines the CH_4 content of the biogas, as indicates the organic substance present in the biomass, potentially transformable in biogas [6]. Table 1 summarizes the price and CH_4 content of the biogas according to the biomass source.

Table 1. Costs of biomass and CH_4 content in biogas [7]

Substrate	Biomass price [€/ton]	% CH_4 in biogas
Energy crops	55	50-65
Livestock waste	2-5	60-65
Agroindustry scraps	5-10	50-60
Sludge	15	50-55
SMW	5	50-60

The biogas employed in the BioRobur^{plus} project is provided by ACEA pinerolese, who produce it from SMW. Figure 12 illustrates the biogas production scheme at ACEA premises. So, the cost estimation for the was done by ACEA. Thus, the production cost of the biogas was estimated to be equal to 0.24 €/m^3. This value was obtained by assuming as the missing production of thermal energy through the biogas combustion in a combined unit of heat and power (CHP).

Figure 12. Biogas production at ACEA pinerolese premises.

3.2 Estimation of Capital Expenditure (CAPEX)

The investment capital includes direct costs (DC) and indirect costs (IC).

• DC costs concern the main equipment, the procurement of raw materials and the equipment installed in the plant.

• IC costs arise from process control and management, for example, personnel costs for supervisory, engineering and construction activities are included in this section.

In the evaluation of the CAPEX, all the main equipment of the plant was considered as Direct costs. OSR and WGS reactors, heat exchangers, purification units, blowers and compressors are among the main equipment. The cost of the equipment is related to the actual cost of the materials employed for the BioRobur plus plant. Direct costs related to the installed equipment per unit are summarized and detailed in Figure 13. Some equipment, like activated carbon filter and water softening were not considered, as the former is considered to be rented so like OPEX, while water softening filter is totally neglected since HST already possessed one. Other Direct costs were related to containers, valves, piping, instrumentation, electrical cabinet, and insulation. While Indirect costs are constituted by engineering and supervision, and construction costs. The direct costs and indirect costs are subdivided and illustrated in Figure 14.

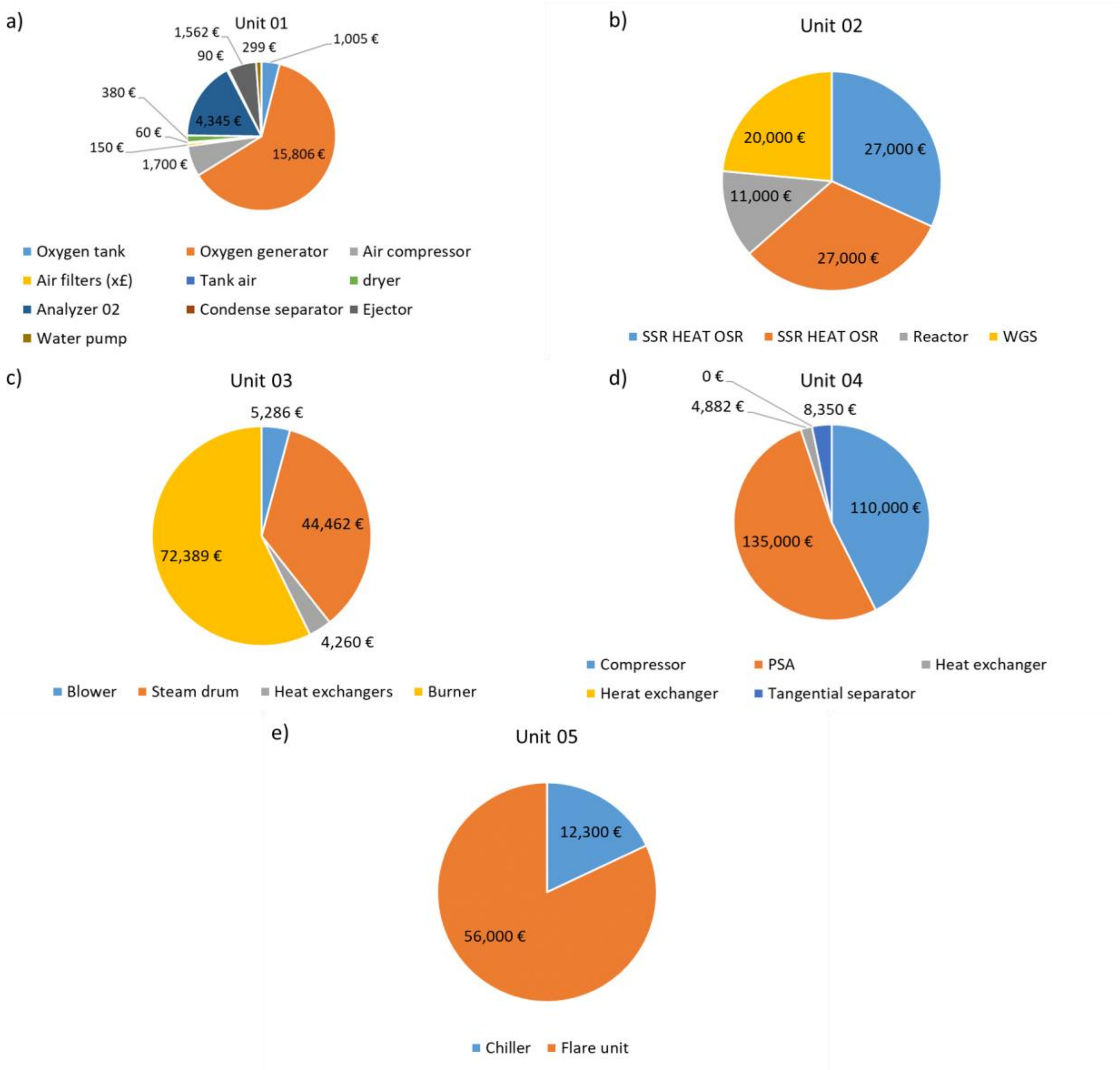

Figure 13. Detailed costs of equipment. a) Unit 01, b) Unit 02, c) Unit 03, d) Unit 04, e) Unit 05.

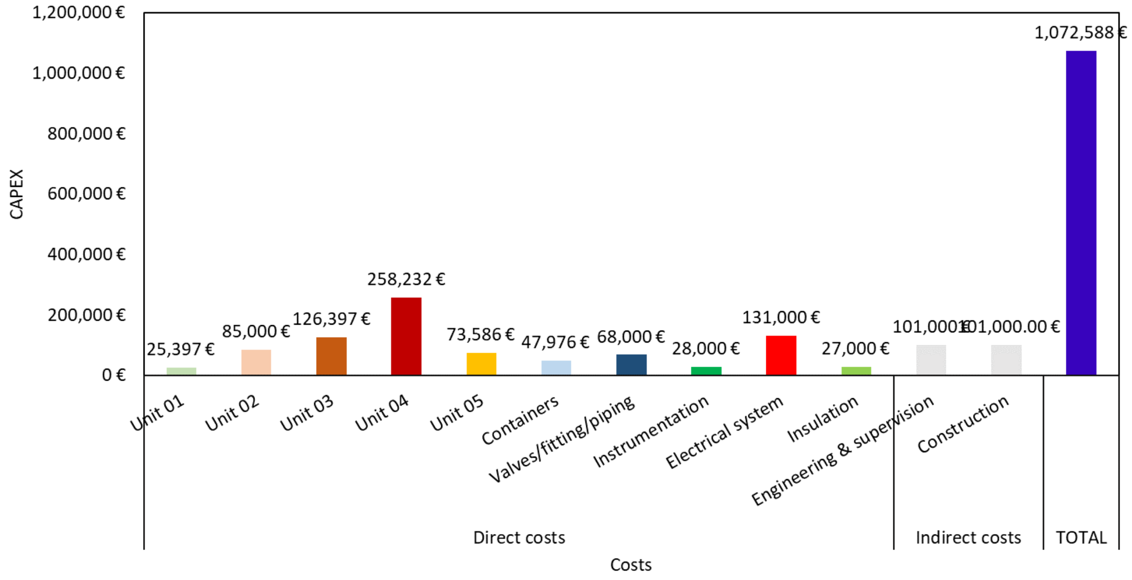

Figure 14. Direct and Indirect costs subdivision

3.3 Estimation of Operational Expenditure (OPEX)

The OPEX estimation foresees all the necessary costs of resources employed for the plant manufacturing. The AACE 5th class was employed as reference [8]. The OPEX could be subdivided in 3 main cost sources. Costs related to raw materials and services inputs, thermal and electrical consumptions, and consumable materials including catalysts, spare parts and adsorbent material. Furthermore, maintenance and operation of the plant costs were considered to be equal to 3% of CAPEX. The thermal consumption was actually zero as the heaters are electrical. The electrical consumption was assumed to be 80% of the installed power. Figure 15 illustrates the impact of each facility on the total OPEX of the BioRoburplus process.

Table 2. Operating costs considerations for calculations.

Operating costs	
Facility	**Cost considerations**
Water	1 €/m3
Biogas	5 €/ton
Heat	-
Electricity	0.05 €/ton
Maintenance	3% of CAPEX
Spare parts	Commercial reference
Catalyst	Amortized over 3 years
Adsorbent material	Amortized over 5 years
Desulphurization system	5495 €/y

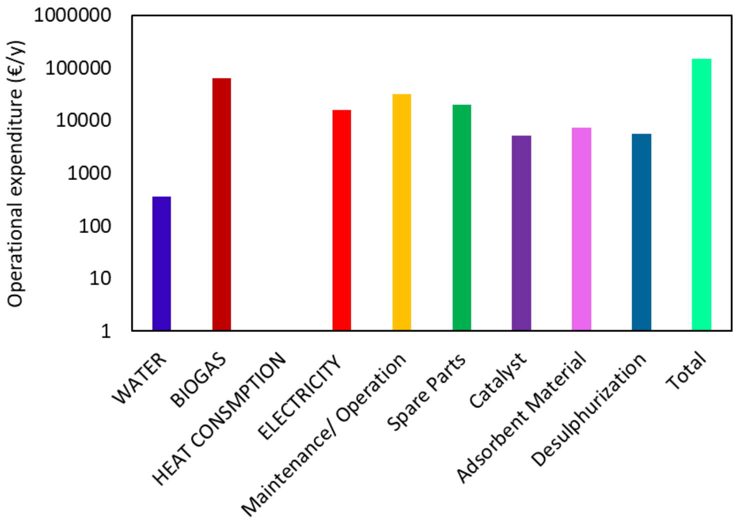

Figure 15. Subdivision of the OPEX.

3.4 Calculation of Hydrogen production cost through BioRoburplus process

As proof of concept, a commercial BioRoburplus plant with a production capacity equal to 50 Nm^3/h of H_2 was considered. The cost of production for H_2 was compared to the EU target, which is equal to 5.6 €/kg H_2 for 10 amortization years. Therefore, the calculations were performed considering two cases, the actual CAPEX of the project and a modified CAPEX. This modified CAPEX foresees a hypothetic optimization of the equipment costs, as the pilot plant manufactured in the framework of the BioRoburplus, especially for the the interconnecting and the reactor, where some equipment was manufactured at high production costs due to the small size of the plant. So, it can be assumed a reduction of the CAPEX of 30% approximately. Consequently, also the OPEX must be modified, especially for the rent of equipment and catalyst and adsorbent material substitution. Nonetheless, the same OPEX will be considered in order to evaluate the economic feasibility at the worst conditions.

So, the calculations carried out considering 10 years of amortization are shown in Table 3. These results suggest that for 50 Nm^3/h of production of H_2 the EU target is not met, neither with the actual CAPEX nor modified CAPEX. Therefore, the process will be assessed through a sensibility analysis considering the effect of several factors on the price. Especially, the scale, the amortization time, daily operation hours of the plant and the cost of biogas, which could be factors with a high impact on the economic feasibility of the project.

Table 3. H2 production cost considering 10 years of amortization with actual CAPEX and Modified CAPEX (H2 productivity is 356.9 ton H2/y)

Case	CAPEX	OPEX	TOTAL	H2 cost
CAPEX	1.07 M€	150 k€/y	2.573 M€	7.21 €/kg
Modified CAPEX	700 k€	150 k€/y	2.2 M€	6.16 €/kg

3.4.1 Sensitivity analysis

3.4.1.1 Hydrogen production scale

The scale of the process could highly affect the production cost, as the costs of the equipment do not generally increase linearly with the production capacity of a plant. The capacity of the plant is linearly related to the size of the plant in terms of equipment volume. While the surface of the equipment, to which the CAPEX is strictly linked, increase following a radical function. So, the CAPEX for different plant sizes could be calculated according to eq. (2). While the OPEX increases linearly, as it is related to the quantity of product produced (See eq. (2)). Table 4 shows the impact of varying the size of the plant from 50 to 800 Nm^3/h of H_2. Table 4 and Figure 16 shows that the production cost of H_2 is reduced with plant size, and the EU target could be met by considering a productivity of H_2 higher than 150 Nm^3/h.

$$\frac{CAPEX}{CAPEXx_{ref}} = \left(\frac{Size}{Size_{ref}}\right)^{0.6} \qquad (1)$$

$$\frac{OPEX}{OPEXx_{ref}} = \left(\frac{Size}{Size_{ref}}\right) \qquad (2)$$

Table 4. Plant size effect on the economic feasibility of the process.

Size (Nm^3/h H_2)	CAPEX (M€)	OPEX (M€/y)	Produced H_2 (ton/y)	H_2 Cost (€/kg)
50	0.7	1.5	357	6.16
75	0.89	2.25	535	5.87
100	1.06	3	714	5.69
125	1.21	3.75	892	5.56
150	1.35	4.5	1071	5.47
175	1.48	5.25	1248	5.39
200	1.61	6	1428	5.33
300	2.05	9	2141	5.16
400	2.44	12	2855	5.06
500	2.79	15	3569	4.98
600	3.11	18	4283	4.93
700	3.41	21	4997	4.89
800	3.69	24	5711	4.85

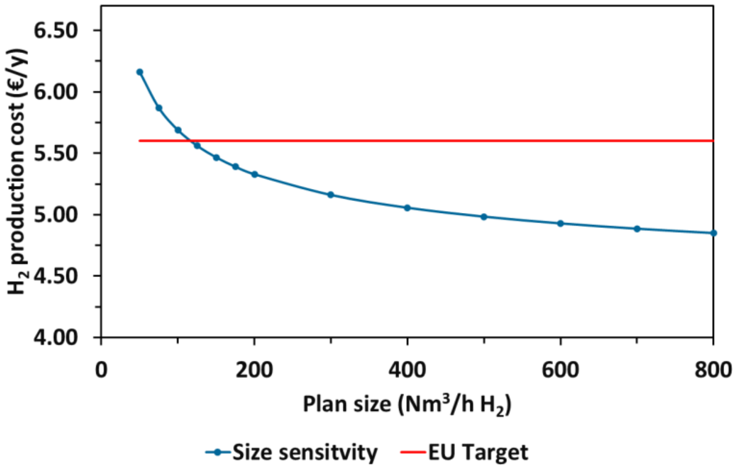

Figure 16. Hydrogen production scale sensitivity

3.4.1.2 Amortization time

The amortization time is the mean life cycle time of the plant; The amortization time could have an impact on the production cost, as the CAPEX impact on the annual production cost changes. The amortization time was varied from 1 to 25 years for different productivities (150-600 Nm^3/h). As the plant size increases, the EU target is met for a shorter amortization time, as shown in Figure 17. It can also be noticed that by increasing the amortization time, the production cost is reduced to values much lower than the EU target.

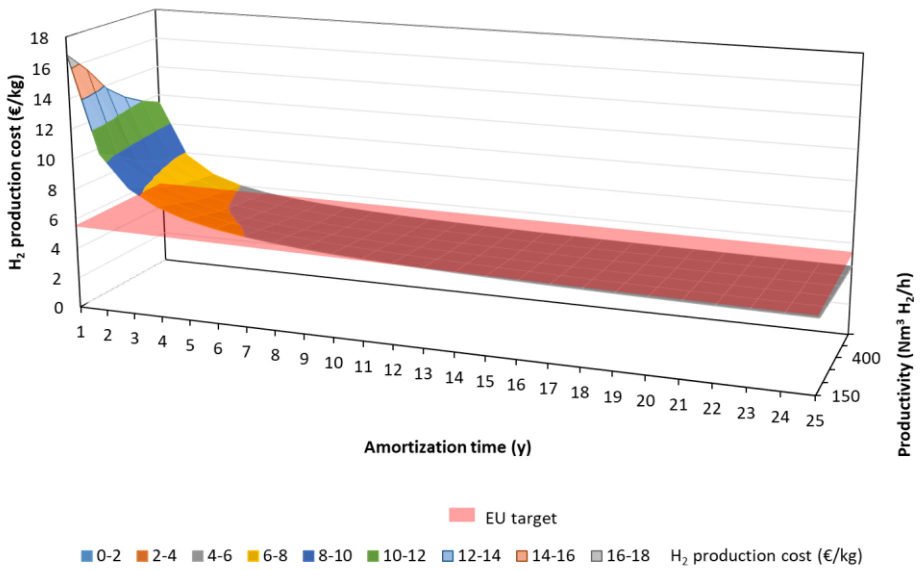

Figure 17. Sensitivity of the variation of the amortization time for different productivities of H_2.

3.4.1.3 Working hours of the plant

The operating time of the plant was also varied from 5840 to 8000 h/y, which corresponds to 16 and 22 h/d, respectively. As reference, the production and amortization time were considered equal to 150 Nm^3/h and 10 years, respectively. Figure 18 shows the effect of the working hours of the plant, and it reflects that the EU target is met if the plant is operated by 22 h/d. The variation of the daily working hours from 16 to 22 entailed a reduction in the production cost of 18%.

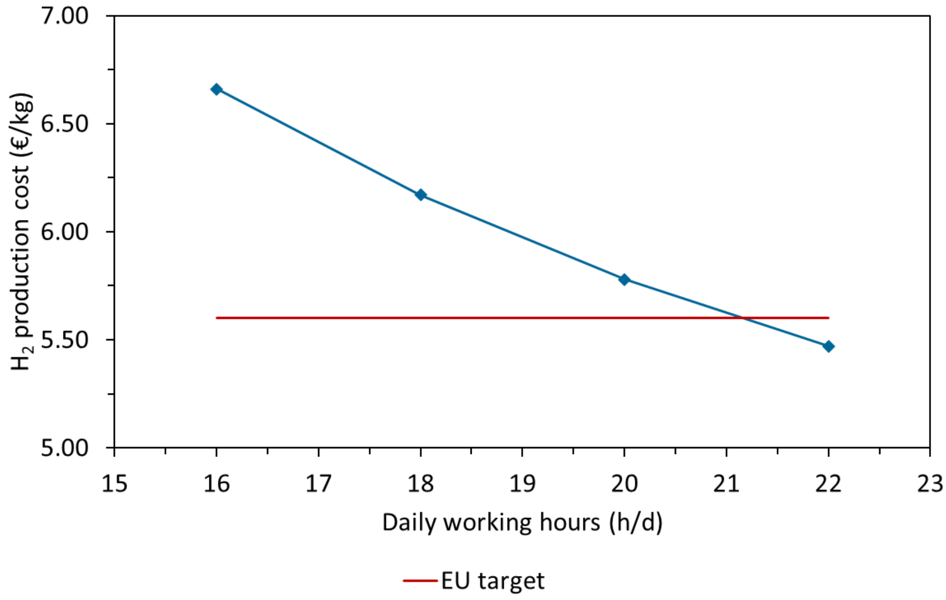

Figure 18. Working hours impact on the economic feasibility of the process.

3.4.1.4 Biogas cost

As stated before, the production cost of biogas depends on the source. For instance, SMW entails a high sulfur content, so treatment costs highly affect the operating costs. We considered a production of 150 Nm^3/h of H_2, and the amortization time equal to 10 years. The cost of biogas will affect the OPEX of the BioRobur plus process.

Table 5 summarizes the effect of the cost of biogas, which depends on the H_2S content. Our case of study, so biogas from SMW, meets the EU target, as the case of getting the biogas from livestock waste and agroindustry scraps. On the other hand, Sludge and energy crops does not meet the EU target, being the latter, the most expensive case, reaching a H_2 cost equal to 20.3 €/kg.

These calculations were performed for a plant size of 150 Nm^3/h of H2, if a scale up is considered, the cases of livestock waste and agroindustry scraps could result even more advantageous. While the Energy crops and sludge cases could meet the EU target. Even if the Energy crops hardly meet, due to the very high biogas cost, which is around ten times the cost of biogas from SWM.

Table 5. Costs of biomass and CH_4 content in biogas [7]

Substrate	Biomass price (€/ton)	% CH_4 in biogas	*H_2S content (ppm)*	*Biogas price (€/Nm³)*	*OPEX (k€/y)*	*H_2 cost (€/kg)*
Energy crops	55	50-65	100	2.24**	681	20.33
Livestock waste	2-5	60-65	400	0.171**	132	4.95
Agroindustry scraps	5-10	50-60	400	0.22***	145	5.32
Sludge	15	50-55	4000	0.4***	192	6.66
SMW	5	50-60	900	0.24*	150	5.47

* Source: ACEA

** Source: CMA

***: Analysis based on the biomass cost and required pretreatments.

4 SWOT analysis

The Strength, Weakness, Opportunities and Threats (SWOT) analysis allows identifying internal and external factors influencing the success of the business model of the Biorobur^plus project. SWOT analysis makes it possible to identify opportunities to improve hydrogen production and future challenges for zero emissions in the European context. Table 6 summarizes the SWOT analysis applied to the BioRobur^plus project.

Table 6. SWOT analysis of the BioRobur technology.

Helpful to achieve the object	**Strengths**	• **Low environmental impact:** Hydrogen is a flexible energy carrier with a zero carbon content. Its production from renewable sources, such as biogas, helps to greatly reduce greenhouse gas emissions. The use of biogas as the BioRobur technology feed allows waste-to-energy conversion. At the same time, it leads to a decline in greenhouse gas emissions in two different ways: heat or electrical energy can be generated to reduce the dependence on fossil fuels, and greenhouse gas emissions are decreased as methane emissions from landfills are avoided. Moreover, serious problems pertaining to their management and disposal are also avoided. The energy recovery in the process is aimed at heating the inlet water, and this permits the thermal consumption to be reduced. • **Competitive on the European market**: after 5 years of amortization, the estimated hydrogen's cost is 4 €/Kg H_2, while the EU target is 5 € per kilograms of hydrogen. • **High energy efficiency**: the heart of the process is an auto thermal reaction; this means that the heat required for the reforming reaction is balanced by the heat released by the partial oxidation, thus guaranteeing a self-sustainable process.
	Opportunities	• **Policy incentives:** there has been an increase in biogas production plants in the last few years. In fact, government incentives have promoted the use of biomass in order to produce energy as an alternative to fossil fuels. • **Research on renewable sources:** in order to reduce pollution and develop a clean and sustainable energy system, several research projects have been promoted. At present, there is more sensitivity toward and interest in environmental protection.
Harmful to achieve the object	**Weaknesses**	• **High cost of the PSA unit:** gas purification is crucial to attain the final specifications, and the required high grade. The PSA unit is able to guarantee these results, but the overall costs of this technology (the equipment, the materials and the energy consumptions) are very high, that is, almost 22% of total costs.
	Threats	• **Difficult final applications:** the hydrogen technology is not so diffused at present, and this makes the final applications of the produced H_2 complicated/difficult. • **Fossil fuels:** over the next 30 years, it is expected that energy consumption will continue to mainly be covered by fossil fuels. • **The time:** there is still a need for a significant improvement in the plant efficiencies of H_2 production, in order to obtain reduced capital costs, higher reliability and operating flexibility. It is believed that a long time is still necessary to achieve hydrogen economy. In this context, which is characterized by strong technological competition, the BioRobur technology will be able to compete with more consolidated technologies.

5 Conclusion

The present TEA showed the feasibility of the BioRobur^{plus} process, which showed that the process with some optimizations for the CAPEX and a higher H_2 production scale could meet the EU target in terms of H_2 production costs. The effect of the CAPEX is reduced for higher production scales, allowing the EU target meeting. The production costs were also reduced by increasing the working hours and the amortization time, as it allows to allocate the CAPEX and OPEX on higher H_2 production at the end of the life cycle of the study. Interest results were obtained regarding the biogas cost, which suggested that the BioRoburplus feasibility is highly sensible to the biogas cost, so the source of biogas with a lower production cost, such as livestock waste, could provide higher economic benefits to the project.

Nonetheless, the complete maturity of the process is not reached yet. Therefore, it is necessary to increase the government incentives to improve BioRobur^{plus} like technologies to increase its profitability. The European strategy aims to promote the green H2 and its use by financing projects such as BioRoburplus, increasing the energy produced from renewable sources. Italy incentives the local energy production by using biomass, representing interesting opportunities for the technology to get into the energy market. Nonetheless, some weaknesses and threats could affect the success of a BioRobur^{plus} like technology. The cost of the unit and the fossil fuels production at higher scales are among the most relevant weakness and threats.