

# Beyond Energy Action Strategies



## D.3.1.c – Business Plan of CMM - SAVE

**Title of the project: Energy efficiency refurbishment of CMM headquarter**

**Location: Morbegno (IT)**



**Submission date: .....**



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## 1 Summary of the Project/Project at a Glance

*(Nature of the business, the location, resource requirements, volume of business, a brief on market justifying the project, financial highlights)*

The CMM headquarter building is an awarded construction in the city center of Morbegno (Latitude: 46 ° 8'8 "North; Longitude: 9 ° 34'2 "West; Height: 252 m.s.l.m.). Indeed, the first prize come from the INARCH Award in 1994, and the second one, the INARCH/DOMUS Award, is dated 1996.

Due to energy savings issue, the building needs an improvement and renovation. That's why the CMM decide to have a new roof, windows and efficient lights. This project will be able to guarantee a notable annual savings in terms of emissions, having a good design building aiming to influence the population representing an example of good practice to imitate.

Thanks to the replacement of windows (total surface of 374,3 m<sup>2</sup>), it is expected a primary energy savings in winter heating season alone of about 370 cubic meters per year of natural gas. In terms of economic benefit, the savings achieved year at current prices correspond to 6,200 € per year. In addition, regarding the summers season it is expected a saving of electricity needed for air conditioning of about 600 kW / h of electricity for air conditioning saved. In terms of electric power consumption during the summer is of 3772 kwh per year, considering a reasonable cost kwh of electric 0,2 € / kwh, the savings achievable becomes equal  $3772 \times 0,2 = € 754.4$

Differently form this, regarding the photovoltaic park on the roof, the production of energy foreseen is equivalent to save 63600 kWh per year, taking into account the current cost of energy equal to about 0,20 Euro, the estimated economic benefit is around €12.720 per year.

In addition, each luminaire 4x18W replaced with a LED technology will save about 374 Euros (considering 40,000 operating hours, equivalent to about 15 years of operation activities for office workers ), equivalent to about € 24.90 per year.

All works were commissioned to Studio Elettrotecnico Sala Tesciat, Studio Martinalli and Arct. Romegialli companies for a total of € 750.000 for one year of labors.

## 2 Details of the Proposed Project

*(Requirement of fixed capital and working capital, the cost of project and means of finance. Step-by-step description of the process, plant capacity, expansion plans and quality control procedures etc)*

The renovations and improvements planned for the building of the Mountain Community of Morbegno can be divided into three lots, summarized as:

- 1 Replacement of existing windows to change radically its thermal and acoustic performance;
- 2 Installing photovoltaic panels on all three slopes of the roof and replacing lighting offices;
- 3 Removing the roof covering in flagstone and installation of insulated panels sheet suitable for installation of photovoltaic panels;

The set of the interventions are 'focused on reducing overall energy saving and energy source for the entire building as well as the upgrading and remodeling architectural appearance of the building itself, with the aim of imparting a strong and ecological environmentally friendly characterization in line with specific functions carried out by the Mountain Community, while maintaining the appearance of the building in its main lines as much as possible with the original architecture.

#### LOT 1

In addition to the replacement of windows, the architectural project also includes the replacement of Birse-soleil GRC (fiber-reinforced concrete) today present on the fronts east and west which have problems with static sealing retainers of their connection to the slab that could cause situations, in case of accidental detachment, of serious danger on the underlying areas.

#### LOT 2

This second lot foresees the implementation of a photovoltaic plant having an installed capacity of 59.00 kWp, with photovoltaic modules coplanar coverage so as to make the 'visual impact the less impact possible.

The installed capacity of 59.00 kWp will be managed with the "exchange on site of 'energy produced" system so as to make available the ' power produced and not used immediately in times of need by increasing the savings in 'buying power.

Installing new lighting fixtures with LED technology to replace existing incandescent to lower power consumption and maintenance costs.

#### LOT 3

The lot covers the preparatory work of the yard (installation of scaffolding, removal of the roofing and plumbing) and the repair of the roof cladding and its ancillary components (plumbing, firm snow and lifeline)

Specifically the works related to the new roof covering include: removal of existing coverage, positioning of new coverage materials suitable for improving insulation and support PV panels.

### 3 Internal aspects

*(Describe the strengths and weaknesses)*

The project is characterized by the high value of the building, which will be modernized by energy efficiency works. The foreseen interventions are focused on improving the overall energy saving of the entire building in compliance with its architectural features. In effect, the building and the integrated adjacent edifices received several architectural awards over time; due to this, the new works will be characterized by high value design. Often, building energy refurbishment bring a high impact on architectural characteristics, it means it would lead to an improvement of energy efficiency respectful of the architectural value of the structure. Taking into account this, the foreseen peculiar actions concerning a public building will be a good example for further similar travels to be implemented by public entities and private citizens in their edifices taking into account both the design and the energy efficiency aspects.

In addition, strengthening the project, CMM reached the favorable commitment of the public bank for public entities, namely "Cassa Depositi e Prestiti", with the aim to engage a mortgage for the implementation of the project.

Nevertheless, the preliminary project considered the employment of integrated product able to guarantee thermal insulation and RES production for both windows (Schuko windows) and the south façade (Pitz panels). However, the end of subsidies makes these products not convenient in the future and, in addition, it should consider that these materials will be unavailable on the market.

Finally, the project implementation implies a high economic investment which is detrimental in terms of costs-benefits. Indeed, in term of quality-price, analysis shown the payback period of the investment similar as much as the economic life of the panels on the roof. Besides, from the environmental point of view, the expenses for all foreseen travels are not enough to show the ecofriendly impacts having only an initial save in terms of money from new lights and windows.

## 4 External environment

*(Describe the threats and opportunities)*

In line with the previous point, the project implementation will guarantee annual energy saving of about 63600 kWh per year, without considering the energy saving of LED lamps and RES energy produced by PV panels on the roof. At the moment, the annual saving for maintenance costs (heating, cooling, and lighting) is about €7.000 resulting from windows replacement. In addition, a total amount of €374 for each LED luminaire installed per year will be saved, considering about 15 years of their operation activities. Finally, €12.500 per year will be spared from the RES produced by PV roof panels.

The undertaking project actions will contribute to the improvement of inner comfort for CMM workers, bringing them to higher productivity. Indeed, the wellbeing of the office places is an important factor to increase the efficiency of workers.

In order to achieve the foreseen results from the project, political commitment is fundamental in order to make the project feasible and sustainable for the future. Thanks to administrative election pool held in May, the CMM government (composed by mayors of municipalities of the mountain community) changed composition. This new political situation, at the moment, is affecting the project, having difficulties in finding a new approval for the further mortgage.

In addition, aesthetic issues should be taking into account. Indeed, the building has an important architectural value recognized over the years by the assignment of prizes at national level. Thus, making energy efficiency refurbishment sometimes the design is not take into account. In order to preserve the aesthetic value of the building it is important to implement the design phase in respect with the characteristics of the existing building, providing a great balance between energy performance and aesthetic considerations.

## 5 Market Potential

*(Introducing a new product to the market requires an analysis of the external factors that may affect a successful business case. The business model environment can be described by a number of forces that will influence the competitiveness of the business on the short and long haul –Key trends, industry forces, macroeconomic forces, and market forces-. Provide a note on marketing strategy, potential customers, competition, market size and future prospects)*

The energy improvement of the CMM headquarter is totally in line with the scope of the EC Energy efficiency in buildings directives (2010/31/EU and 2012/27/EU). Indeed, under this Directive, Member States must establish and apply minimum energy performance requirements for new and existing buildings, ensure the certification of buildings' energy performance and require the regular inspection of heating and air conditioning systems.

Related to the replacement of the current CMM headquarter roof, contrary to what can be observed in other countries, in 2014 PV installations in Italy were 591,029 with an installed capacity of 18,053 MW. Moreover, 44% of installed PV capacity is in the North of the country, where the total capacity of Lombardy is estimated 1,992 MW (11%). Nowadays, Lombardy is the affirmed first region with the largest number of plants (84,338 plants), in other words, 14.3% of the national total.

With regard to the production of electricity from solar photovoltaic, data from the International Energy Agency shown the continuous increase of energy produced by PV (900 GW within 2030, 5% coverage of total production).

Indeed, to produce energy from a PV system is suitable taking into account the Italian market trends.

1) The extension of the tax deduction 50% for all 2015, in order to produce clean energy in the home and household can halve the cost of the installation and, as a consequence, the payback period of the plant. This advantage will guarantee an annual income tax refund to 50% of the costs of the plant.

2) To produce clean energy is useful in order to save the bill. Indeed, using PV it is a way to auto-generate some of the electricity needs that presumably takes place mainly during the day.

3) The energy produced by the solar power plant, in fact, will be paid by the market at a price that today is really lowest (drop in price up to 4 euro cents per kWh). In this case, the convenience is to sell directly the produced energy to the end user, as the case of certain types of SEO (Efficient Systems of User) where the owner of the plant sells the energy produced directly to the end user which is on the same site.

In addition the other two measures, taking always into account the mentioned EC directives, the replacement of lights with LED technology and the introduction of more energy efficient windows, are following the new market tendencies to boost on saving energy and money.

Indeed, with the burst of recent initiatives to accelerate adoption of energy-efficient fenestration technologies in the marketplace, an update on window market transformation efforts is needed. Because of the impact of glazing on total home energy performance, the residential window market has received increasing attention over the past years, having begun to move markets toward higher-efficiency windows. The results have included increasing sales of efficient products, stocking of more efficient qualifying products, and price reductions of high-efficiency product. Similarly, due to energy and environment regulatory and lighting preferences in the EU market, the replacement of old lamps with the led ones is constantly increasing (21% to \$12.2 Billion in 2018). Indeed more than 60% of the market led is related to commercial, industrial, outdoor and architectural purposes.

Following these market tendencies CMM can have returned its investments in less than 30 years showing to population a new and functional example of energy efficient design building that can be taken as a good practice for the future of other edifices.

## 6 Risk analysis

*(Emphasis on those elements that are threats to the project with an important impact)*

The main risks able to affect the project are identified as follow:

- Quality of workmanship or condition of wall and roof;
- Poor quality and/or durability of the support frame and fixings.

Moreover, relevant events could threat the project, for example:

- Failure of fixing;

- Extreme weather events, such as strong winds and heavy snow loadings;
- Solar renewable technologies being pulled off a wall or roof;
- Collapse of a wall or roof.

As a consequence, due to the impact of falling equipment, the adjacent buildings will be damage and injury to humans can happen.

In addition there are specific risks common to both roof and window, namely:

- Deterioration of roof trusses and existing wall
- Alterations to the roof construction and the original wall
- Deterioration of frame or fixings
- Increased wind loading
- Increased snow loading

## 7 Financial Analysis

*(This section should provide a basic financial assessment of the project including the expected IRR and payback period as well as data on expected capital costs, depreciation, operation and maintenance costs and expected revenues. Full financial spread sheets showing IRR calculations and cash flow can be included in the annexes.)*

The project foresees relevant saving as respect current energy bill.

In particular, due to window replacement it is expected an annual gas saving for heating of 370 cube meters per year, corresponding to € 6.200.

Furthermore, thanks to improved insulation, replaced windows will enable an annual saving also regarding energy cost for summer cooling, esteemed in € 754,40 per year (3772 Kwh x 0,20 €/Kwh).

Summarizing, the annual saving expected from windows replacement is of € 6954,40 € per year.

In addition it has to be considered the annual saving arising from Led luminaire, corresponding to € 374,00 for each lamp (considering 15 years of operation – 40.000 hours). Providing the replacement of 15 lamps, the annual saving corresponds to € 374 per year.

Finally, the energy produced from the PV parks on the roof would guarantee an annual production of 63.600 kWh per year, corresponding to € 12.720 per year (considering € 0,20 per Kwh).

**Total annual income correspond to € 20.048,40.**

Considering the total cost of the project of € 740.000 (see following paragraph) the payback period would be of 37 years.

Furthermore, in this calculation it has not been considered the cost for maintenance and operation,

as well as depreciation cost.

It is evident that the project is still lacking of feasibility from the financial point of view, that why CMM has just commissioned a new project design able to guarantee major annual saving, improving the financial sense of the project.

Notwithstanding, the new project design is not still available.

## 8 Cost

*(Capital cost, Cost for studies and other initial promotional costs , Cost of raw materials, utilities, manpower, repairs and maintenance, selling and distribution expenses, administrative expenses, interest on loans availed, depreciation and any other expenses – fixed cost and variable cost)*

	<b>WORKS</b>	<b>COST</b>
LOTA	Windows replacement and building works	€ 249.929,74
	Related safety cost	€ 10.634,66
		€ 260.564,40
LOT B	PV panels and building works	€ 301.746,28
	Related safety cost	€ 10.259,32
		€ 312.005,60
	<b>total</b>	<b>€ 572.570,00</b>
LOTA	VAT 10%	€ 26.056,44
LOT B	VAT 21%	€ 65.521,18
	Project and design	€ 57.000,00
	Administrative costs	€ 18.852,38
	<b>total</b>	<b>€ 167.430,00</b>
	<b>combined total</b>	<b>€ 740.000,00</b>

The total cost of works include: € 572.570 for works implementation and safety costs, and € 167.430 for project and design, VAT and administrative costs.

The total amount for work results € 740.000.

## 9 Income

*(Sales, cost of manufacturing, contribution, tax liabilities, repayments, retained profit/loss)*

The project doesn't foresees direct income, nevertheless it is possible to esteem saved cost, resulting from the less energy consumption, as indirect income.

Following, saved energy amount and related saved costs:

- window replacement € 6954,40 per year.
  - winter energy saved – heating € 6.200
  - summer energy saved – cooling € 754,40 per year
- LED luminaire € 374 in 15 years for each new luminaire, considering the replacement of n.15 luminaires tha annual saving corresponds to € 374,00
- PV panels – energy produced 63.600 kWh per year, corresponding to € 12.720 per year (considering € 0,20 per Kwh).

## 10 Feasibility assessment

*(IRR, NPV, payback period, benefits of the project)*

The project presents many rooms for improvement, first of all from the financial point of views. In effect, the initial investment is too high as respect as the economic benefit foreseen, resulting in a payback period of 37 years.

For this reason, CMM commissioned an additional project design, asking for improving the cost-benefit result and focusing more on energy efficiency than on aesthetic value.

The second project should be available within the end of this years, only once terminated it would be possible to define the economic sustainability of the project, enabling the start of works.

A part from this, the project presents undeniable benefits from the environmental and pedagogical point of view. In fact, the CMM headquarter is a reference point for 25 municipalities of the valley, and a consistent effort for energy efficiency would sensitize many mayors to implement similar projects in their territories. Notwithstanding, in order to have a positive effect on the surrounding area it is essential to demonstrate the real convenience of the project also from the financial point of view, motivation for which it has been commissioned a deepen study with the intent to improve this aspect.

## 11 Sensitivity analysis

*(Sensitivity analysis on important parameters with a great impact to the project financial feasibility)*

CMM has just acquired the positive response for take out the mortgage financing the project, obtaining a subsidized rate reserved to local administration from the “Cassa Depositi e Prestiti”, the national bank for public entities.

In addition, CMM has recently commissioned a new deepen study aimed at improving the current the project, with the aim to increase saving cost and get better the cost-benefit analysis, the parameters with the most important impact on the project is the possibility to have major savings with equal investment, for example paying more attention to final performance of manufacts than their aesthetic impact.

By this way, it will be possible to achieve a positive return on investment decreasing the payback period thanks to the increase of annual savings guaranteed.

## 12 Social benefits and Public support

*(Please identify and rate the positive impacts of the project and provide an alternative scenario of feasibility analysis including public support if needed to achieve a reasonable Return on investment)*

Social benefits of the project include the positive effect on the surrounding area, which could stimulate the implementation of similar project of energy efficiency refurbishment on public buildings of the 25 municipalities of the area administrated by CMM, bringing to a better environmental sensitivity and a minor energy bill, making more resources available for alternative investments needed by citizens.

The project could represents a best practice for similar projects to implement in the area, but it is needed the increase of energy savings in order to improve cost-benefits analysis and constitute a real reference point for local administrations.

## 13 Implementation roadmap

*(Use a Gantt chart to show the timeline for key activities and milestones throughout the project implementation phase.)*

WORKS	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
windows												
photovoltaic panels - led luminaires												
roof insulation												

The total duration of works is esteemed in 12 months.

Firstly, it will replaced existing windows with more efficient ones, and restored brise soleil.

Secondly, it will start roof works in order to prepare for the following positioning of PV panels.

## 14 Conclusion

*(Is it a good or bad idea? Why should investors put their money in this project?)*

Financing this project it will possible to save more energy creating a unique example of energy saving architecture design in the valley. Nevertheless, this plan shows how it is necessary to recur to certain materials before they are not more available on the market and with the same price. Indeed, energy conservation technologies have advanced so rapidly in recent years making possible significant savings in economic and energy terms. As it is showed, investing on led lights, new windows and a new roof, it will possible to save energy cutting carbon emission at low cost, having a return of investments about to €20.000 per year. Moreover, thanks to such investment workers will feel more comfortable being more productive and it will be possible to capitalize the saved money on other valuable works making benefits for the entire community.