Photovoltaic - wind hybrid system for energy supply of an isolated consumer

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Presentación proyecto IN2Rural

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IN2RURAL

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General overview

- The farm is closed to the Călugăreni village.
- Located on a hill elevated 877.1 m over the sea.
- The farm produces dairy products throughout the year. And energy is produced thanks to a diesel generator.

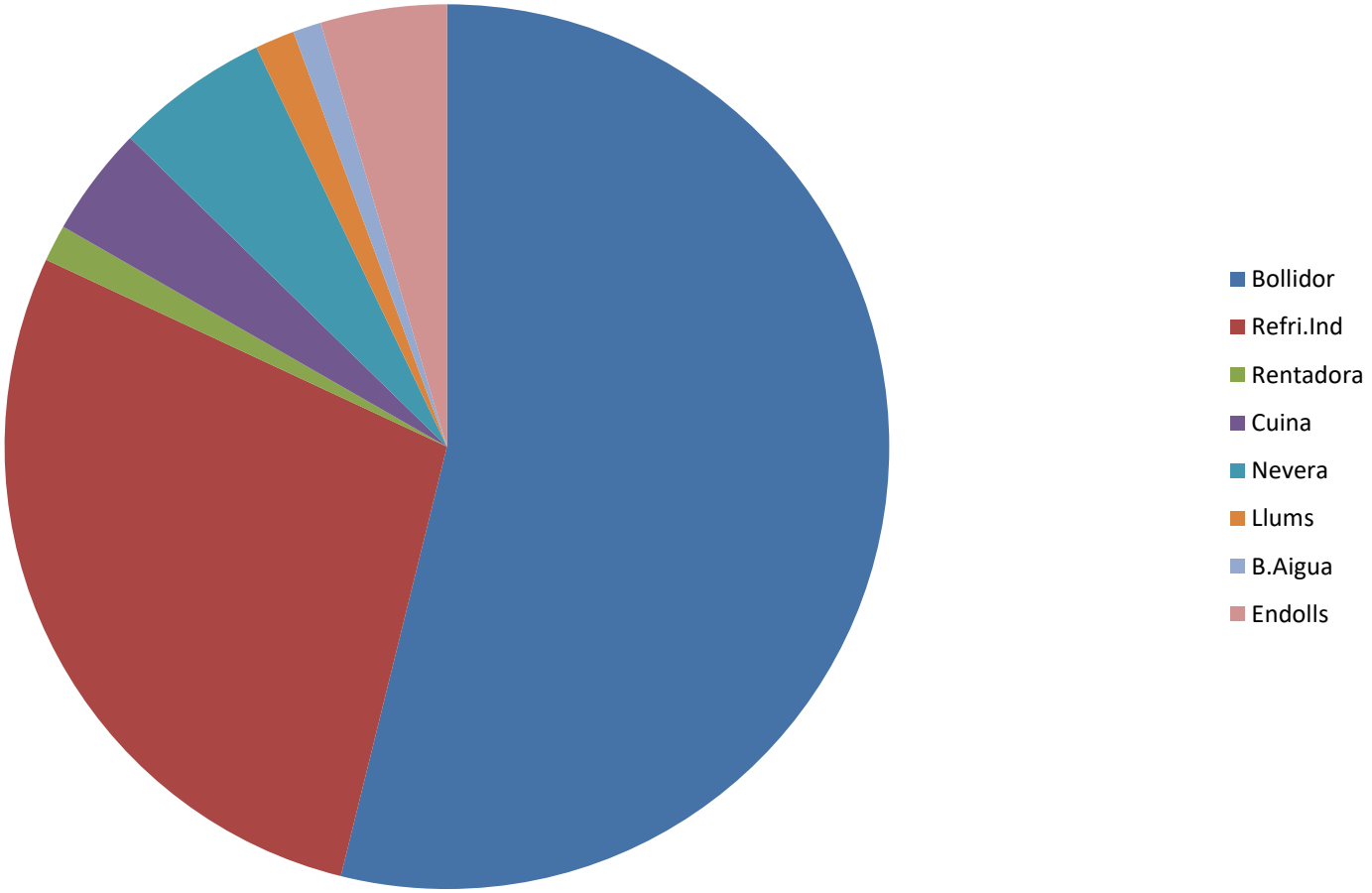
Consumptions

- The farm has a series of consumptions along the year, that can be divided in:

Production area: Consisting of a Industrial fridge and a Boiler.

House area: Consisting on the typical consumptions from a house.

Consumptions



Elements to be installed

- 52 solar panels, rated power 340 W model Tamesol TM-M672340.
- One wind turbine, model Enair E-30 PRO rated power 3000 W

Elements to be installed

- Two charge regulator SmartSolar MPPT 250/85 by Victron Electron
- Two inverters Phoenix Inverter 48/5000 by Victron Electron
- Wind turbine has its own charge regulator, model RCE-ENAIR-120

Elements to be installed

- 40 battery blocks, model 12 CS 11P, from the company Rolls.
- Each battery block has a rated voltage of 12 V
- System working voltage at 48 V

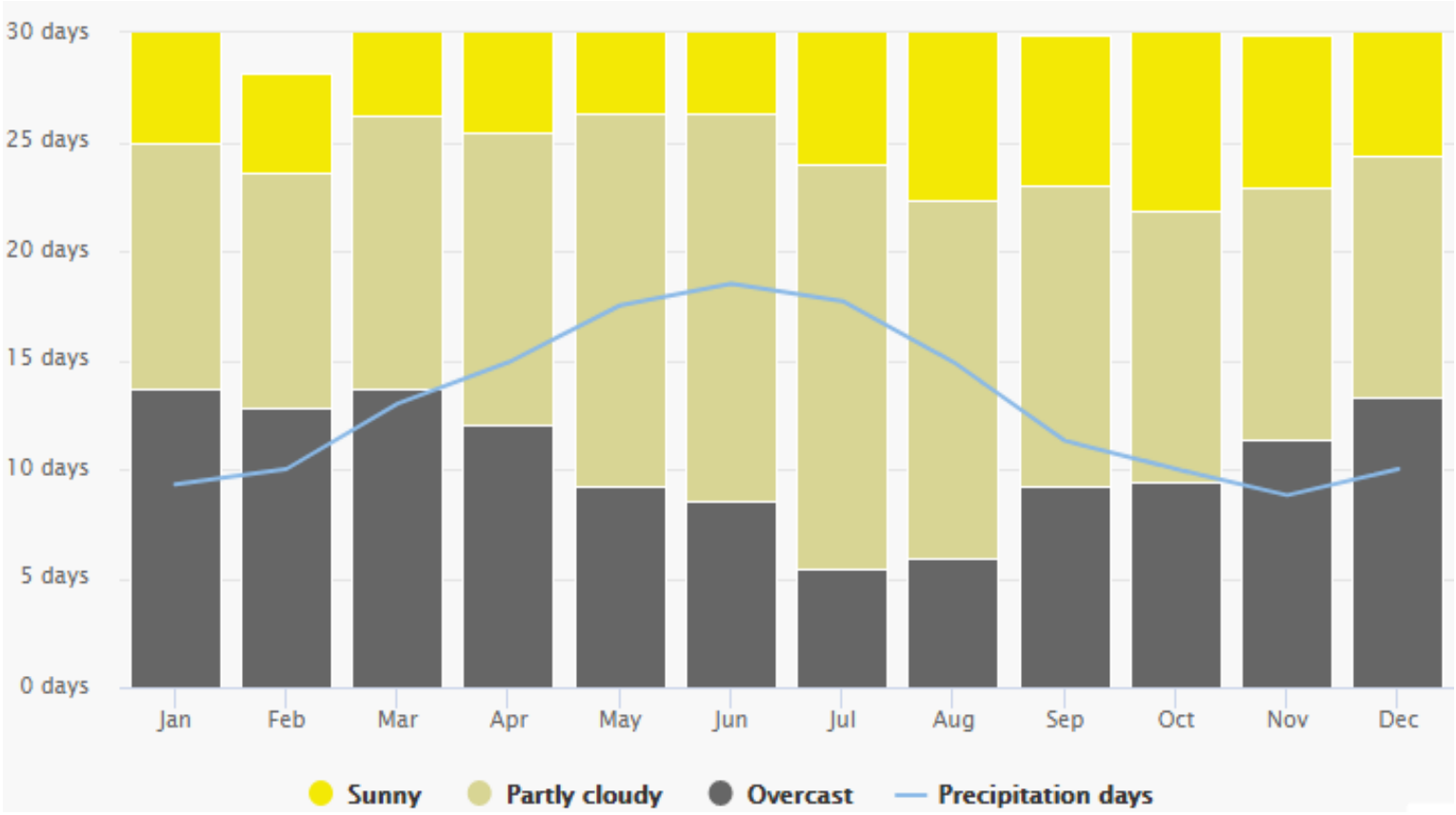
Other elements

- Connection cables
- Fuses and circuit switch openers
- Grounding
- Connection boxes etc…

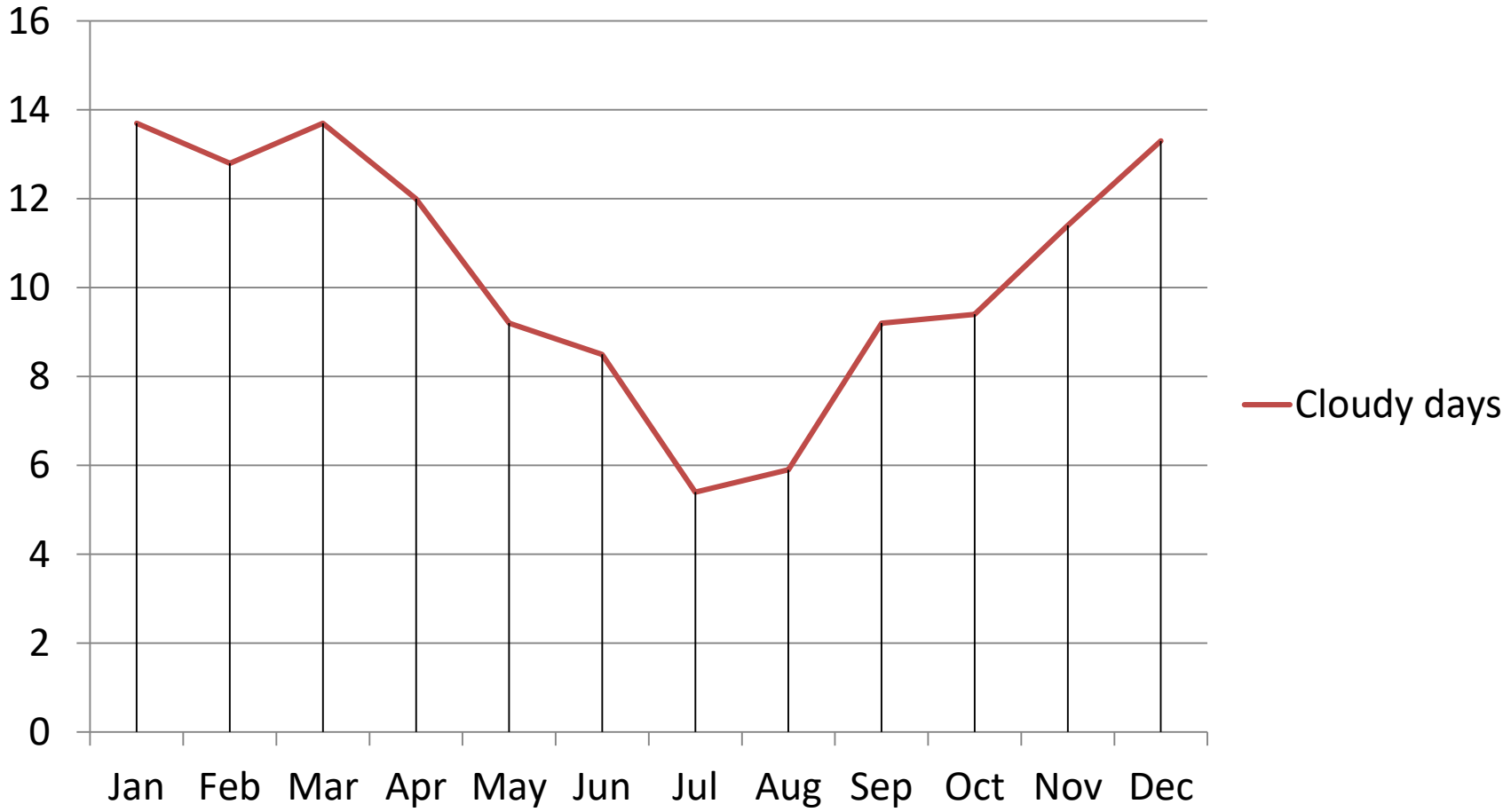
Criterion and reasons for a hybrid system

- High amount cloudy days.
- Very low irradiation on the month of December.
- Higher energy supply security and safety.

Criterion and reasons for a hybrid system



Criterion and reasons for a hybrid system



Suggested installation

- The solar panel system is to be installed on the roof of the house, at a 50 degree angle.

- The wind turbine, following the manual, is suggested to be installed on a 15 m pole and 10 m away from the house.

Suggested installation

Suggested installation

Optional elements

- On the winter period the house makes use of heated sanitary water
- A vacuum tube collector can be installed as an optional element to provide an alternative.

Budget

- Element cost:

		Price.exVAT(€)	PriceVAT(€)
Panels		6.683,04 €	7.952,82 €
Wind turbine		5.880,16 €	6.997,39 €
Inverters		5.086,00 €	6.052,34 €
Charge regulators		1.413,45 €	1.682,00 €
Battery system		37.830,08 €	45.017,80 €
		Total price:	67.702,35 €

Budget

- The total cost of the installation will be:

Elements price	BOS+ others	Funding	Total (€)
67702.35	14786	-1500	80988.35

Cashflow and payback

- The clashflow will be the money saved from the diesel used on the generator.

$$CashFlow = LitresDieselSaved * PriceDiesel - O\&M$$

$$CashFlow = 9357.648 \frac{€}{Year} - 1619.76 \frac{€}{year} = \mathbf{7737.88\ €/year}$$

Cashflow and payback

- Therefore the payback period:

$$Payback\ period = \frac{80988{,}35\ €}{7737.88\ \frac{€}{Year}} = \mathbf{10.466\ Years}$$

NPV and IRR

- Considering a discount rate of 5%
- We obtain a NPV of 7.088,42 € and IRR of 6%
- Therefore the inversion will provide a benefit to the farmer.

GHG emissions

The emissions emited from the production of the energy production elements are:

	Kw.Installed (kW)	CO_2 g/Kwp	Total.CO_2 g
Panels	17,68	99	1750,32
Turbine	3	10,2	30,6
		Total:	**1780,92**

GHG emissions

			Yearly energy demand (Wh)	Generator (Kw)	YearHours	Litres/h	LitresDiesel	DieselCO2	Total emission saved
0% use of the diesel generator			7798039,643	5000	1559,60793	6	9357,64757	2,69	**25172,07197**
25% use of the diesel generator			5848529,732	5000	1169,70595	6	7018,23568	2,69	**18879,05398**

Conclusions

- The solution presented is flexible and provides a fully solution to the problem that the client has.
- It provides him benefit and contributes to the GHG and global warming solution.